



Groote Eylandt Mining Company (GEMCO)

Eastern Leases Project

Draft Environmental Impact Statement

2015

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Aboriginal and Torres Strait Islander readers should be aware that this document may contain images or names of people who have died.

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1 INTRODUCTION

The Groote Eylandt Mining Company Pty Ltd (GEMCO) operates an open cut manganese mine (the existing mine) on Groote Eylandt in the Northern Territory (NT) (Figure 1). GEMCO is proposing to develop the Eastern Leases Project (the project) in order to access additional mining areas to the east of the existing mine.

An Environmental Impact Statement (EIS) has been prepared for the project in accordance with the requirements of the NT *Environmental Assessment Act* (EA Act) and to support an application for Authorisation under the NT *Mining Management Act*. The EIS also supports an application for approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This Executive Summary provides a high level overview of the project, the environmental impact assessment process, and the key findings of the EIS.

The Anindilyakwa People are the Traditional Owners of Groote Eylandt. The authors of this EIS and the proponent gratefully acknowledge the assistance that the Anindilyakwa Land Council (ALC) and the Traditional Owners provided in relation to the production of the EIS. This included providing access to the project site for the purpose of undertaking field surveys, participation in specialist field surveys, provision of information which supports this EIS, and involvement in the stakeholder consultation program.

THE PROPONENT

The project proponent is GEMCO which has two shareholders, South32 Pty Ltd (60%) and Anglo Operations (Australia) Pty Ltd (40%).

BHP Billiton Manganese Australia Pty Ltd was previously a shareholder in GEMCO, however its interest is now represented by South32. South32 is an independent global metals and mining company that was formed in May 2015 following BHP Billiton Plc's demerger. The company is listed on the Australian, Johannesburg and London Stock Exchanges, and is headquartered in Perth.

South32 is globally diverse, with interests in five countries, including Australia and South Africa. South32 has extensive high-quality assets in aluminium, coal, nickel, silver and manganese. Its assets include the existing manganese mine on Groote Eylandt, which accounts for more than 15% of the world's high grade manganese ore production, with approximately 70% of its production exported to global markets.

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

PROJECT NEED

There are substantial undeveloped manganese resources within the project site. The project is proposed in order to efficiently extract these resources in a safe and sustainable manner. Manganese ore from the project is proposed to be blended with manganese ore from the existing mine. The development of the project will allow the existing mine to continue supplying a product that is based on a specific quality to market. It will also extend the life of the existing mine.

The existing mine is an integral part of the economy of Groote Eylandt and provides significant socio-economic benefits to the local community, as well as the regional economy of the NT. Development of the project will allow for the continuation of these benefits, including continued provision of 835 direct jobs, payment of government taxes, and payment of royalties to the NT Government, the ALC and Traditional Owners. It will also allow for continued education, training and apprenticeship opportunities for local residents, and continued provision of social infrastructure and services to the communities on Groote Eylandt.



FIGURE 1 LOCATION PLAN

2 REGULATORY FRAMEWORK

KEY ENVIRONMENTAL APPROVALS

The key environmental approvals required for the project are summarised in Table 1. These approvals are required prior to the commencement of the project.

The EIS is the key document supporting approval under the *Mining Management Act* and the EPBC Act.

The main steps in obtaining environmental approval for the project (including the EIS preparation and approval process) are shown in Figure 2. These steps are as follows:

- **Preliminary Planning**

Background investigations, including mine planning and the assessment of alternatives, were undertaken. Preliminary investigations relating to surface water, groundwater, ecology and archaeology were undertaken in order to guide the project design.
- **Notice of Intent**

The NT EIS statutory process was initiated when the proponent submitted a Notice of Intent (NOI) to the NT Environment Protection Authority (NT EPA) in May 2014. The NOI provides high level information about the project, the baseline environment, potential project impacts and environmental management strategies.
- **Assessment Method Decision**

The NT EPA determined on 19 June 2014 that an EIS was required for the project. An EIS is the most comprehensive level of assessment available under the environmental assessment process.
- **EPBC Act Controlled Action Decision**

The proponent referred the project to the Federal Department of the Environment (DotE) under the EPBC Act. DotE determined that the project is a controlled action, thereby requiring approval under the EPBC Act. The controlling provisions are potential impacts on listed threatened species and communities (sections 18 and 18a) and migratory species (sections 20 and 20a). DotE indicated that it would make use of the NT EIS assessment process in assessing the project.
- **EIS Terms of Reference**

The EIS Terms of Reference (TOR) describe the required content of the EIS and the level of assessment required for various specialist studies (i.e. more comprehensive studies are required for high risk environmental areas). The NT EPA prepared a draft TOR. Following a public exhibition and comment period, the NT EPA then issued a final TOR. This Draft EIS has been prepared in accordance with the final TOR.

TABLE 1 KEY PROJECT APPROVALS

APPROVAL	LEGISLATION	ADMINISTERING AUTHORITY
EPBC Act Approval	Commonwealth EPBC Act	Federal Department of the Environment (DotE)
Environmental Assessment Report	NT EA Act and <i>Environmental Assessment Administrative Procedures</i> (EAA Procedures)	NT Environment Protection Authority (NT EPA)
Authorisation under the <i>Mining Management Act</i>	NT <i>Mining Management Act</i>	NT Department of Mines and Energy (DME)

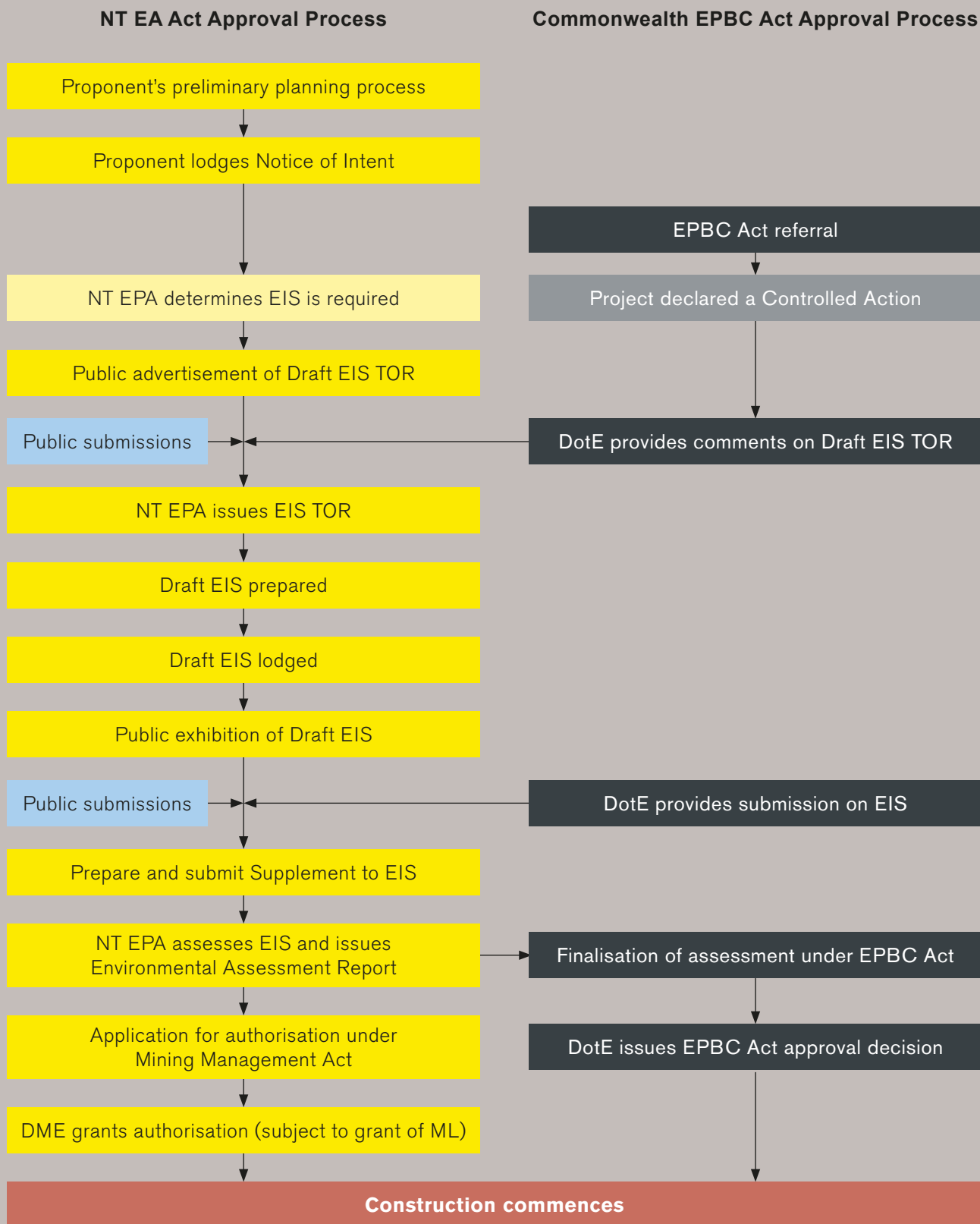
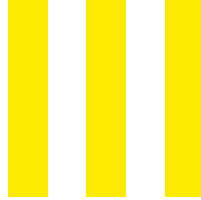


FIGURE 2 PROJECT APPROVAL PROCESS



■ **EIS Preparation**

The Draft EIS was prepared following the completion of baseline field and desktop studies, environmental input into project planning, and consideration of potential impacts and mitigation measures. The EIS studies were conducted by a team of multi-disciplinary specialists. The Draft EIS has been prepared in accordance with the requirements of the EA Act and the EIS TOR and also considers issues and feedback from the stakeholder consultation program undertaken as part of the EIS process.

■ **Lodgement and Public Exhibition of the Draft EIS**

The Draft EIS will be placed on public exhibition for six weeks. During this period, government agencies and the public are invited to make submissions to the NT EPA. Submissions on the Draft EIS must be made in writing and sent to the NT EPA within the public exhibition period, as advertised in the EIS public notice.

■ **Preparation of the Supplement to the EIS**

The NT EPA will issue a copy of all accepted submissions to the proponent. The proponent will prepare a Supplement to the EIS addressing the submissions. The Supplement to the EIS will be submitted to the NT EPA.

■ **Preparation of the Environmental Assessment Report**

The NT EPA will assess the EIS (including the Draft EIS, the Supplement to the EIS and any further information) and will produce an Environmental Assessment Report. The report contains recommendations in relation to environmental management. The Environmental Assessment Report will be provided to the proponent, and the DME.

■ **Assessment under the EPBC Act**

The NT EPA will also provide the Environmental Assessment Report to DotE for its consideration of issues related to the EPBC Act approval. DotE will make a decision on approval, and impose conditions on the approval to protect Matters of National Environmental Significance.

■ **Authorisation under the Mining Management Act**

Once the Environmental Assessment Report has been issued, the proponent may lodge an application to the DME for Authorisation under the *Mining Management Act*. The application must be accompanied by a Mining Management Plan for the project. The Mining Management Plan is required to reflect any recommendations arising from the Environmental Assessment Report. The DME will process the application for Authorisation under the *Mining Management Act* once the mineral leases for the project have been granted.



Emerald River



GEMCO operations employee

OTHER APPROVALS

Additional environmental approvals will be required for the project under the following legislation:

- *NT Heritage Act*. A Works Approval under the *Heritage Act* is required prior to any disturbance of a heritage place or object as declared or protected under this Act. The *Heritage Act* is administered by the NT Department of Lands, Planning and the Environment – Heritage Branch.

The project requires various other approvals prior to the commencement of construction. These include:

- Mineral tenements under the *NT Mineral Titles Act*.
- Approval under the *Commonwealth Aboriginal Land Rights (Northern Territory) Act 1976 (ALRA)*. The project will require consent from the Traditional Owners of Groote Eylandt because it is located on Aboriginal land scheduled under the ALRA.

This consent will be provided in the form of a Mining Agreement for the mineral tenements, and an agreement under Section 19 of ALRA for the proposed haul road corridor. These agreements are made between the proponent and the ALC, which is the Land Council responsible for Groote Eylandt, and represents the Traditional Owners.

- An Authority Certificate under the *Northern Territory Aboriginal Sacred Sites Act 1989 (Sacred Sites Act)*. Sacred sites are places in the landscape with special significance under Aboriginal tradition. An Authority Certificate ensures compliance with the Sacred Sites Act when works are undertaken on or near to sacred sites.

The EIS provides a brief overview of the process for obtaining these approvals.

3 PROJECT DESCRIPTION

EXISTING MINE

GEMCO's existing manganese mine is located on Groote Eylandt in the Gulf of Carpentaria, approximately 650 km south-east of Darwin (Figure 1). The mine has been operating for more than 50 years. Operations involve mining manganese ore by open cut mining methods, and then sizing and washing the ore in a concentrator. The washed ore is transported from the concentrator by road to the proponent's port facility at Milner Bay (Figure 3). The proponent currently sells approximately 5 Million tonnes per annum of manganese ore to domestic and export markets.

PROJECT OVERVIEW

The project will provide access to additional mining areas, located to the east of the existing mine (Figure 3). The additional mining areas comprise two exploration tenements (Exploration Licences in Retention - ELRs) termed the Eastern Leases. The Eastern Leases consist of ELR 28161, termed the Northern Eastern Lease (Northern EL) and ELR 28162, termed the Southern Eastern Lease (Southern EL) (Figure 3).

The project will use the same open cut mining methods used at the existing mine. Project mining areas will be connected to the existing mine via a new haul road. Manganese ore will be transported via this haul road to the existing mine for processing. The project site, for the purposes of this EIS, comprises the Eastern Leases and the haul road connecting them to the existing mine.

Project mining operations will take place concurrently with mining operations at the existing mine. Ore mined as part of the project will be blended with ore from the existing mine, and sold as a single product. This will allow ore to be blended in a manner that produces an optimal quality product. The project will extend the life of the existing mine by 4 years. It will not increase GEMCO's overall production rate.

The project is an additional mining area that will be operated as part of the existing mine, rather than an independent mine. Where possible, the project will make use of infrastructure (e.g. concentrator, stockpiles) at the existing mine. No upgrades of this infrastructure will be required.



Open cut mining at the existing GEMCO mine

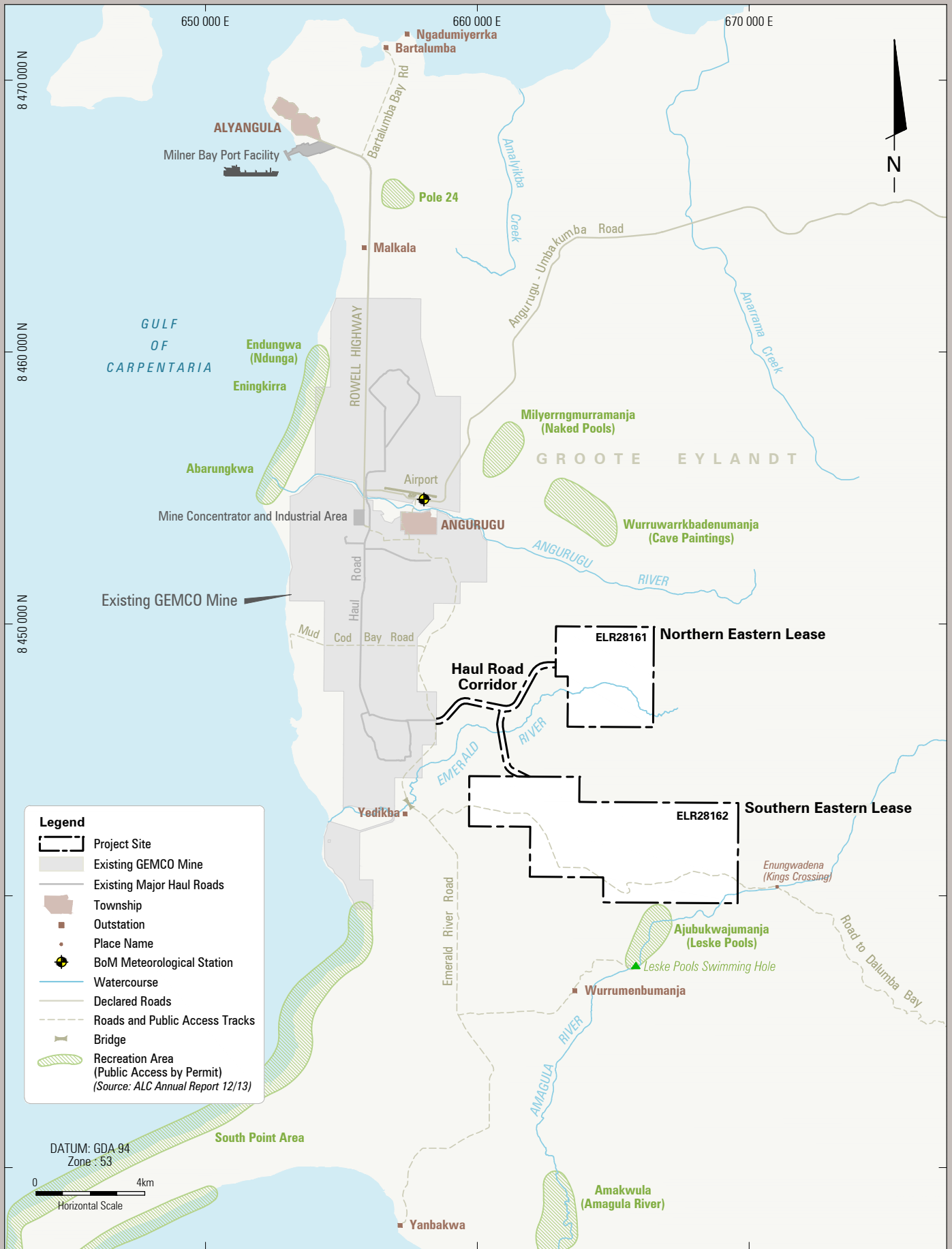


FIGURE 3 LOCAL SETTING

PROJECT SETTING

Groote Eylandt

Groote Eylandt is Australia's third largest island, and is part of an archipelago of islands. Groote Eylandt is Aboriginal land under ALRA. The Traditional Owners of the Groote Eylandt Archipelago are an amalgamation of two cultures, the Warnindilyakwa, and the Nunggubuyu. The Traditional Owners are made up of 14 clan groups, divided into two moieties, united by a common culture of kinship, ceremony and language. Both cultures speak Anindilyakwa as their first language, and the land, people and culture are also referred to by this term.

Groote Eylandt is largely undeveloped, and much of the island is still used for traditional Aboriginal practices such as hunting and gathering. The existing mine is the main development on Groote Eylandt. The key townships on Groote Eylandt are shown on Figure 1, and are as follows:

- Alyangula, which is located on the north-west of Groote Eylandt and has a population of approximately 1,000 people. Alyangula was built by the proponent and predominantly houses the existing mine workforce and their families;
- Angurugu, which is located on the western side of the island, on the Angurugu River. It has a population of approximately 850 people, the majority of whom are Anindilyakwa People. Angurugu Township is surrounded by mining tenements associated with the existing mine; and



Cycads (*Cycas arnhemica*)

- Umbakumba, which is located on the north-east of the island and has a population of approximately 450 people, the majority of whom are Anindilyakwa People.

There are also a number of small, rural Aboriginal settlements (termed "outstations") on Groote Eylandt (Figure 3). Outstations typically have varying levels of use, from occasional visitation to sporadic residency.

The Groote Eylandt Archipelago is located within the East Arnhem Local Government Area, administered by the East Arnhem Regional Council (EARC).

Groote Eylandt, and the marine area surrounding it, has significant ecological value. Groote Eylandt is considered an International Site of Conservation Significance in the NT. The threatened terrestrial fauna species present on the island are relatively protected from the environmental threats that exist on the mainland, such as Cane Toads.

The Groote Eylandt Archipelago has been declared an Indigenous Protected Area (IPA). An IPA is an area of Indigenous-owned land or sea where Traditional Owners have entered into an agreement with the Federal Government to promote biodiversity and cultural resource conservation.

Project Site

The project site is located in the south-western part of Groote Eylandt. The Eastern Leases are 2 km east of the existing mine at the closest point. The township of Angurugu is located approximately 6.5 km to the north-west of the Northern EL, and is the closest permanent residential community to the project site (Figure 3).

The project site is characterised by elevated rocky outcrops and gently sloping valleys. Elevations within the project site range from approximately 10 m to 120 m Australian Height Datum. The project site is located in the catchments of the Angurugu River, Emerald River and Amagula River. The Emerald River and its tributaries drain the majority of the Northern EL. A small section of the Amagula River traverses the Southern EL in the south-east corner of the tenement.

The land within and surrounding the project site comprises natural bushland that is mainly eucalypt dominated open forest, woodland and shrubland. The most common eucalypts are Darwin Woollybutt and Darwin Stringybarks, but a wide variety of other native plants occur. Other vegetation types in the project site include swamp forest and rainforest.



Pandanus (*Pandanus spiralis*)

The land within the project site is used for traditional Aboriginal practices such as hunting and gathering of bush foods. The majority of land within the project site is burnt annually or biennially by Traditional Owners. The other key land use within the project site is the proponent's ongoing exploration drilling activities, which have been occurring since 2001. No farming or agricultural activities are undertaken within or in the vicinity of the project site, nor have such activities been undertaken in the past.

There is no infrastructure within the project site, although there are a number of unsealed tracks, including tracks developed by the proponent as part of exploration activities. In addition, there is an unsealed 4WD access road to Dalumba Bay that traverses part of the Southern EL (Figure 3).

Sensitive Receptors

The nearest sensitive receptors to the project site are listed in Table 2 and are shown in Figure 3. The sensitive receptors are a significant distance from the project site, with the nearest sensitive receptor being located more than 2 km from the project site.

PROJECT ACTIVITIES

Mining

Figure 4 shows the proposed open cut mining areas (termed quarries), along with the haul roads that will provide access to the quarries. The quarries and haul roads will be developed in a staged manner, and rehabilitated progressively as mining is completed. Consequently not all of the quarries shown on Figure 4 will be operational at a single point in time.

The project will make use of the same open cut mining methods that are used at the existing mine. The overburden depth within the project site is up to 25 m, with an ore thickness of up to 5 m. Similar to the existing mine, mining strips will be up to approximately 1,500 m long and 40 m wide.

TABLE 2 SENSITIVE RECEPTORS

RECEPTOR	TYPE	NEAREST DISTANCE TO PROJECT SITE
Angurugu	Township	6.5 km to the north-west of the Northern EL
Yedikba	Outstation	2.2 km to the west of the Southern EL
Wurrumenbumanja	Outstation	3.5 km to the south of the Southern EL
Leske Pools Swimming Hole	Recreation Area	2.4 km to the south of the Southern EL

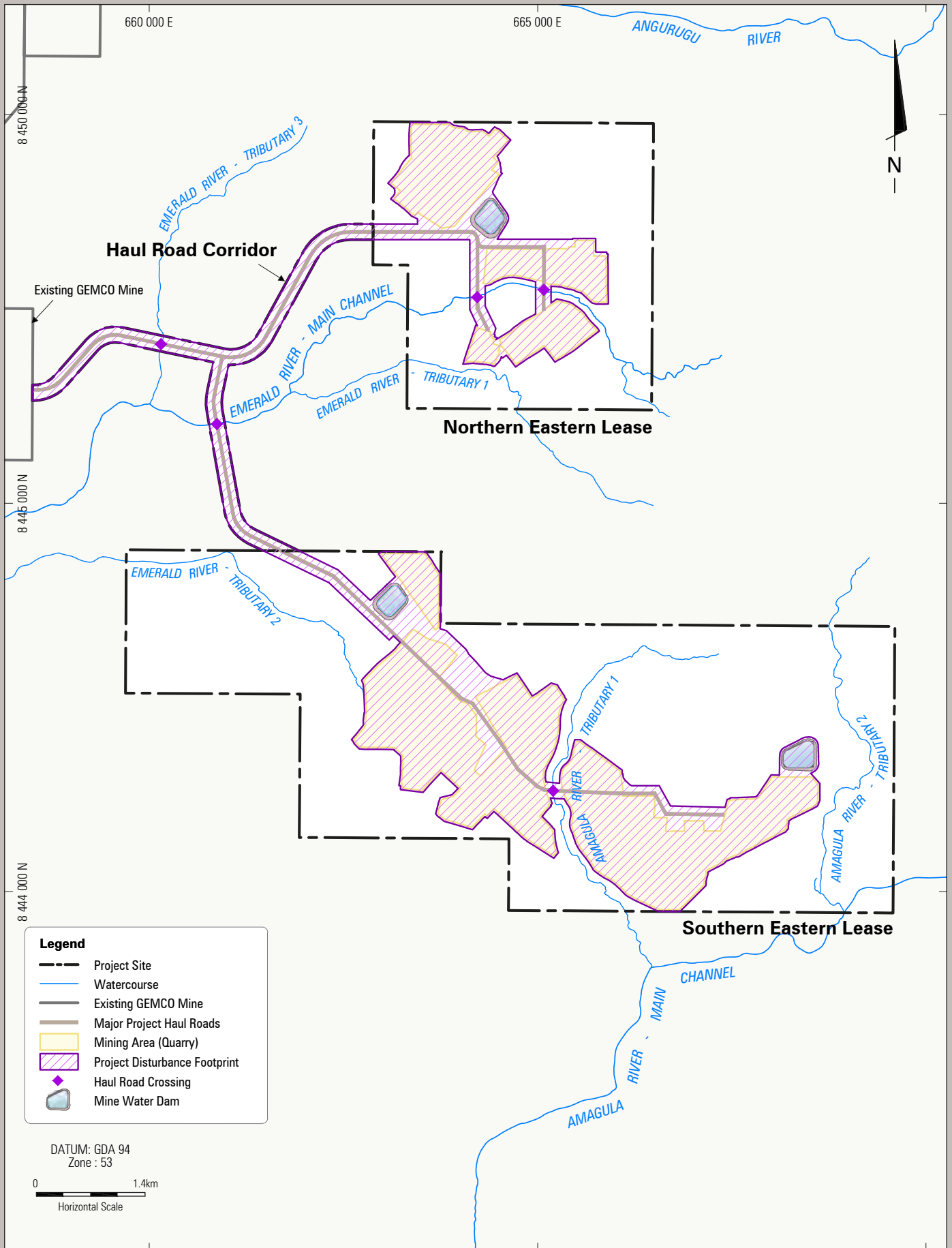


FIGURE 4 PROJECT QUARRY EXTENTS AND DISTURBANCE FOOTPRINT

The mining process is illustrated in Figure 5. Mining and rehabilitation will involve the following sequence of activities:

- Clearing vegetation using bulldozers.
- Stripping and recovering topsoil. The stripped topsoil will either be placed directly on areas that are ready for rehabilitation, or stockpiled in designated areas for later use.
- Pre-stripping overburden. Overburden will be excavated in order to gain access to the ore. This material will either be temporarily stockpiled or placed directly within previously mined quarries.
- Drilling and blasting the manganese ore in order to break up the material so that it can be easily handled.
- Mining ore using excavators and haul trucks.
- Backfilling quarries following ore removal. A stable, free-draining landform will be created that broadly replicates the pre-mining landform. The mine has been designed and scheduled to ensure that there will be no final voids or elevated overburden emplacement areas at the end of the mine life.
- Topsoil replacement. Topsoil is spread over backfilled areas at an average depth of 0.3 m. The topsoil is then ripped before being seeded.
- Revegetation using seeds from native tree, shrub and endemic grass species.
- Monitoring rehabilitation areas for performance and undertaking any required remediation. Rehabilitation is designed to restore mined land to a self-sustaining open woodland, similar to the pre-mining environment and the surrounding undisturbed land.

The project will use the equipment fleet (front-end loaders, dozers, graders, haul trucks, excavators and water carts) from the existing mine.

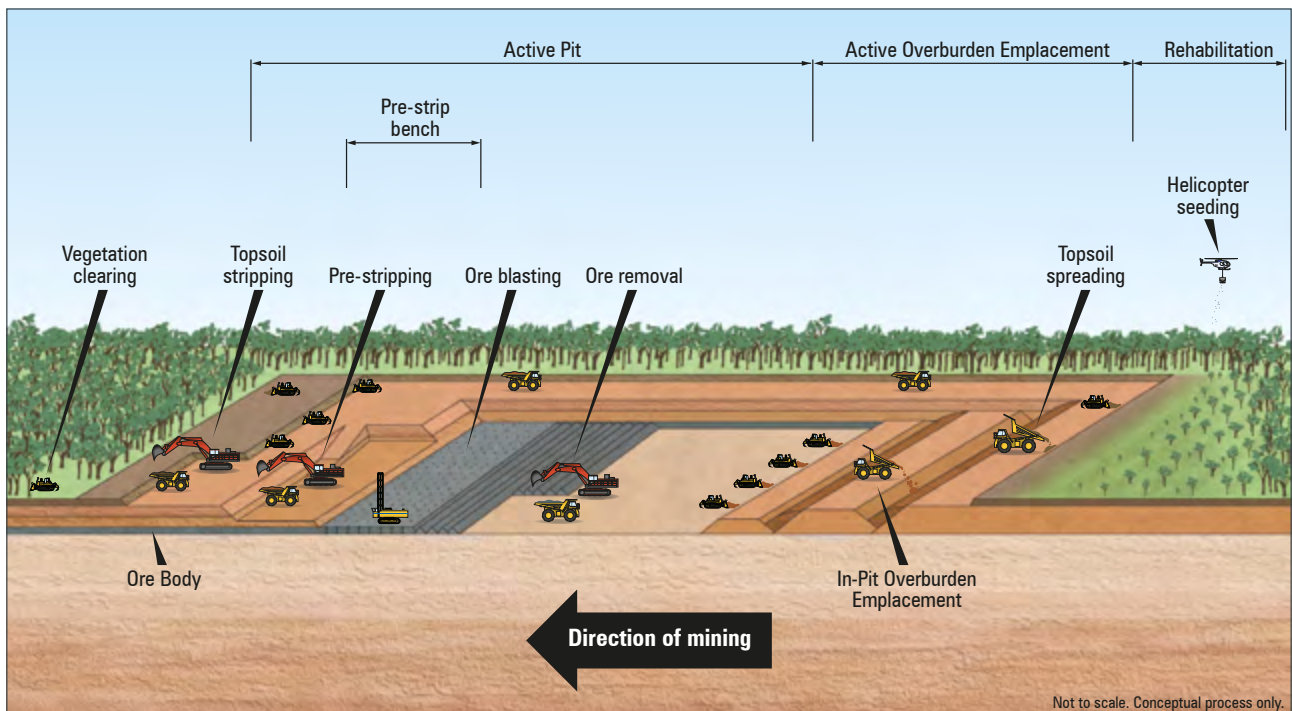


FIGURE 5 SCHEMATIC OF OPEN CUT MINING OPERATIONS



Topsoil handling

Ore Processing and Transport

The processing and transport of ore is illustrated in Figure 6. Ore from the project site will be transported to the existing mine, using trucks that will travel on project haul roads. The ore will be stockpiled at the existing Run of Mine (ROM) stockpiles at the mine industrial area. Stockpiled ore from the project will typically be blended with ore from the existing mine. Blended ore will then be crushed and conveyed into the concentrator, where it will be washed. No upgrades to the concentrator, stockpiles or any other infrastructure within the existing mine are required for the project. The processing of ore is restricted to sizing and washing the ore and no smelting of ore occurs on Groote Eylandt.

Washed ore will be transported via road train to the existing Milner Bay Port Facility (Figure 3) for shipping to export and domestic markets. In some instances, due to the nature and quality of the ore, it may not be necessary to wash the ore and it will bypass the concentrator. In these circumstances the ore will be trucked by road train directly from the ROM stockpiles to the port facility. No changes to the road transport of ore or port facilities are required as a result of the project.

Tailings and Middlings

The processing of ore at the concentrator gives rise to two types of tailings (sands tailings and slimes tailings) and a coarse waste fraction known as middlings (Figure 6). Tailings from the existing operations are disposed of in dedicated tailings storage facilities located within the existing mine. These facilities will also be used for the disposal of tailings generated as the result of processing ore from the project.

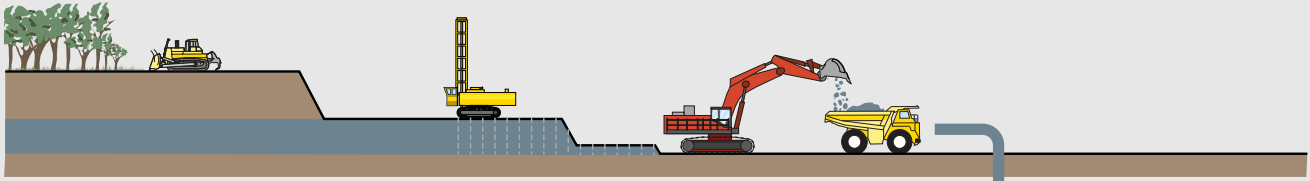
Middlings from the existing operations are hauled by truck to a designated storage area within the existing mine, for use as road base or for stemming in blasting. Middlings from the project will also be stored and used in this manner.

Geochemical characterisation of tailings and middlings was undertaken as part of the EIS. The tailings and middlings generated by the project have been assessed as being geochemically similar to those generated by the existing mine. These materials are expected to be non-acid forming, and are expected to generate runoff and seepage exhibiting neutral pH, low salinity and low concentrations of metals. The existing storage and handling strategies for these waste streams are therefore appropriate for the nature of these materials.

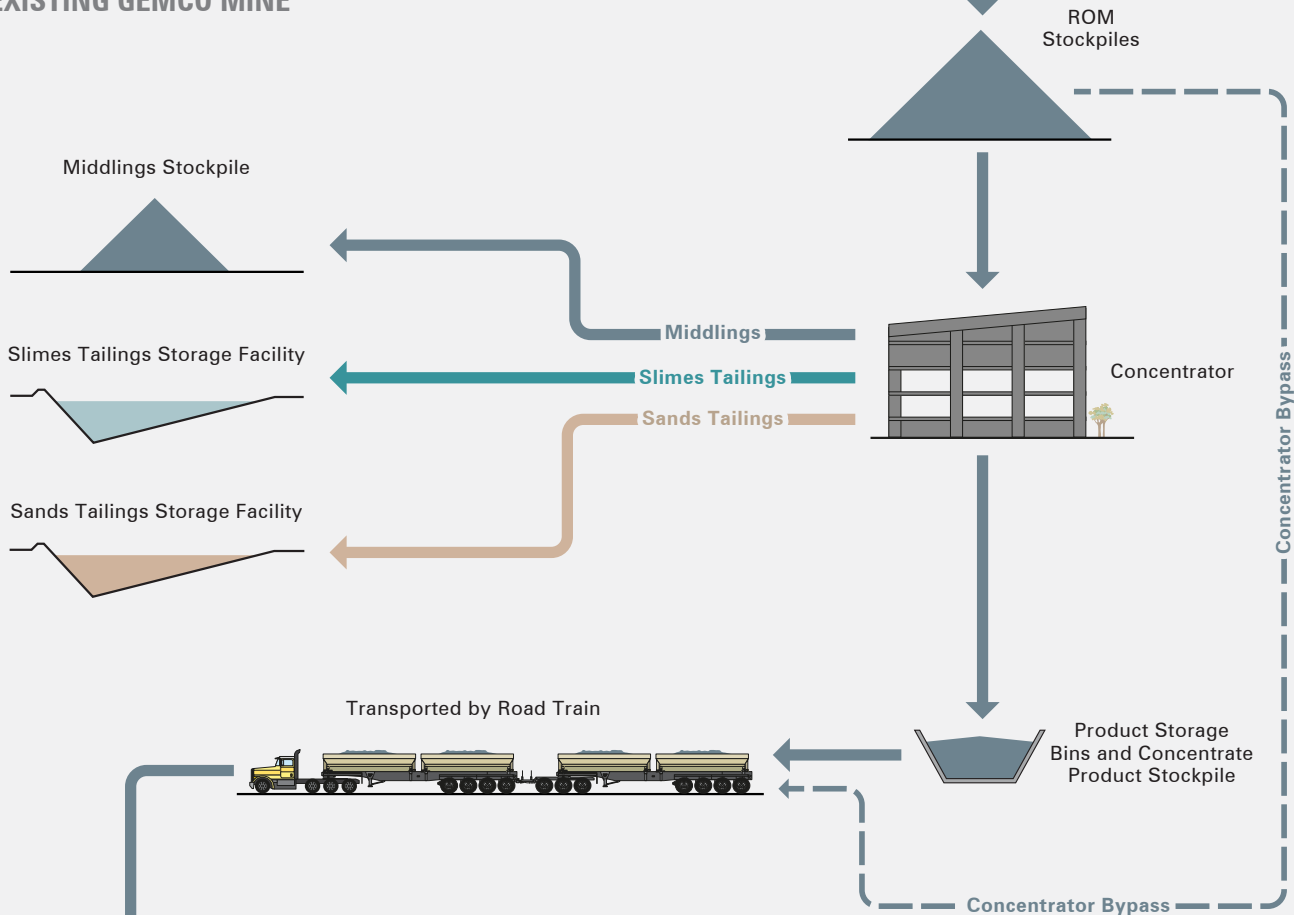


EASTERN LEASES

Open Cut Mining Operations

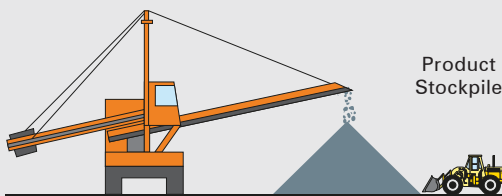


EXISTING GEMCO MINE



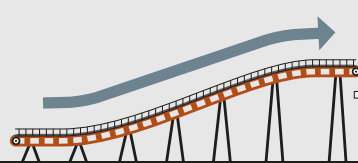
Dump Station

Stacker Blending



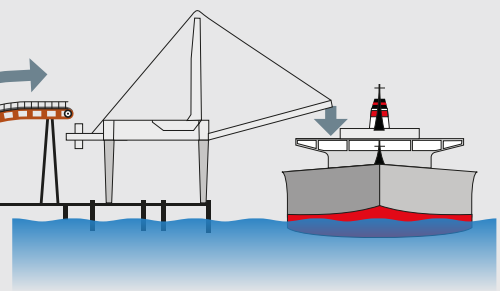
Product Stockpile

Product Conveyor



MILNER BAY PORT FACILITY

Fixed Head Ship Loading Facility



Not to scale. Conceptual process only.

FIGURE 6 PRODUCTION PROCESS

Project Infrastructure

The project will make use of infrastructure (e.g. stockpiles, concentrator) at the existing mine. Consequently, there is very limited infrastructure required to be constructed within the project site. Infrastructure proposed for the project includes:

- Dams – a single dam in the Northern EL and two dams in the Southern EL (Figure 4).
- A crib hut in each of the Northern EL and the Southern EL. The crib huts will be small demountable structures providing basic ablution and staff facilities.
- Separate light and heavy vehicle parking and basic vehicle servicing and maintenance areas, adjacent to the crib huts.
- Temporary laydown storage areas.

A network of haul roads will be constructed within the project site to provide access to the mining areas. Erosion and sediment controls will be constructed and remain in place over the life of the project.

The area proposed to be disturbed by open cut mining activities and infrastructure is shown on Figure 4. The full extent of this area will ultimately be rehabilitated to a self-sustaining open woodland consistent with the pre-mining landform.

PROJECT SCHEDULE

Diagram 1 provides the key milestones in the proposed project development schedule. It is important to note that this is an indicative schedule, subject to change based on global commodity prices and activities within the existing mine. The timing of the commencement of construction is also subject to the receipt of environmental approvals, mineral leases, and agreements under ALRA. Construction is scheduled to commence in the Northern EL in 2017 (Project Year 1), with mining in the Northern EL commencing in Project Year 2. Construction and mining in the Southern EL will commence a number of years later. Mining in both tenements will be undertaken until Project Year 15.



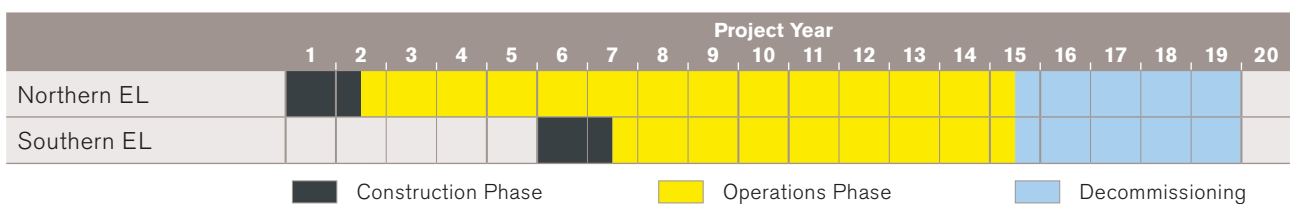
Ore stockpiling

This equates to a 13 year operational mine life (i.e. mining of ore). The project will extend the life of the existing mine by four years. Without the project, the existing mine is scheduled to cease operations in approximately 2027.

WORKFORCE

Two construction phases are proposed. These are associated with the initial development of the Northern EL and then the later development of the Southern EL. Both of these phases will require a construction workforce of around 90 people over a maximum period of 12-18 months. The project construction workforce will be employed primarily as non-resident workers on a fly-in fly-out (FIFO) roster arrangement. There is sufficient capacity within the proponent's existing accommodation arrangements to house the project's construction workforce.

DIAGRAM 1 PROJECT MINING SCHEDULE







GEMCO road train on the Rowell Highway

The existing mine is forecast to have a workforce of approximately 835 people in 2018, when the project is scheduled to commence operations. The project operations workforce will be drawn from the workforce at the existing mine, and there will be no net increase in the size of the proponent's workforce. There will be no changes to existing shift, roster or accommodation arrangements.

TRAFFIC AND TRANSPORTATION

The project site will be accessed via haul roads from the existing mine. The existing mine is accessed from Alyangula via the Rowell Highway, which is a public access road owned and maintained by the proponent (Figure 3).

The project will give rise to very limited additional vehicle movements. No significant impacts on the road pavement or level of service of the highway are anticipated as a result of the project.

A section of the public access road leading to Dalumba Bay traverses part of the Southern EL (Figure 3). This road is owned by the EARC and comprises an unsealed track, suitable only for 4WD vehicles. It is used sporadically by Traditional Owners to access the eastern part of the island.

Part of this track is located in areas proposed to be mined by the project and the proponent will relocate this section of the track prior to mining. The proponent will consult with the EARC and the ALC in relation to the proposed relocation.

The Emerald River Road is an unsealed public access track, owned by the EARC, and is used by locals and Traditional Owners to travel to recreation areas or outstations. The project haul road will cross the Emerald River Road near the existing mine (Figure 3). At the intersection of the haul road and the Emerald River Road, the haul road will be constructed as an overpass, ensuring that the project will not affect the users of Emerald River Road. The proponent will consult with the EARC and the ALC in relation to the design of the overpass, and will obtain any necessary approvals prior to its construction.

PROJECT ALTERNATIVES AND MINE PLANNING

An integrated multi-disciplinary approach to mine planning, informed by an environmental risk assessment process, was undertaken to ensure the development of an environmentally responsible mine plan. A number of alternatives were assessed as part of this planning process, including the alternatives summarised in Table 3.

The mine plan that has been selected ensures that there will be no residual disturbance associated with the project. In particular, there are no final voids (i.e. deep quarries that are not backfilled) or permanent elevated overburden emplacements (i.e. free standing emplacements/stockpiles) on the project site. The entire project site will be able to be rehabilitated to a self-sustaining native woodland following mine closure. The absence of final voids has significant environmental benefits, including reducing potential project impacts on the groundwater regime and providing for a free-draining post-mining landform, which will ensure that there is no loss of downstream catchment yield.

The watercourses that traverse the project site were a key consideration during the mine planning process because of their environmental and cultural sensitivity. The project has been designed to ensure that mining will not encroach on the Emerald or Amagula Rivers or their tributaries. Buffers have been delineated around these watercourses and there will be no mining within the buffers. This will avoid disturbance to the main channels of the watercourses, and will limit any interference with surface water flows. As a result of this approach to mine planning, no river diversions or levees are required for the project.

The project has also been designed to allow for the storage of excess mine-affected water, and reuse of this water during times of water deficit. This will avoid the need for routine discharge of mine-affected water from the site. The proponent has adopted this strategy in order to minimise the potential for any impacts on watercourses.

PROJECT JUSTIFICATION

The proponent's justification for the project is:

- It involves a responsible mine plan that considers environmental constraints, and incorporates appropriate control measures to limit any adverse environmental and social impacts to an acceptable level;
- It maximises the responsible utilisation of the manganese resource; and
- It will result in significant economic benefits for the local area and the NT.

The key economic benefits of the project include:

- Capital expenditure in the NT of approximately \$160 million during the project construction phase;
- Four additional years of operation of the existing mine, which will result in an additional four years of:
 - Operational expenditure on Groote Eylandt of approximately \$1.9 million per year;
 - Royalty payments to the ALC, Traditional Owners and NT Government; and
 - Tax payments to the Federal Government of approximately \$100 million per year for each additional year.

TABLE 3 KEY PROJECT ALTERNATIVES

PROJECT ASPECT	PREFERENCE	ALTERNATIVE
Mine Plans	Forgoing the resource beneath the Emerald and Amagula Rivers, and delineating environmental buffers around the rivers to protect them	Mining the full resource beneath the Emerald and Amagula Rivers by diverting the rivers and mining the river channels Mining a portion of the resource beneath the Emerald and Amagula Rivers by constructing levees adjacent to the main channels
Final Voids and Elevated Overburden Emplacements	Planning and scheduling mining in a manner that avoids the need for final voids or elevated overburden emplacement areas at the end of the mine life	Standard mining techniques designed to limit overburden haulage distances and rehandling of material, resulting in final voids and elevated overburden emplacement areas at the end of the mine life
Haul Road Alignments	Preferred haul road alignment minimising environmental disturbance	Alternative haul road alignments
Processing Arrangements	Stockpiling and processing ore at the existing mine	Stockpiling and processing ore at the project site
Water Management	Storage of excess mine-affected water, and reuse during times of water deficit	Routine discharge of excess mine-affected water to watercourses

4 RISK ASSESSMENT

Risk assessment and management is a key part of the proponent's business. Risk management is integrated into business processes to ensure that, on a day-to-day basis, both strategic and operational decisions are risk-based. The proponent's risk management system provides a structured risk assessment methodology and the tools to identify both opportunities and threats. In the context of the project, the proponent's risk management system includes requirements for risks to be identified early in the project lifecycle to ensure that appropriate controls can be applied to the planning and design of the project.

Environmental and social risk assessments were undertaken through a series of workshops and review sessions at various stages during project design and EIS development. The principles in AS/NZS ISO 31000:2009 *Risk Management – Principles and Guidelines*, as well as the proponent's internal risk assessment documentation, guided the risk assessment. The process included establishment of context and risk identification, analysis and evaluation. Individual risks were identified by drawing upon the years of experience and local knowledge at the existing mine, reviewing feedback from stakeholder consultation and considering preliminary risks identified in the EIS TOR. Risks were systematically identified, taking into consideration the full range of project activities in relation to individual aspects of the existing environment.

The following aspects of the environment were considered as part of the risk assessment:

- Groundwater;
- Surface water;
- Ecology (including biodiversity issues relating to air quality and noise); and
- Social (including social issues relating to air quality, noise, visual amenity, socio-economics and cultural heritage).

Once all risks had been identified, the consequence and likelihood of each individual risk was then analysed using a risk assessment matrix. Risks were assessed both with and without mitigation.

The EIS presents the environmental risk assessment that was prepared for the project. The assessment considers environmental and social risks. A total of 50 risks were identified for the project. Risks were significantly reduced through the application of mitigation measures, primarily the adoption of a project design intended to eliminate or significantly reduce risks. Following mitigation, the majority of risks (38) are rated as being low risk, with 11 moderate risks and one high risk. No extreme risks are predicted following the application of management measures.

The only risk which remains high, even after mitigation, is the potential for the transport of materials and personnel required for the project to exacerbate the risk of Cane Toads being introduced to Groote Eylandt. This risk is solely a function of the project's location on Groote Eylandt. The consequence of this risk is considered to be severe, and even though the likelihood is rare, the resultant risk to flora and fauna is rated as high. The proponent is cognisant of the inherent risk posed by the accidental introduction of Cane Toads into the Groote Eylandt ecosystem. The proponent has a number of procedures that are already in place to prevent the introduction of the Cane Toad to Groote Eylandt, and additional measures are proposed as part of the project.



5 CONSULTATION

A comprehensive stakeholder consultation program was undertaken as an integral part of the EIS process. It included consultation with Local, Territory and Federal Government agencies, Traditional Owners, residents of Grootte Eylandt, employees of the existing mine and other interested parties. The aim of EIS consultation was to identify stakeholders' issues in relation to the project and ensure that these issues were addressed as part of the EIS process.

The consultation program involved the following stages:

- **Stakeholder Identification**
The objective of this stage was to identify all relevant stakeholders in order to involve them early in the consultation process.
- **Endorsement of the Consultation Process**
The ALC is the principal voice of the Traditional Owners on the island, and it was therefore important to obtain the ALC's endorsement of the proposed EIS consultation program.



Consultation with residents of Umbakumba

- Issue Scoping**

The objective of this stage was to provide preliminary information to stakeholders on the project and the EIS process. This enabled stakeholders to raise concerns and issues about the project.

- Social Impact Assessment Consultation**

This stage occurred in parallel with the Issue Scoping Stage and was undertaken to understand the baseline socio-economic profile of the communities of interest, and to assist in the identification and assessment of socio-economic impacts.

- Issue Response Consultation**

The objective of this stage was to address and proactively respond to all relevant stakeholder issues.

- EIS Feedback Consultation**

The objective of this stage is to provide feedback on the results of the EIS specialist studies to stakeholders. This stage will be undertaken during the EIS public exhibition period.

Consultation methods and tools have included community information sheets, group presentations, one-on-one meetings, small group meetings, and telephone interviews.

Issues identified during consultation have been addressed in the project design and in the EIS.



6 MINE REHABILITATION AND CLOSURE

Rehabilitation of areas disturbed by project activities will be conducted in accordance with the methods and procedures successfully being used at the existing mine. To date, the proponent has progressively rehabilitated approximately 1,000 ha of disturbed areas within the existing mine, with the rehabilitation varying in age from a few months to over 30 years. Older areas of rehabilitation have large, established trees and understorey vegetation.

Rehabilitation activities at the existing mine are undertaken in accordance with the requirements of the *Mining Management Act*, the Mining Agreement under ALRA, and a framework of existing internal documents and procedures.

Key rehabilitation and mine closure objectives entail leaving the site:

- Safe for humans and wildlife;
- Non-polluting;
- Geotechnically stable; and
- Able to sustain an agreed post-mining land use.

Rehabilitation is designed to restore mined land to a self-sustaining open woodland, similar to the pre-mining environment and the surrounding undisturbed land.

Project rehabilitation activities will include backfilling quarries with overburden to create a free-draining landform similar to the pre-mining landform, with no elevated overburden emplacements. Topsoil will then be spread at a depth of 300 mm, and ripped prior to seeding. Revegetation will be undertaken using seed collected from the local area. Species selection will be designed to reflect the diversity, abundance and distribution of vegetation on Groote Eylandt. Similar to the existing mine, aerial seeding will be the primary seeding technique, although seed may also be sown by hand.

A weed control program will be implemented in rehabilitated areas, where necessary. The rehabilitation will be monitored against stringent, internal completion criteria.

The EIS contains an assessment of topsoil resources, including a topsoil balance. It concluded that there is a surplus of topsoil available within the project site to complete the rehabilitation work. The available topsoil is considered to be in good condition, and able to support native vegetation. No specific topsoil amelioration measures are therefore required. The EIS describes the topsoil management measures that will be adopted, including measures related to the handling and stockpiling of topsoil.

An assessment of the geochemistry of overburden material was undertaken for the EIS. The majority of overburden samples (83 out of 86 samples) were found to be Non-Acid Forming-Barren (NAF-Barren), with a high factor of safety with respect to the potential for acid generation.



Harvesting native seeds for the rehabilitation program at the existing GEMCO mine



Three samples within a small, isolated area in the Southern EL were classified as Potentially Acid Forming (PAF). Given the highly weathered nature of the geological profile, the PAF samples are considered to be an anomaly rather than representative of the broader geochemistry of the project site.

The small proportion of PAF material would be buffered by the significant excess alkalinity of the large majority of the overburden materials found on the site and, therefore, the bulk overburden material has a high factor of safety with respect to potential for acid generation. The EIS contains specific measures for the monitoring, selective handling and disposal of these materials.

The concentrations of metals and metalloids in overburden are typically below applied guideline criteria for soils. Overburden materials are non-sodic and therefore have a low risk of being susceptible to dispersion or erosion. Testing was undertaken for smectite and kaolinite clay minerals that may be sporadically present within the excavated overburden material. These materials were found to be non-dispersive, and are not expected to present a significant materials handling or water management issue for the project.



Twenty-six year old rehabilitation at the existing GEMCO mine



7 TERRESTRIAL ECOLOGY

The EIS includes a detailed ecology assessment that involved multi-season terrestrial flora and fauna surveys. The vegetation and habitats within the project site are almost pristine and are strongly influenced by topography and drainage. Eucalypt open forests and woodlands dominate the well-drained areas of the project site, with swampy and riparian areas dominated by Melaleucas. Fire plays a significant role in determining vegetation composition. The majority of the site is regularly burnt by the Traditional Owners. The project site provides a range of forest, woodland and wetland habitat for fauna species and is contiguous with adjacent native vegetation.

No threatened flora species or threatened ecological communities were recorded from the project site, and none are expected to occur. However, the project site does contain areas of Old-Growth Forests, Dry Monsoon Rainforests and Riparian Vegetation. These vegetation types are recognised as sensitive vegetation communities by the Department of Land and Resource Management.

There are a number of areas on the project site where vegetation is dependent on shallow groundwater. The project site provides habitat for a range of fauna and flora species and Figure 7 shows the broad habitat types within the project site.



Black wattle (*Acacia auriculiformis*)

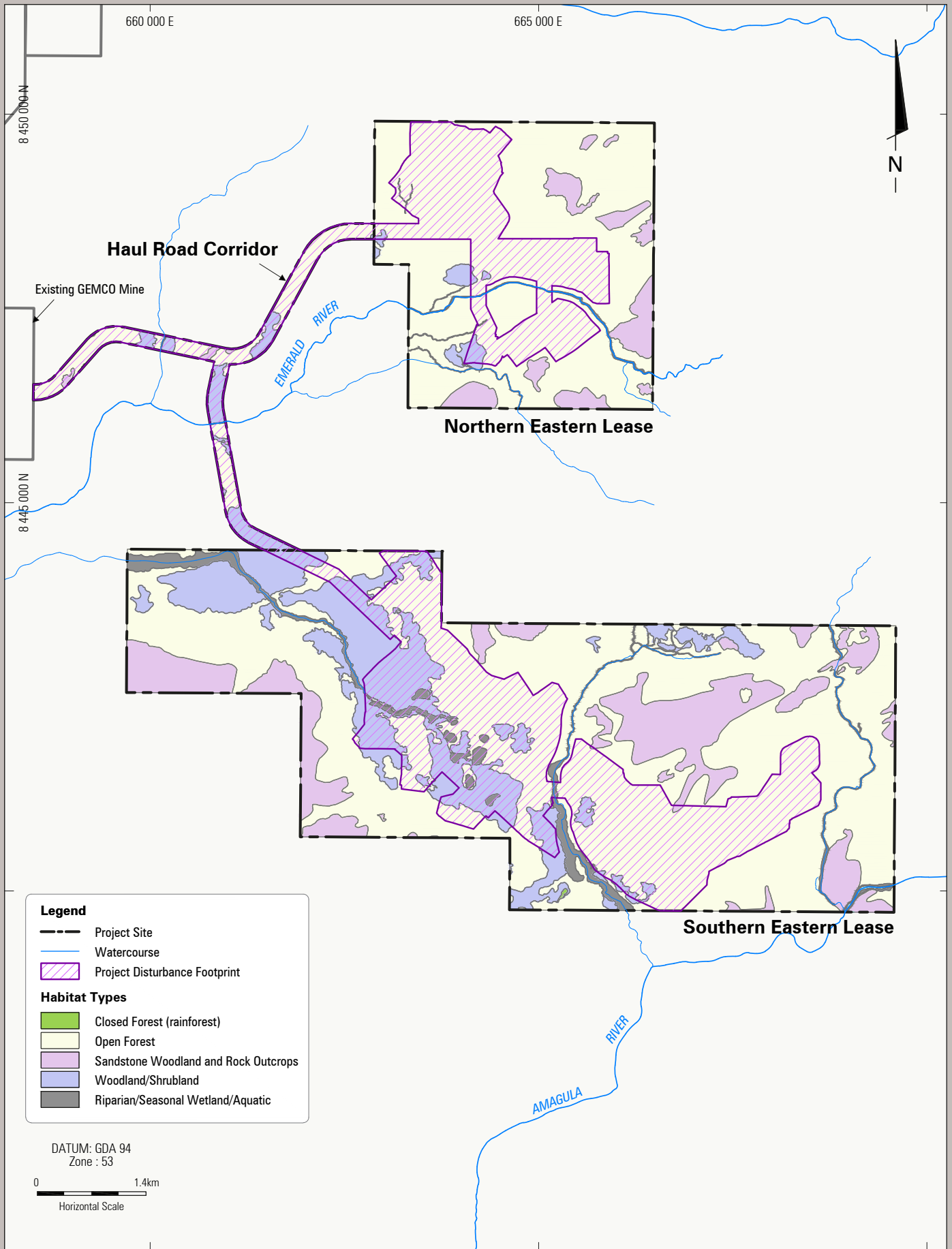


FIGURE 7 HABITAT TYPES WITHIN THE PROJECT SITE

Table 4 lists the threatened fauna species, under the EPBC Act and/or the NT *Territory Parks and Wildlife Conservation Act* (TPWC Act), that were recorded from the project site during field surveys.

The following migratory species listed under the EPBC Act were recorded on the project site, or were assessed as having a moderate potential to occur within the project site:

- Rainbow Bee-eater (*Merops ornatus*);
- Salt-water Crocodile (*Crocodylus porosus*);
- Fork-tailed Swift (*Apus pacificus*);
- White-bellied Sea-eagle (*Haliaeetus leucogaster*); and
- Rufous Fantail (*Rhipidura rufifrons*).

The EIS included an assessment of potential impacts on these fauna species. It considered direct impacts such as clearing of vegetation and habitat, as well as indirect impacts, including habitat fragmentation, edge effects, noise and vibration, vehicle strike, lighting, dust, erosion and the introduction of invasive species. The EIS describes measures to avoid impacts, as well as measures to mitigate impacts. In particular, it explains the project design features that limit impacts on habitat, such as the inclusion of buffers around watercourses to restrict mining within these areas. Progressive rehabilitation of mined areas is a key management measure for the project.

The terrestrial ecology assessment concluded that clearing activities associated with the project would potentially have a significant, residual impact on the Northern Hopping-mouse and the Brush-tailed Rabbit-rat.



Flora survey

In accordance with the *EPBC Act Environmental Offsets Policy 2012*, environmental offsets are proposed for the predicted impacts on these two species. No other significant, residual impacts, as defined in the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*, are predicted as a result of the project.

TABLE 4 THREATENED FAUNA SPECIES RECORDED ON THE PROJECT SITE

SPECIES	SCIENTIFIC NAME	EPBC ACT STATUS	TPWC ACT STATUS
Masked Owl (northern)	<i>Tyto novaehollandiae kimberli</i>	Vulnerable	Vulnerable
Brush-tailed Rabbit-rat	<i>Conilurus penicillatus</i>	Vulnerable	Endangered
Northern Quoll	<i>Dasyurus hallucatus</i>	Endangered	Critically Endangered
Northern Hopping-mouse	<i>Notomys aquilo</i>	Vulnerable	Vulnerable
Yellow-spotted Monitor	<i>Varanus panoptes</i>	-	Vulnerable
Mertens' Water Monitor	<i>Varanus mertens</i>	-	Vulnerable

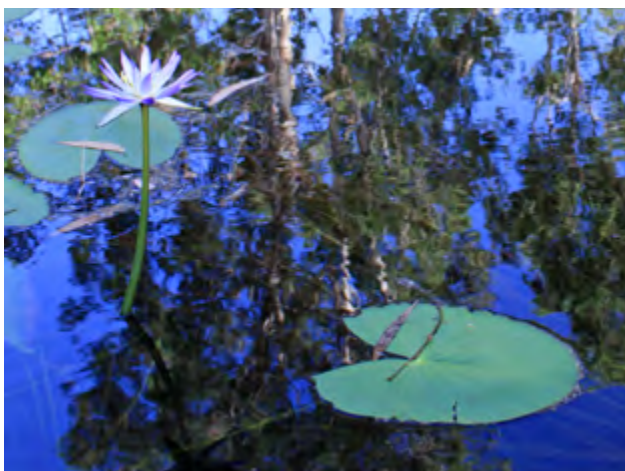
Northern Quoll
(*Dasyurus hallucatus*)



8 AQUATIC ECOLOGY

The EIS includes a detailed aquatic ecology assessment that involved multi-season aquatic ecology surveys. The catchments of the project site are vegetated with open forest, woodland and swamp forest. The watercourses in the project site are undisturbed and in their natural state. The majority of watercourses in the project site have rocky beds with occasional sand and silt deposits. Most watercourses in the project site are dependent on surface water flows. In the dry season freshwater habitat in the majority of watercourses is restricted mainly to remnant pools isolated by dry river beds.

The Amagula River is perennial, as are small sections of the Amagula River – Tributary 1 and the Emerald River – Tributary 2 (Figure 8). These perennial sections are understood to receive groundwater inflows, which contribute to base flows in the rivers.



Water lilies

The aquatic ecology assessment did not identify any threatened or migratory aquatic species that occur within the project site, or are likely to occur within the project site. The project will not impact the estuarine and marine environment, and consequently marine and estuarine species are not relevant to the assessment.

The EIS includes an assessment of the potential impacts of the project on the aquatic environment. It includes consideration of potential impacts arising from the construction of the open cut mine and haul roads. It also considers potential impacts on water quality, issues associated with changes in groundwater levels, erosion and sedimentation, and the potential introduction of weeds and pest animals.

The potential for the project to impact the aquatic environment has been significantly reduced by the following project design features:

- The project has been designed to ensure that there will be no mining activities within the main channel of the Emerald and Amagula Rivers and their tributaries, or within the 1% Annual Exceedence Probability (1 in 100 year) flood extents of the watercourses.
- The project has been designed with sufficient storage capacity for excess mine-affected water to ensure that no routine discharges of mine-affected water will be required.

In light of these project design features, and the impact mitigation measures that are proposed (e.g. erosion and sediment controls), no significant impacts on aquatic ecology are predicted.

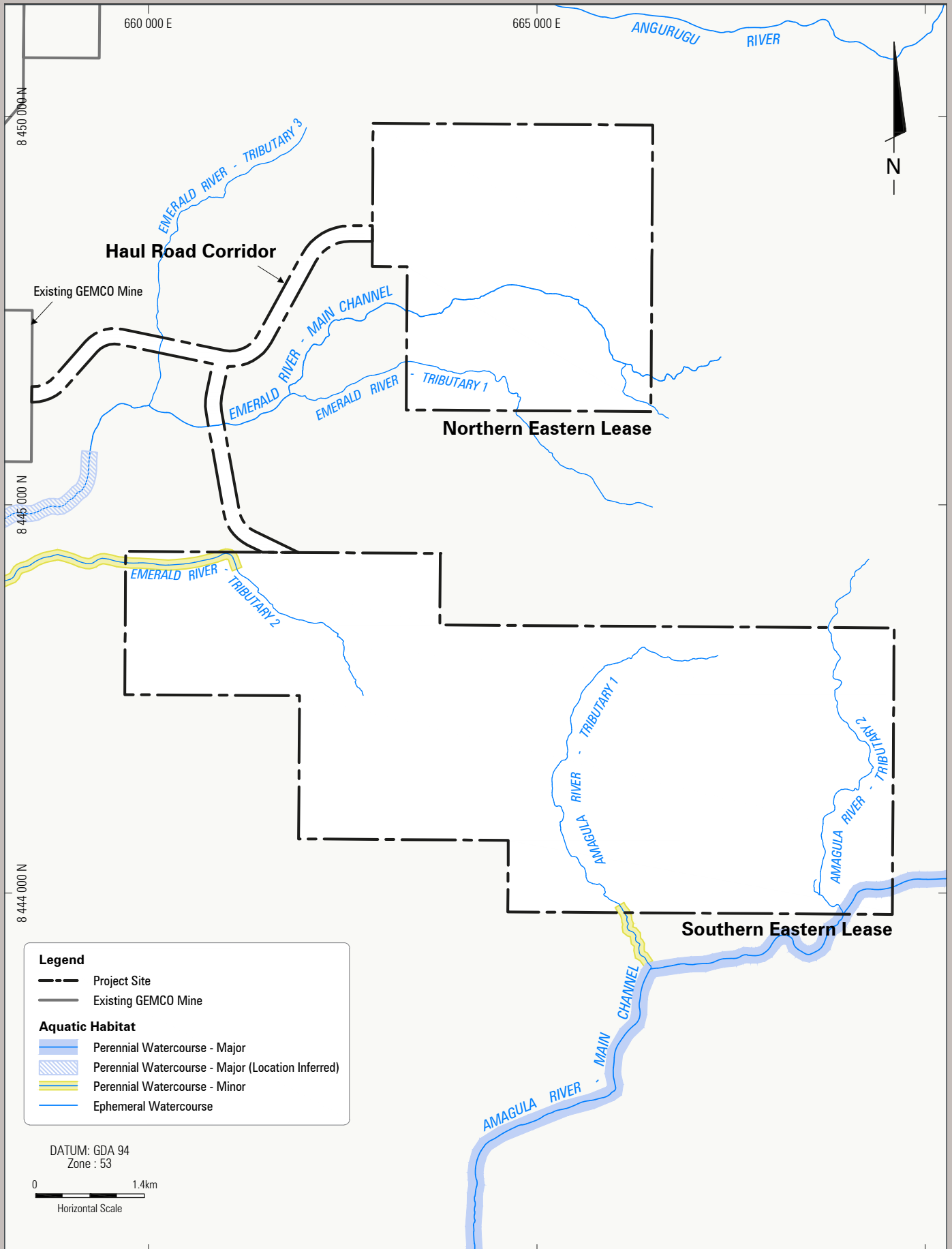


FIGURE 8 DRAINAGE OF THE PROJECT SITE

9 GROUNDWATER

GROUNDWATER SETTING

A groundwater assessment was undertaken for the EIS which included a field investigation, the installation of monitoring bores, and the development of a 3D numerical groundwater model to predict the impact of mining during the operational and post-mining phases. Groundwater modelling considered operations at the existing mine, where relevant.

The geological sequence within the project site is shown on Figure 9. Two aquifers occur within the project site:

- A shallow laterite aquifer; and
- A deeper Cretaceous sandstone aquifer.

The laterite aquifer receives recharge in the form of seepage through the overlying Quaternary sediments. It also receives recharge in areas where the laterite is exposed at the surface or in the beds of watercourses. The main recharge zone for the Cretaceous sandstone aquifer is where the sandstone outcrops and receives recharge in the form of runoff from seasonal rainfall events. The rate of recharge to the Cretaceous sandstone aquifer is very high.

Both aquifers provide some discharge to watercourses. Discharge from the laterite aquifer is very limited. However, the Cretaceous sandstone aquifer provides baseflow to watercourses including the Amagula and Emerald Rivers, particularly in low lying coastal areas downstream of the project site.

The water quality in both aquifers is non-saline and slightly acidic. The water contains naturally elevated concentrations of metals and metalloids (such as manganese, copper and zinc). No private bores in the vicinity of the project site are known to target the shallow laterite aquifer. However, the bores at Yedikba and Wurrumenbumanja Outstations intersect the deeper Cretaceous sandstone aquifer. These two bores are not regularly used given that the outstations are not permanently occupied and drinking water at the outstations is preferentially sourced from surface waters.

GROUNDWATER MODELLING AND IMPACT ASSESSMENT

Groundwater modelling was undertaken in order to assess the effects of mining on groundwater levels, and the associated impacts to groundwater users and the surrounding environment. Groundwater modelling indicated that localised depressurisation is predicted in the laterite aquifer around the proposed quarries. The Cretaceous sandstone aquifer is not predicted to be significantly depressurised by the project due to the thick marine claystone aquitard that underlies the manganese ore body and which will form the floor of the mined quarries.



Groundwater monitoring

The zone of depressurisation in the laterite aquifer due to mining is predicted to extend less than 1 km from any quarry. Depressurisation of the aquifer is predicted to be the greatest in the Southern EL, where proposed quarries are the deepest. Depressurisation is predicted to be up to 14 m in this area. Post-mining groundwater levels in the laterite aquifer are predicted to recover rapidly following completion of mining. 80% of the drawdown is predicted to recover within 5 years of mining. Almost total recovery of groundwater levels (i.e. to pre-mining levels) is expected to be achieved within 20 years of mine closure.

No impacts on private groundwater bores are predicted as a result of depressurisation. This is because the bores are installed in the Cretaceous sandstone aquifer, which is not predicted to be significantly depressurised as a result of the project.

Potential impacts on watercourses as a result of depressurisation of the laterite aquifer were also assessed. Groundwater modelling indicated that predicted drawdown does not extend to the perennial sections of watercourses. Potential impacts on the ephemeral sections of the watercourses were assessed and it was found that groundwater drawdown will not have a significant impact on the baseflow in any watercourses within or beyond the project site.

The EIS describes the measures that will be adopted to prevent any impacts on groundwater quality and also describes the ongoing groundwater monitoring program for the project.

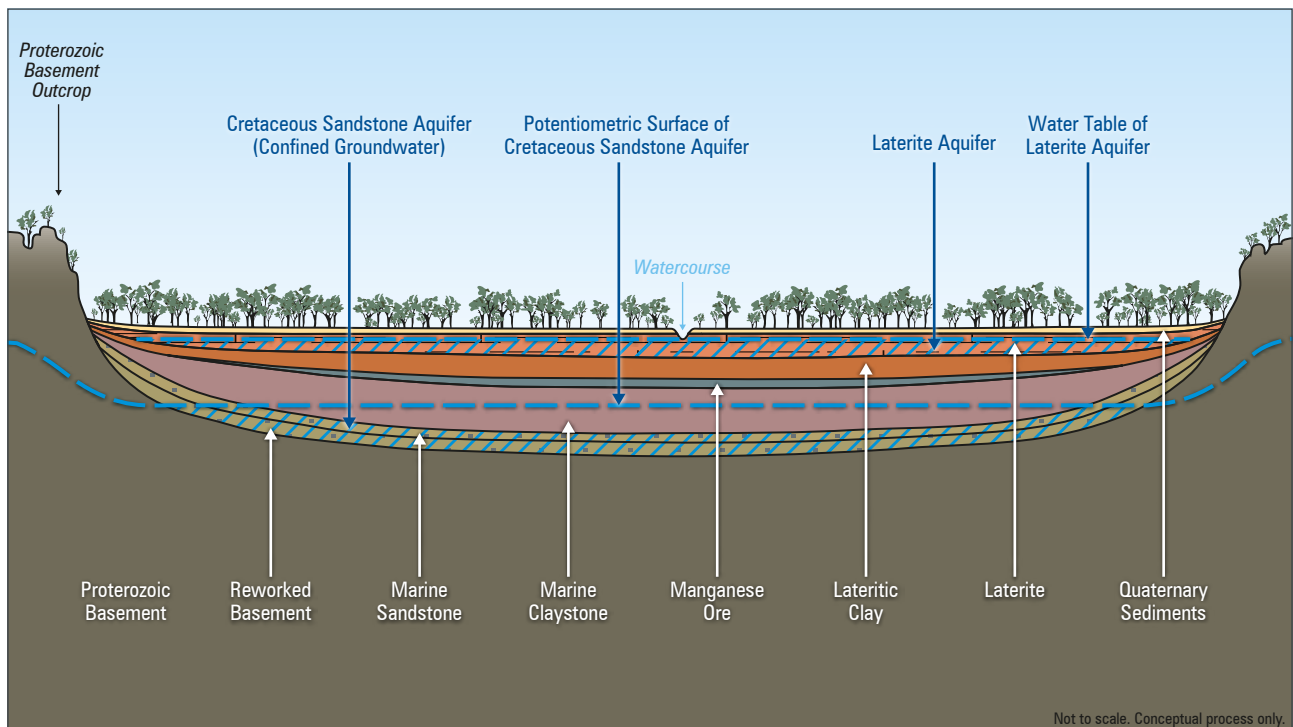


FIGURE 9 CONCEPTUAL HYDROGEOLOGICAL CROSS-SECTION



10 SURFACE WATER

The project site is in the upper catchments of the Emerald, Amagula and Angurugu Rivers. A geomorphological study and water quality monitoring program was undertaken as part of the EIS in order to characterise the watercourses in the project site. The watercourses are shown in Figure 8.

The surface water resources in the vicinity of the project site currently support a range of environmental values including aquatic ecosystems and human uses. The existing environmental values relevant to the surface water setting were identified from a review of local and downstream land uses, stakeholder consultation and published information. The surface water values relevant to the project include high conservation value aquatic ecosystems, recreational use (swimming and aesthetic values), human consumption, and cultural values.

The baseline water quality of the Emerald and Amagula Rivers reflects the underlying geology and surrounding land uses. Surface water is typically acidic and non-saline with low turbidity and low suspended sediment. Nutrient and mineral concentrations are typically low throughout these catchments as a result of the lack of agriculture and the highly weathered geology. Due to the underlying geology, there are naturally elevated concentrations of several metals, including aluminium, copper, manganese and zinc. Baseline water quality was found to exceed relevant guideline values for drinking water and recreational use due to acidity and occasionally elevated metal concentrations (i.e. manganese), reduced oxygen saturation and water hardness.

The project has been designed to ensure that mining will not encroach on either the Emerald or Amagula Rivers or their tributaries. Buffers have been defined around these watercourses and there will be no mining within the defined buffers. The buffers were delineated by the 1% Annual Exceedence Probability (1 in 100 year) flood extents. Flood modelling was undertaken to confirm the extent of these buffers. The buffers have been designed to allow mining to take place in a manner that avoids disturbance of the main channels of the watercourses and limits any interference with surface water flows. As a result of this approach to mine planning, no river diversions or levees are required for the project.

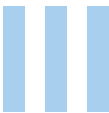
The project has been designed to ensure that a stable free-draining post-mining landform will be established with no final voids. The final landform design will ensure that there is no long-term reduction in downstream catchment yield.

WATER MANAGEMENT STRATEGIES

The project will require management of various types of water, including:

- Quarry water – i.e. water that accumulates in the quarries due to groundwater inflow and surface water runoff;
- Runoff from areas disturbed by project activities; and
- Runoff from undisturbed areas in the project site.

The EIS describes the proposed management strategy for each type of water generated by the project. The strategy is dependent on the quality of the water, and is designed to prevent any adverse impacts on downstream surface water values.







The broad strategies for management of the waters that will be generated by the project are:

- Where possible, divert clean runoff from undisturbed areas around areas disturbed by mining activities and allow to drain from the site;
- Control suspended sediment in site drainage water in accordance with an Erosion and Sediment Control Plan. This will include the collection of sediment-affected water draining from areas disturbed by mining, and directing it through sediment control structures that will be designed to limit any potential downstream sedimentation; and
- Contain quarry water in on-site water storages for reuse as mine water supply.

WATER MANAGEMENT SYSTEM

The proposed water management system for the project is represented in Diagram 2. The system is straightforward and limited to the containment and reuse of quarry water for mine water supply (i.e. dust suppression).

An operational simulation model has been used to assess the project water balance across a range of climatic conditions over the life of the project. The water balance model was used to assess appropriate sizing and location of dams, availability of quarry water for dust suppression, and frequency and volumes of any necessary controlled releases of excess quarry water.

Modelling results show that median water demands over the life of the mine are generally greater than the amount of quarry water that will be generated by the project in a given year. This indicates a significant overall water deficit for the project and the need for external water supply in certain years of operation. The proponent is proposing to use available mine water from the existing mine to address any water deficit for the project. The existing mine operates with a general water surplus that is sufficient to meet any additional requirements for the project, without compromising existing mine operations or dust suppression activities at the existing mine.

Project water storages have been designed to avoid the need for any routine discharges of quarry water. Modelling has demonstrated that there would be sufficient total storage capacity to contain quarry water during the range of historical climate conditions over the life of the mine without the need for routine discharges.

Modelling of the proposed water management system indicates that there would be no requirement to discharge quarry water based on the 124 years of modelled climate data, including all extreme wet periods. However, it is possible, with a very low likelihood, that a sequence of prolonged rainfall events could occur that is more extreme than any within the modelled 124 years of rainfall data. The proponent will therefore request authorisation for discharge of quarry water, as a contingency measure. The nominated discharge criteria have been calculated using the method contained in the ANZECC Guidelines for pristine, high conservation value settings, and are based on monitored baseline water quality. The criteria are designed to ensure there is no detectable change in the ecosystem, beyond natural variability.

DIAGRAM 2 CONCEPTUAL WATER MANAGEMENT SYSTEM



IMPACT ASSESSMENT AND MANAGEMENT

The EIS contains a summary of potential impacts on surface water, including potential impacts on surface water quality, sedimentation of watercourses, loss of downstream flow in watercourses and impacts on watercourse geomorphology.

No significant impacts are predicted. This is largely because of the project design features that are purposefully designed to limit the project's impact on watercourses.

A number of management measures will be adopted in relation to surface water and an Erosion and Sediment Control Plan and Water Management Plan will be prepared for the project. Ongoing water quality monitoring will be undertaken.



Surface water quality monitoring

11 CLIMATE

Climate data has been collected since 1999 from the Bureau of Meteorology (BoM) meteorological station at Groote Eylandt Airport. This meteorological station is located approximately 6.7 km to the north-west of the project site, at its closest point (Figure 3).

Groote Eylandt experiences a tropical climate which is characterised by hot humid summers during which the majority of rainfall occurs, and dry winters. The prevailing winds in the region are from the east. However, during the active monsoon season (November to April) north-westerly winds draw in moist air from the ocean, leading to heavy rainfall periods that are typically associated with intense storms and cyclones.

The monthly mean temperatures are typical of the tropical climate, with relatively warm temperatures all year round and slightly cooler temperatures from June to August. The highest mean daily maximum temperature recorded was 34°C for November, and the lowest mean daily minimum temperature recorded was 15°C for August. Annual mean temperatures range between 21°C and 32°C.

The annual pattern of rainfall illustrates the tropical climate in the region, with 97% of the annual rainfall occurring during November to April. The highest mean monthly rainfall recorded was 333 mm in March, and the lowest mean monthly rainfall was 1 mm in August. Annual mean rainfall is 1,326 mm.

On average relative humidity is approximately 58% higher in the morning than the afternoon. The highest monthly average relative humidity value was recorded in March for both morning and afternoon values (79% and 70%, respectively).

The predominant winds are from easterly directions, with 60% of winds occurring from the north-east and south-east. The most prevalent wind speeds recorded are moderate winds ranging from 2m/s to 4.99 m/s, measured 45% of the time.



Sunset over Groote Eylandt



12 AIR QUALITY

An air quality and greenhouse gas assessment was undertaken for the EIS to assess the potential impacts of the project on air quality. A review of proposed project activities indicated that particulate matter (i.e. dust) will be the key air emission generated by project activities.

As indicated in Table 2, there are four sensitive receptors identified in proximity to the project site. They include Angurugu township, Yedikba and Wurrumenbumanja Outstations, and the recreation area at Leske Pools Swimming Hole. The location of the sensitive receptors is shown on Figure 3.

Existing air quality at these sensitive receptors is influenced by natural features of the environment such as pollens, grass seeds, windblown dust from unvegetated areas, as well as smoke from fires. Air quality at Angurugu is also influenced by operations at the existing mine, and the operation of the nearby airport.

The air quality objectives that were adopted for the project are shown in Table 5.

TABLE 5 APPLICABLE AMBIENT AIR QUALITY OBJECTIVES

PARAMETER	AVERAGING PERIOD	VALUE
PM ₁₀	24-hour	50 µg/m ³ (with five exceedances per annum permitted)
Total Suspended Particulates	1-year	90 µg/m ³
Dust Deposition (incremental)	1-year	2 g/m ² /month



Angurugu township

The EIS air quality assessment included a review of background air quality data, estimation of emission rates for the project, and dispersion modelling to estimate dust levels in the vicinity of the project site. The assessment considered key project activities that could contribute to dust generation, including blasting activities associated with the active quarries, wind erosion of exposed surfaces and transport of overburden, ore and topsoil.

Dust emissions from the project are not predicted to give rise to any exceedances of the applicable ambient air quality objectives at any sensitive receptors, even when existing background levels are taken into account. The EIS outlines the dust mitigation measures and monitoring program that will be adopted for the project.

Greenhouse gases (GHGs) will be produced by the project, predominantly as a result of diesel fuel consumption. An assessment of GHG emissions was undertaken in accordance with the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) and the predicted annual GHG emissions are presented in the EIS. The EIS outlines the initiatives that are being proposed to reduce GHG emissions through improvements in energy efficiency. The proponent conducts regular internal reviews of reported GHG data, and audits of NGER data are conducted by an external party. This data is then used to measure performance against internal policies, objectives and targets.



View toward the Eastern Leases from the lookout at the Wurruwarrkbadenumanja Cave Paintings

13 NOISE AND VIBRATION

A detailed noise and vibration assessment was undertaken for the project and included assessment of predicted noise levels resulting from mining operations, including project operations alone (termed “intrusive noise”) and cumulative noise levels which include the existing mine. It also considered noise that could give rise to sleep disturbance, low frequency noise emissions, road traffic noise, and blasting impacts. Noise modelling of three representative project years was undertaken. The modelled years are representative of worst case years for noise impacts at the sensitive receptors. Sensitive receptors are listed in Table 2. The key sources of noise are mobile plant and equipment (e.g. dozers) operating within the project site.

In the absence of relevant noise criteria in the NT, noise criteria for the project were derived from a number of sources, including *NSW Industrial Noise Policy* (NSW EPA, 2000) and the *Draft Ecoaccess Guideline for the Assessment of Low Frequency Noise* (Queensland EPA, 2004). The noise criteria are based on existing background levels, as well as land uses at the sensitive receptors. The noise criteria are therefore specific to individual sensitive receptors. The EIS contains a full list of criteria for individual sensitive receptors.

Blasting criteria were sourced from *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (ANZEC, 1990), which contains the following criteria:

- Noise limit (overpressure): 115 dBL peak for 95% of blast events in a 12 month period, with an absolute limit of 120 dBL peak for all blasts; and
- Ground vibration limits: 5 mm/s Peak Particle Velocity (PPV) for 95% of blast events in a 12 month period, with an absolute limit of 10 mm/s PPV.

The assessment predicts that noise levels from the project will comply with relevant noise criteria, with the exception of a predicted exceedance of the intrusive noise criteria at Wurrumenbumanja Outstation. The exceedance at this receptor is predicted to occur intermittently for periods of a few weeks in the years when mining activities are closest to this receptor. The exceedance is predicted to occur during evening and night periods, during worst case noise enhancing conditions. The proponent will undertake discussions with the ALC, as representatives of the Traditional Owners, to resolve any issues that may arise from the predicted noise levels at Wurrumenbumanja Outstation.

The project is predicted to achieve compliance at all receptors, at all times, with the criteria for:

- Cumulative noise;
- Sleep disturbance;
- Low frequency noise; and
- Overpressure and ground vibration due to blasting.



14 VISUAL AMENITY

A visual impact assessment was undertaken to determine the impact of the project on the visual quality and character of the surrounding area.

The main elements of the project that may be visible are the temporary overburden emplacement areas and water storage dams. The viewing locations that were assessed represent the residences or public recreation areas nearest to the project site. These are:

- The four sensitive receptors listed in Table 2; and
- The lookout at the Wurruwarrkbadenumanja cave paintings (this is a public recreation area, located approximately 5 km to the north of the Northern EL).

As shown on Figure 10, lines of sight were developed to determine the visual effect of the project at the viewing locations. A line of sight is a representative line drawn from a viewing location to the project elements (i.e. dams and temporary overburden emplacements) to evaluate the extent to which project elements will be visible at a viewing location. The lines of sight take into account distance, topography and screening vegetation.

The visual impact assessment concluded that the project is not anticipated to be visible from any of the viewing locations due to screening from intervening topography and /or vegetation.



View of the Southern Eastern Lease

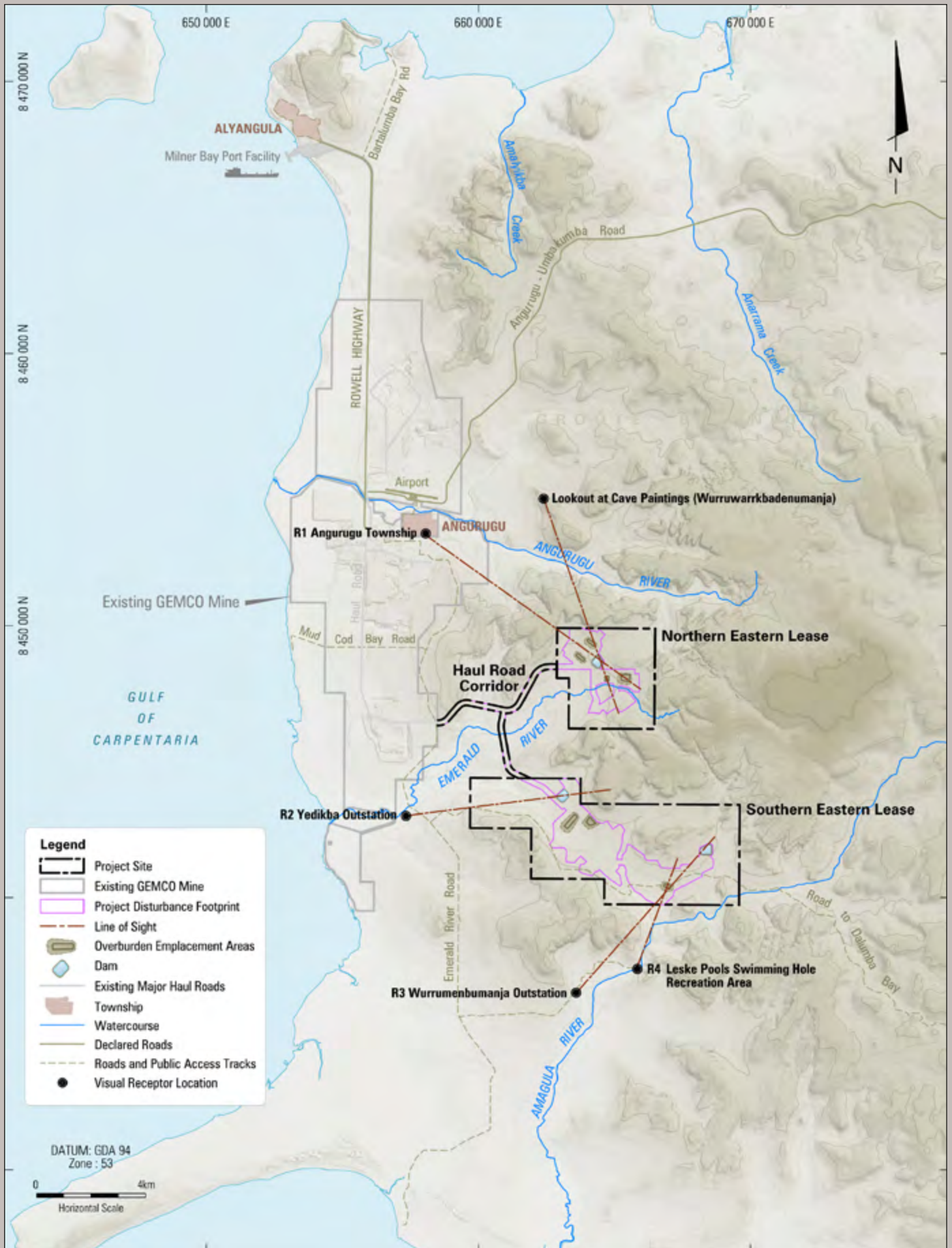


FIGURE 10 LOCAL TERRAIN AND VISUAL RECEPTORS

15 SOCIO-ECONOMICS

A socio-economics assessment, integrated with a comprehensive stakeholder consultation program, was undertaken for the project. This enabled the identification of community and social issues associated with the project and the development of strategies to address these issues.

The EIS presents the social profile of Groote Eylandt, using data derived from baseline research (e.g. census data) and data gathered during consultation. Details are provided on demography, housing and accommodation, social infrastructure accessibility, local values, education and training, labour force participation, and economic vitality. The social baseline of Alyangula reflects the fact that it is a residential base for the proponent's workforce.

Alyangula has a wider availability of services than most communities of its size due to the presence of the existing mine and the funding provided by the proponent. Angurugu and Umbakumba are Aboriginal communities and the socio-economic profile of these communities is similar to other remote Australian Aboriginal communities.

The EIS describes workforce arrangements at the existing mine. Approximately one third of the workforce lives locally, mostly residing in Alyangula. The remainder of the workforce is employed on a FIFO basis, residing in accommodation villages whilst on roster, and then returning to their homes on the mainland at the end of each roster period. The project will enable the continued employment of this workforce for an additional four years.



Alyangula Day Care Centre



Substantial royalties are paid as a result of the existing mine and existing royalty arrangements include:

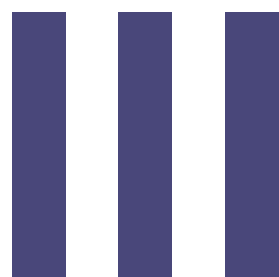
- Negotiated royalty payments. Payments are made to the Groote Eylandt Aboriginal Trust (GEAT) in accordance with the conditions of the private agreement dating from the original establishment of the mine in the 1960s. Payments are also made to the ALC on behalf of the Traditional Owners of Groote Eylandt as part of the 2006 Mining Agreement (approximately \$8 million a year between 2005 and 2013).
- Statutory royalty payments. The proponent is required to pay royalties to the NT Government under the NT *Mineral Royalty Act*. Between 2007 and 2013, the proponent paid, on average, nearly \$100 million per year in royalties to the NT Government.
- Indirect royalty payments are made by the Federal Government into the Aboriginal Benefit Account (ABA) as a result of the proponent's royalty contribution to the NT Government. The ALC receives a proportion of these payments and received approximately \$21 million per year between 2005 and 2013.

The socio-economic assessment considered potential negative and positive impacts associated with the project. Negative impacts include loss of access to land, impacts on social amenity, anxiety and uncertainty surrounding new mining areas, and impacts on spirituality and sacred sites. The Mining Agreement that will be negotiated between the proponent and the ALC for the project is the primary vehicle for addressing a number of these impacts.

Positive impacts include continuation of employment and provision of services and facilities, and economic benefits to Traditional Owners, Groote Eylandt, the NT and Australia.



Sorting native seeds for the rehabilitation program at the existing GEMCO mine



16 ARCHAEOLOGY

An archaeological assessment was undertaken for the EIS to identify sites of Indigenous and non-Indigenous historical cultural heritage significance within the project site. The assessment methodology included a desktop review, field survey and impact assessment to determine the cultural significance of the sites identified from the field survey. Traditional Owners participated in all field surveys.

A total of 28 sites of varying levels of archaeological significance were located during the field survey (Figure 11). The majority of sites were rock shelters containing art, and other archaeological features such as artefacts, deposit and grinding.

There were two locations (one within the Northern EL and one within the Southern EL) where a large number of sites were clustered within a small area.

An assessment of cultural significance, guided by the Burra Charter, was undertaken for the sites identified during the field survey. It was based on the results of the field survey with consideration of the character of the sites both individually and collectively. Significance was determined for each site by assessing its cultural value (including aesthetic, historic, scientific, social and spiritual value) against defined attribute criteria. The majority of sites had a high cultural value.



Rock shelter with art at Archaeological Site ELN09

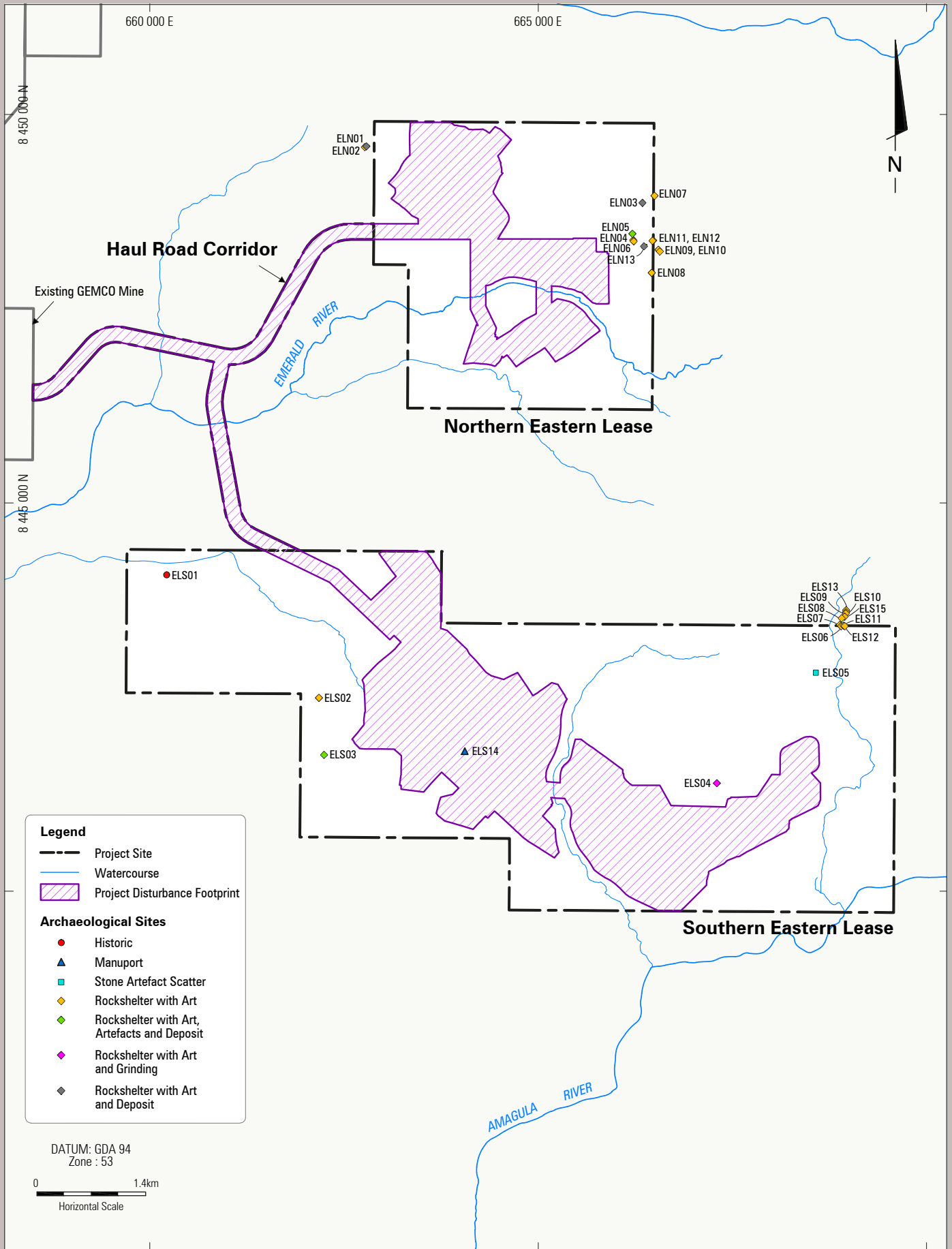
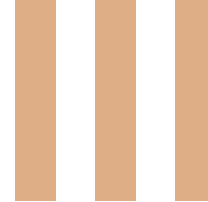


FIGURE 11 LOCATION OF ARCHAEOLOGICAL SITES



Of the 28 sites located during the field survey, only one site (the manuport – site ELS14) is located within the project disturbance footprint. A manuport is a natural object which has been moved from its original context by humans. Site ELS14 is a small stone used by Traditional Owners as a marker stone. A proposed management approach for this site involves relocating the manuport beyond the mine disturbance footprint. Agreement with the ALC would need to be sought in order to relocate the manuport. Under the *Heritage Act*, relocation of this site would be considered to be disturbing the site and approval under the Act would need to be obtained.

A range of indirect impacts have the potential to affect the archaeological sites found within the project site. These include increased visitor access, dust, and blasting. It should be noted that the rock shelters are a significant distance from the nearest mining operations, with the nearest shelters being 400 m away and the majority of shelters being over 1 km away.

Nevertheless, appropriate mitigation measures will be put in place to avoid indirect impacts to these sites, including:

- Placing restrictions on access during mining operations to the areas where archaeological sites occur;
- Recording the baseline condition of the art and monitoring the art to identify any impacts that may be due to dust (such as exfoliation of the art surface); and
- Developing a Blast Management Plan which will include determining appropriate ground vibration limits for individual sites to protect the integrity of the rock shelters and minimise the risk of damage.

A Cultural Heritage Management Plan will be prepared for the project. An unexpected finds procedure will also be implemented to help mitigate impacts in the unlikely event that previously unrecorded sites of cultural heritage significance are found during project activities.



Traditional Owners assisting the archaeology survey

Rock shelter with art at
Archaeological Site ELS07



17 NON-MINING WASTE

The main wastes anticipated to be generated by the project include:

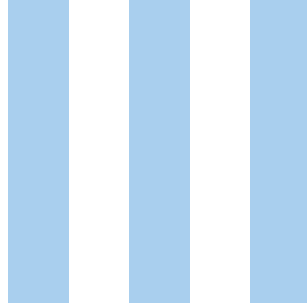
- General and recyclable wastes;
- Green waste;
- Sewage;
- Waste oil;
- Coolant;
- Miscellaneous hydrocarbon wastes; and
- Tyres and batteries.

These waste streams are consistent with those currently being generated by the existing mine.

The proponent has a waste management system in place for the existing mine and wastes generated by the project will be managed in accordance with this system. The waste management system is based on the regulatory requirements, values and principles of the *Waste Management and Pollution Control Act, Waste Management and Pollution Control (Administration) Regulations*, and the *Draft Waste Management Strategy for the Northern Territory*. Waste inventories are maintained for all waste types and quantities and reported annually in accordance with the *National Pollution Inventory Guide*.



Oil spill kits



The waste management system adopts the principles of the waste management hierarchy as far as practicable. Key features of the system include segregation and secure containment of all wastes for appropriate reuse, recycling or disposal at licensed facilities; employee awareness of waste management practices; regular environmental auditing; and regular inspections and ongoing monitoring.

The proponent operates several waste management facilities on Groote Eylandt for the reuse, recycling or disposal of the various waste streams. A proportion of the wastes collected are transported to the mainland for repair, reuse, recycling or disposal by licensed contractors.

The EIS describes the waste streams that will be generated by the project and their proposed management. All wastes will be managed in accordance with the existing waste management system.

The project is located on land with no past history of development or agricultural activities. Only small scale exploration activities have been sporadically undertaken on the site. There are no known instances of land contamination on the project site as a result of these or any other activities. There are only limited activities that will be undertaken on the project site that may give rise to land contamination, and these include:

- Refuelling of on-site equipment using mobile refuelling trucks; and
- Basic maintenance works required on-site for equipment.

The proponent has established procedures and mitigation measures in place to prevent and control any spills. The risk of land contamination on the project site from project activities is therefore considered minimal.



Inspection of mobile equipment at the GEMCO Mine





18 HEALTH AND SAFETY

The proponent has extensive health, safety and risk management systems and procedures in place for the existing mine, and risks associated with the project will be managed in accordance with these systems and procedures. In particular, the proponent has a detailed Risk Management Plan which is the company's overarching plan designed to manage health, safety, environment and community risks associated with the operation of the existing mine. The Risk Management Plan provides a framework for achieving the proponent's objectives in relation to health and safety and ensuring compliance with all applicable legislation. It is supported by an extensive number of associated internal plans, procedures and manuals.

The proponent has established procedures for reporting and investigating systematic and event based non-conformances. Corrective actions, reports and close out statistics are generated on a weekly and a monthly basis, to allow departmental managers to assess department, section and individual performance. In addition, all incidents that cause environmental harm will be reported to the DME as soon as practicable, in accordance with Section 29 of the *Mining Management Act*.

Auditing forms a key part of the existing Risk Management Plan. Internal auditing of the Risk Management Plan and its associated procedures is undertaken against corporate standards by an external party in order to measure performance against policy, objectives and targets.

A Preliminary Hazard Analysis was undertaken to identify potential hazards and risks associated with the project. In identifying hazards associated with the project, consideration was given to project activities, as well as malicious acts and natural events.

The primary hazards identified were in relation to the transport and use of hazardous and dangerous goods and materials on the project site. These materials will be transported and handled in accordance with the proponent's existing stringent procedures and guidelines.

A rigorous re-appraisal of hazards associated with the project will be undertaken as part of the Risk Management Plan prior to the commencement of the construction, operations and decommissioning phases of the project, based on detailed design and operating plans.



19 ENVIRONMENTAL MANAGEMENT PLAN

The EIS contains measurable and auditable commitments to environmental management practices for the project. The implementation of these commitments will ensure that the project is undertaken in accordance with a high standard of environmental management.

The Environmental Management Plan describes the proposed environmental management measures that will be developed and implemented to address the potential environmental impacts associated with the project.

The proponent's environmental management framework is discussed, along with the series of environmental management and monitoring plans that will be developed and implemented for the project.

These management plans will effectively manage and control the potential environmental impacts that have been identified in this EIS. This section also includes a summary of the proponent's EIS commitments to mitigate and manage environmental impacts.



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