







GROOTE EYLANDT MINING COMPANY (GEMCO)

# SOUTHERN LEASE STAGE 1 EXPLORATION PROGRAM

## NOTICE OF INTENT June 2019

Volume 1

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

SOUTH32

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## INTRODUCTION

The Groote Eylandt Mining Company Pty Ltd (GEMCO) (the "proponent") is proposing to undertake the Stage 1 exploration program (the exploration program) in Exploration Licence (EL) 2455, known as the Southern Lease (Figure 1). The proponent operates a manganese mine (termed "the existing mine") on Groote Eylandt and exploration in the nearby Southern Lease is required to inform the proponent's assessment of potential future resources.

This Notice of Intent (NOI) has been prepared by Hansen Bailey, with support from specialist ecologists, on behalf of the proponent. This document has been prepared to enable the Northern Territory Environment Protection Authority (NT EPA) to determine whether the exploration program is expected to give rise to significant impacts and hence whether it will require further environmental assessment under the *Environmental Assessment Act 1982* (NT) (EA Act). This NOI has been prepared in accordance with the NOI information requirements described in the NT EPA Guideline *Referring a Proposal to the NT EPA, A guide for proponents and referral agencies*.

The overall conclusion of the NOI is that the exploration program is not predicted to have a significant effect on the environment. There is a high level of confidence in this conclusion because of the large amount of baseline environmental work that has been undertaken, including large scale field programs. In addition, the proposed activities are very similar in scope to other exploration programs previously undertaken by the proponent in its other tenements on Groote Eylandt. The potential impacts from exploration are therefore well understood and the management measures are well established.

### Background

As part of its long-term strategy, the proponent is assessing potential future manganese resources on Groote Eylandt. In October 2016, the proponent was granted the exploration rights to the Southern Lease, an exploration tenement located to the south of the existing mine (Figure 1). In 2016, the proponent undertook a drilling program in the Southern Lease in accordance with a Mine Management Plan (MMP) (Authorisation 0887-01, 02 November 2016).

Based on information obtained from the 2016 exploration program, the proponent sought to undertake further exploration in the Southern Lease in 2017. In March 2017 the proponent met with Northern Territory government agencies to obtain advice on the environmental approval process for the proposed 2017 exploration program. The meeting was attended by representatives from the NT EPA, the Department of Primary Industry and Resources (DPIR) and the Department of Environment and Natural Resources (DENR). In this meeting the proponent was advised that an NOI should be prepared for the proposed exploration program to ensure that the potential environmental impacts were assessed, particularly impacts on threatened fauna species. Government representatives specifically highlighted the need to provide information in the NOI on potential impacts on the Northern Hopping-mouse (*Notomys aquilo*) and Brush-tailed Rabbit-rat (*Conilurus penicillatus*). It was noted that these two threatened species were potentially present within the Southern Lease but there was a scarcity of information about their distribution and habitat preferences, and the potential for exploration to impact them.

The proponent has since undertaken a large scale research project (termed "Small Mammal Research Project") on these species in order to confirm their presence and habitat preferences within the Southern Lease. An assessment of the potential for exploration activities to impact these species, and other threatened fauna species, has also been undertaken. Together, these studies comprise much of the information in this NOI.

## Proponent

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

South32 is an independent global metals and mining company. 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 operations in aluminium, bauxite, coal, lead, nickel, silver, zinc and manganese. Its operations include the existing manganese mine on Groote Eylandt, which is currently the largest and lowest cost manganese ore producer in the world. Product is shipped to a domestic manganese alloy plant in Tasmania and also exported globally.

Anglo Operations (Australia) Pty Ltd is a wholly owned subsidiary of Anglo American Plc, a mining group based in the United Kingdom 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.

## Regulatory Approvals

The key regulatory approvals required for the exploration program and their status are listed in Table 1.

**Table 1 Key Regulatory Approvals**

| APPROVAL | LEGISLATION | AGENCY | STATUS |
|---|---|---|---|
| Consent from landowners | *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA) | Federal Minister for Indigenous Affairs | Exploration Agreement under ALRA was signed with the Anindilyakwa Land Council (ALC) on 17 May 2016. |
| Tenement | *Mineral Titles Act 2010* (NT) | DPIR | EL2455 was granted on 12 October 2016. |
| Environmental Approval | *Mining Management Act 2001* (NT) | DPIR | It will be necessary to obtain Authorisation for the exploration program under the *Mining Management Act 2001*. This Authorisation will not be granted until the NT EPA has undertaken any necessary environmental assessment. This NOI is being prepared as part of the environmental assessment process.<br>Once the environmental assessment process has concluded, a Mining Management Plan (MMP) will be submitted to DPIR to seek Authorisation for the exploration program under the *Mining Management Act 2001*. |

# PROJECT DESCRIPTION

## Regional Setting

The Southern Lease is located on Groote Eylandt in the Gulf of Carpentaria (Figure 1). Groote Eylandt is largely undeveloped, and much of the island is still used for traditional practices such as hunting and gathering. The existing mine is the main development on the island and has been operating for over 50 years. There are three townships on Groote Eylandt, namely Alyangula, Angurugu and Umbakumba (Figure 1). They have a combined population of approximately 2,300 people (Australian Bureau of Statistics 2017b). There are also several small, rural Aboriginal settlements (termed "outstations") on Groote Eylandt. Outstations typically have varying levels of use, from occasional visitation to sporadic residency.

Groote Eylandt, and the surrounding marine area, has significant ecological value. Groote Eylandt and various smaller surrounding islands are considered an International Site of Conservation Significance in the Northern Territory (Harrison et al. 2009). The islands have outstanding conservation values for nesting marine turtles and colonial seabirds. In addition, the threatened terrestrial fauna species present on the island are relatively protected from key threatening processes (such as Cane Toads) that exist on the mainland. 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 (Department of Environment and Energy 2013).

## Site Setting

The Southern Lease covers an area of approximately 26,000 ha. The area is remote, containing only a few 4WD access tracks and one outstation (Wurrumenbumanja, also known as Leske Pools outstation). The Southern Lease is accessed from the existing mine via the Emerald River Road, an unsealed public road (Figure 1).

The Southern Lease contains elevated rocky outcrops and gently sloping valleys. Elevations range from approximately 0 m to 110 m Australian Height Datum (AHD). Outcrops of the geological basement form rocky outcrops, particularly in the eastern part of the Southern Lease, and are referred to as white rock. These areas are generally culturally significant to the Anindilyakwa People.

The Southern Lease is traversed by the Amagula River, Mayimokumanja River and Innokumanja River (Figure 2). All three rivers have headwaters starting in the white rock. As these rivers traverse the landscape towards the gulf, the relatively flat, low-lying topography forms densely vegetated shallow gradient valleys converging onto coastal plains. This topography promotes the establishment of off-channel wetlands during the wet season when floodwaters expand across the coastal plains. Many of the drainage lines throughout the site are highly ephemeral, only flowing for short periods (<2-3 months) after substantial rainfall events (e.g. the Mayimokumanja River). The Amagula River and the Innokumanja River are more significant drainages and maintain continuous flows year-round. In addition to the three rivers, there are also three minor, ephemeral drainage lines located on the western side of the Southern Lease.

## Planning of Exploration

The exploration program was designed through the following process, which ensured that environmental and cultural factors were considered in the planning phase:

- The potential mineralised area was defined (i.e. the area in which manganese may potentially occur). This was based on high level geological information from previous exploration, as well as extensive geological information from the current mining area. The potential mineralised area represents the area in which exploration would be undertaken if there were no environmental constraints. It is shown in Figure 2.

- The environmental constraints in the potential mineralised area were identified. The identification of environmental constraints was based on an extensive fieldwork program over a 2-3 year period and included consultation with the ALC and regulators. The following work was undertaken to identify environmental constraints:
  - Baseline terrestrial ecology work;
  - Review of vegetation mapping, including vegetation mapping prepared by the DENR, supplemented by fieldwork;
  - An aquatic ecology field survey, and mapping of watercourses using field survey results, ground-truthing, aerial photography, drone imagery and LiDAR (i.e. topography);
  - Digitisation of areas of sandstone outcropping, known as white rock, based on LiDAR, aerial photography and ground-truthing; and
  - Consultation with the ALC to understand cultural considerations.
- A risk-based approach was adopted to determine the significance of the constraints. This culminated in approximately 7,500 ha of the potential mineralised area being permanently excised from future drilling programs. The revised area is termed the potential exploration area and is shown in Figure 2. The potential exploration area was developed based on the principle that there would be no exploration drilling within the following features:
  - Waterways and wetlands;
  - Monsoonal vine thicket, which is an environmentally sensitive vegetation type, but is also culturally sensitive;
  - Culturally sensitive areas including sacred sites; and
  - White rock, which is culturally sensitive in places. Although white rock does not tend to overlap with areas of potential mineralisation, the Traditional Owners require a buffer around white rock areas to ensure that exploration drilling does not encroach into these areas.
- The geological information from the potential exploration area was reviewed and the exploration program was developed with the aim of:
  - Gaining further information regarding the extent of mineralisation in areas that have already been confirmed as containing manganese; and
  - Determining whether manganese is present in areas where very little geological information is available.

This planning culminated in the development of the layout and methods for the exploration program.

## Overview of Exploration Activities

The exploration program is part of the proponent's broader exploration campaign within the Southern Lease. Exploration is undertaken in a structured manner, which is designed to progressively gain more information about the geology and mineralisation of the area. Regional exploration holes are initially drilled to determine if any manganese mineralisation is present, as well as the potential extent of mineralisation. Subsequent planning of infill drilling is based on the results of the regional exploration holes. In areas where manganese is found to be present, additional holes are required to be drilled in grid patterns to improve the understanding of the extent, thickness and quality of the mineralisation, with the goal of defining a resource. Diamond drilling may also be required to provide core samples which are subject to laboratory testing of geometallurgical properties such as density.

The exploration work described in this NOI comprises the following activities:

- Approximately 40 regional exploration holes;
- Infill drilling areas in the western part of the Southern Lease; and
- Four diamond drill holes.

The layout of the exploration program is shown in Figure 3.

The exploration work described in this NOI is termed the Stage 1 Exploration Program and, depending on the results of this program, further exploration may be required in the future. The details of any potential future exploration work cannot be determined at this point in time because the scope and location of future exploration will be dependent on the results of the Stage 1 Exploration Program. Separate approvals will therefore be obtained for any future exploration that may be required.

## Permit to Clear Process

Prior to any exploration work being undertaken, the proponent's Permit to Clear process will be followed. This process includes a pre-clearance survey to determine the precise locations of drill pads and access tracks, based on the distance from local environmental constraints and the presence of habitat features for threatened species. Although the potential exploration area already takes into account key environmental constraints, pre-clearance surveys are required because the mapping scale used to delineate the potential exploration area is not suitable for defining the precise location of features such as small waterways.

The pre-clearance survey will address the following:

- The limits of clearing will be clearly delineated (via flagging) and will be restricted to the minimum areas required to safely complete the drilling program. This will include minimising the width of access tracks and drill pads.
- The pre-clearance survey will ensure compliance with the following adopted buffer distances from sensitive areas. Any drill holes or access tracks identified within these areas will be relocated.
  - A minimum of 100 m from waterways and wetlands.
  - A minimum of 100 m from monsoonal vine thicket.
  - A minimum of 100 m from white rock areas.
- Searches will be undertaken of each proposed clearing area by an experienced ecologist to identify and flag key habitat features of threatened fauna species.
- Any large, mature trees will be avoided, if possible. Such trees will be flagged.
- The area to be cleared will be inspected for weeds. Any weeds that are identified will be GPS recorded, and sprayed or removed prior to any clearing being undertaken.

Consultation will be undertaken with the ALC as part of the Permit to Clear process. As part of this process, a cultural monitor (i.e. a Traditional Owner who speaks for the country) will be invited to visit the exploration area and confirm that it is suitable from a cultural perspective and to nominate any necessary additional buffers from culturally sensitive areas.

The pre-clearance surveys and advice from the ALC and/or cultural monitors may necessitate the relocation of drill holes and tracks. The location of drill holes and tracks shown in Figure 3 is therefore indicative and subject to change.

## Drilling

Approximately 40 regional exploration holes are proposed to be drilled as part of this program (Figure 3). Regional exploration drilling is proposed to be undertaken using a low impact aircore drill rig which is mounted onto a medium sized 6WD truck. The regional exploration holes are proposed to be located on existing or historic tracks, where possible. In areas where there aren't any existing tracks, the access route will be selected to avoid clearing of larger trees. This is possible due to the smaller size of the rig, which means it can manoeuvre between trees. The proposed alignment of the access route will be flagged and then a pre-clearance survey will be undertaken. Once the proposed alignment of the access route has been confirmed, any necessary clearing will be undertaken. Clearing will be limited to the lower canopy such as small trees, shrubs and grasses, as well as moving fallen timber to the edges of the drilling area. Clearing will be undertaken using a chainsaw, axe or similar hand tool. This method of drilling does not require a drill pad to be cleared.

Approximately 500 infill drill holes are proposed as part of the exploration program (Figure 3). Holes are distributed in a grid pattern and will be accessed via existing tracks, although additional tracks may be constructed to access the individual drill pads. Infill drilling is proposed to be undertaken using a Reverse Circulation (RC) drill rig. For safety reasons, it will be necessary to clear a pad for each drill hole. Drill pads will be cleared of vegetation using a D6 scrub dozer. Clearing will be conducted using the "blade up" method, whereby the blade of the dozer is lifted to reduce soil disturbance and the topsoil will not be disturbed. Vegetation clearing for access tracks will follow a similar process.

Four diamond drill holes are proposed as part of the exploration program (Figure 3). The holes will be accessed via existing tracks and the drill pads will be located on existing tracks, reducing the need for additional clearing.

A single low-impact aircore rig and a single diamond drill rig will be used for exploration program, but there may be multiple RC rigs.

The extent of clearing for the drilling program will be limited, as far as possible, including minimising the width of access tracks and drill pads. An area of approximately 29 ha will be cleared for infill drill holes, comprising approximately 7 ha for the clearing of drill pads and approximately 22 ha for the construction of access tracks. The cleared areas will be rehabilitated and naturally regenerate following drilling, as described in the following section.

## Rehabilitation

Following the completion of drilling, rehabilitation will be undertaken of drill holes, drill pads and access tracks using the following methods:

- Exploration drill holes will be plugged and capped in accordance with the proponent's existing procedure.
- Drill pads and access tracks will be rehabilitated using the same methods successfully used for exploration drilling at the existing mine and in the Eastern Leases. The rehabilitation of drill pads and access tracks comprises:
  - Removing and disposing of any rubbish;
  - Respreading any remaining drill cuttings;
  - Replacing surface materials such as logs, vegetation cover and leaf litter, on the disturbed areas, as far as practicable; and
  - Allowing the area to naturally revegetate from seeds in the soil seed bank and from adjacent vegetation.

The drill pads and tracks will be inspected after they are rehabilitated. The inspections will identify any erosion or subsidence of drill holes, and will determine if revegetation is occurring or if any weeds are present. Photographic monitoring records of representative sites will be maintained. The ALC will also be provided with an opportunity to inspect rehabilitated exploration areas to confirm the rehabilitation has been undertaken to the satisfaction of the Traditional Owners.

The proponent has had considerable success with rehabilitation of exploration drill holes and access tracks. A recent survey of rehabilitated drill pads and tracks has been conducted of exploration sites from 2017 to as far back as the 1960s (Cumberland Ecology 2019). Analysis was made of vegetation in areas cleared or disturbed by exploration activities compared to adjacent, uncleared areas. The survey included assessment of 72 sample sites, each including a disturbed site (i.e. previous drill pads or tracks) and an analogue (undisturbed) site. Monitoring was undertaken across the Eastern Leases, the existing mine and the Southern Lease. Sites were monitored for vegetation structure, woody species regeneration, ground cover, time since fire, fire impact and weed species cover. Survey results showed woody species composition appears to rapidly regenerate (within 1 to 2 years) following cessation of disturbance. This was attributed to the “blade up” method of clearing, which ensures that topsoil is undisturbed and contains vegetative material as well as the soil seed bank. This mimics natural regeneration following fire, where suckering occurs from in-situ roots and lignotubers and germination of soil stored seed occurs. Vegetation structure was found to return more slowly to pre-disturbance levels, with comparable levels being achieved approximately 30 years after disturbance. Regeneration of vegetation structure was influenced by recurrent fires, with frequent fire regimes considered likely to extend the timeframe for the establishment of large stems. Overall, the monitoring indicates that the rehabilitation techniques used by the proponent allow exploration areas to successfully regenerate over time.

There will only be very minor disturbance associated with the regional exploration holes, due to the small size of the low impact aircore drill rig and the fact that it is not necessary to clear drill pads or access tracks. This reduces the rehabilitation requirements for these holes.

### Timing

Exploration activities will commence once environmental approvals are obtained. Exploration will only be undertaken during the dry season. Detailed scheduling is still to be finalised and is dependent on the timing of regulatory approvals, particularly the timing relative to the commencement of the wet season.

Due to the number of drill holes, the infill drill program is expected to take the longest amount of time and will be completed within 12 months. The diamond drilling is expected to be completed in approximately 1 week, and the regional exploration holes are expected to be completed within 6 months. The exploration program is scheduled to commence in the second half of 2019 and will be completed in 2020. The rigs undertaking infill drilling will potentially operate 24 hours a day, whereas diamond drilling and drilling of regional exploration holes will occur during daytime hours only.

### Workforce and Accommodation

The peak workforce required to complete the exploration program is up to 52 people. Due to the continuous operations proposed, only half of the peak workforce will be onsite at any one point in time. Up to four crews may operate simultaneously and as the respective exploration activities are completed, the number of crews and total workforce onsite will reduce accordingly. The workforce will be housed in existing accommodation.

## REVIEW OF ENVIRONMENTAL FACTORS

The NT EPA has produced a guideline on environmental factors and objectives (NT EPA 2018a), which is designed to provide a systematic way to categorise information in an environmental impact assessment. Environmental factors are broad components of the environment that may be impacted by an action. The guideline identifies a total of 13 environmental factors, characterised under five themes, namely Land, Water, Sea,

Air, and People and Communities (NT EPA 2018a). Objectives have been developed for each environmental factor and potential impacts must be considered relative to these objectives.

As per the guideline, this NOI focuses on addressing environmental factors and objectives that are most relevant to the proposed activities. The following proposal specific factors were identified:

- Terrestrial Flora and Fauna; and
- Social, Economic and Cultural Surroundings.

These proposal specific factors are discussed in detail in the NOI and the assessments conclude that the exploration program is not predicted to have a significant effect on terrestrial flora and fauna or social, economic and cultural surroundings. These proposal specific factors are discussed in the following sections.

## TERRESTRIAL FLORA AND FAUNA

The assessment of terrestrial flora and fauna in the Southern Lease draws on information from the following three specialist ecology reports that have been prepared by Cumberland Ecology and which form part of this NOI:

- A large scale research project on the Northern Hopping-mouse and Brush-tailed Rabbit-rat to confirm their presence and habitat preferences within the Southern Lease. This project is referred to as the Small Mammal Research Project.
- An assessment of the baseline terrestrial ecology of the Southern Lease, including characterisation of vegetation communities and fauna habitat types, and determination of the presence of threatened and migratory species.
- An assessment of the impacts of the exploration program on terrestrial ecology, including assessment of the impact of clearing required for drill pads and access tracks. The potential for indirect impacts from drilling were also assessed. Measures to avoid and mitigate impacts were also considered.

### Small Mammal Research Project

The Northern Hopping-mouse and Brush-tailed Rabbit-rat are small, threatened rodents that are known to occur on Groote Eylandt. DENR recommended to the proponent that research be undertaken on the species in order to inform an assessment of potential impacts from exploration activities in the Southern Lease. DENR designed a research project which formed the basis of the Small Mammal Research Project that was undertaken by Cumberland Ecology, on behalf of the proponent.

The Small Mammal Research Project involved infra-red motion-sensor camera surveys at 152 sampling sites, with fieldwork occurring over six fieldtrips from August 2017 to August 2018. The Study Area for the Small Mammal Research Project included the Southern Lease and additional areas adjoining the northern, western and southern boundaries of the lease. Sampling was also undertaken at an additional site (called the Cave Paintings) known to support a population of the Northern Hopping-mouse. Sampling was undertaken across a range of habitat types, with varying fire histories.

The research project represents a rigorous assessment that is supported by a robust data set. Although over 1.58 million images were obtained, including almost 200,000 images from fauna triggers, no individuals of the Northern Hopping-mouse or Brush-tailed Rabbit-rat were recorded from the Study Area. However, records of the Northern Hopping-mouse were obtained at the Cave Paintings, an area outside of the Study Area that is known to support a population of the species. These records from the Cave Paintings provide evidence that the camera trapping method is able to record the Northern Hopping-mouse if a population is present. The Small Mammal Research Project concluded that there is a low probability of occurrence for the Northern Hopping-mouse and Brush-tailed Rabbit-rat in the Southern Lease.

The research project did not identify any important habitat areas for the Northern Hopping-mouse and Brush-tailed Rabbit-rat in the Southern Lease and did not identify any areas that should be excluded from future exploration in order to protect these species.

## Baseline Ecology Setting

The baseline ecology assessment included a desktop assessment of databases and available literature as well as review of recent ecological surveys undertaken within the Southern Lease and elsewhere on Groote Eylandt. The assessment of the potential for threatened and migratory species to occur in the Southern Lease included species listed under the EPBC Act and the *Territory Parks and Wildlife Conservation Act 2006* (NT) (TPWC Act).

The baseline ecology assessment aimed to gain an understanding of the vegetation communities, fauna habitat types and likely presence of threatened and migratory species in the Southern Lease. A likelihood of occurrence assessment was undertaken for listed species to determine the potential for them to occur within the Southern Lease, and more specifically, within the exploration program area. The likelihood of occurrence was based on the species known range, number and age of records, and habitat preferences, which were evaluated considering the site characteristics identified during recent field surveys.

### Vegetation Structure

The vegetation across the Southern Lease comprises remnant vegetation, and there has been no significant clearing of vegetation within the lease. Overall the vegetation is in very good condition and it is characterised by a high species and structural diversity. Parts of the Southern Lease have been subject to frequent fires, which has resulted in a reduction in the amount of woody debris and has potentially also affected the species composition and structure of the vegetation.

### Vegetation Communities

The vegetation community patterns within the Southern Lease strongly reflect the geology, soils, topography, and the impacts of frequent fires. The most extensive vegetation communities within the Southern Lease comprise open woodlands to open forests dominated by *Eucalyptus tetrodonta* (Darwin Stringybark), and Darwin Woollybutt (*Eucalyptus miniata*), but a wide variety of other native plants and vegetation communities occur. *Melaleuca*-dominated vegetation also occurs within riparian zones and wetlands.

No EPBC Act Threatened Ecological Communities were recorded as occurring or potentially occurring within a 20 km radius of the Southern Lease.

The Southern Lease contains extensive areas of remnant vegetation which provide a range of habitats for fauna species. The matrix of fauna habitats occur within the various vegetation communities, topographical formations and permanent and ephemeral water resources. The habitat features are numerous and provide potential foraging, shelter and breeding opportunities for a suite of fauna species. Key habitats identified within the Southern Lease include laterite woodlands and forest, sandstone woodland and forest, riparian/wetlands, coastal dune/swale complex, estuarine complex and closed forest.

### Flora Species

Over 120 plant species were recorded within the north-western portion of the Southern Lease by Cumberland Ecology (2016). The total number of flora species in the Southern Lease is likely to be higher, given that the survey was restricted to the north-western portion of the Southern Lease.

No threatened EPBC Act listed flora species were recorded within the Southern Lease or are likely to occur within the area in which the exploration program is planned to be undertaken.

### Fauna Species

A total of 96 fauna species have been recorded within the Southern Lease during the recent terrestrial surveys by Cumberland Ecology (2016; 2019), including 56 birds, 19 mammals and 21 reptiles.

The following threatened or migratory fauna species are present in the Southern Lease and within the exploration program area:

- Masked Owl (northern) (*Tyto novaehollandiae kimberli*) (EPBC Act status: Vulnerable; TPWC Act status: Vulnerable);
- Northern Quoll *(Dasyurus hallucatus)* (EPBC Act status: Endangered; TPWC Act status: Critically Endangered);
- Salt-water Crocodile (*Crocodylus porosus*) (EPBC Act status: Migratory; TPWC Act status: not listed); and
- Mertens' Water Monitor (*Varanus mertens*) (EPBC Act status: not listed: TPWC Act Status: Vulnerable).

The results of database searches indicated that a number of additional listed fauna species could potentially occur within the exploration program area. The likelihood of occurrence assessment confirmed the following species had a moderate or high likelihood of occurring within the exploration program area:

- Ghost Bat (*Macroderman gigas*) (EPBC Act status: Vulnerable; TPWC Act status: not listed);
- Fork-tailed Swift (*Apus pacificus*) (EPBC Act status: Migratory; TPWC Act status: not listed); and
- Yellow-spotted Monitor (*Varanus panoptes*) (EPBC Act status: not listed: TPWC Act Status: Vulnerable).

The remaining species were assessed as having a low likelihood of occurring in the Southern Lease and are therefore not considered further in the assessment.

## Impact Assessment

An assessment of the potential impacts of the exploration program on terrestrial ecology was undertaken, including assessment of the impact of clearing 29 ha of vegetation for drill pads and access tracks. The majority of clearing (26.5 ha) is within laterite woodland and forest habitat. Laterite woodland and forest habitat covers approximately 53% of the Southern Lease and are also widespread on Groote Eylandt. The laterite woodland proposed to be cleared represents a very small proportion (0.2%) of the laterite woodland within the Southern Lease. Large areas of this habitat type will remain, beyond the area to be affected by exploration activities. There will be patches of native vegetation remaining between the cleared areas which will continue to provide habitat for native species. The impacts of clearing on this habitat will also be minimised by implementing a pre-clearance procedure that includes identifying and retaining trees with large hollows [i.e. hollows that may be suitable for the Masked Owl (Northern)]. In addition, disturbed areas will be rehabilitated upon completion of the drilling program. Monitoring of previous exploration areas indicates that the rehabilitation techniques used by the proponent allow exploration areas to successfully regenerate over time.

Although it is estimated that 2.6 ha of riparian/wetland vegetation is proposed to be cleared, this is considered to be an overestimate. A pre-clearance survey will be undertaken to confirm the precise location of small waterways and wetlands and any of the drill holes or access tracks that are located within 100 m of waterways or wetlands will be relocated. The pre-clearance survey will consequently reduce the extent of riparian vegetation that may be cleared.

The potential for indirect impacts from drilling were also assessed, including habitat fragmentation, introduction of invasive species and potential changes to the fire regime. Additionally a number of drilling impacts, such as those relating to noise and vibration, dust, light, erosion and sediment control and vehicle strike have the potential to impact fauna. The majority of these potential indirect impacts will only occur during exploration activities and will cease upon completion of the drilling program. The exploration program is considered to be short term, so impacts will be limited and regeneration is expected to be rapid and successful. For these reasons, these indirect impacts are not considered likely to result in a significant impact on terrestrial ecology values.

The impacts of the exploration program were specifically assessed for the listed species either present or with a moderate or high likelihood of occurring in the exploration program area. The assessments identified that the exploration program will not give rise to significant impacts on these listed species. The assessments specifically

considered measures to avoid and mitigate impacts, including the Permit to Clear process and pre-clearance survey, rehabilitation activities, and environmental controls to prevent the introduction of weeds or Cane Toads. Overall, it was concluded that given the measures to avoid and minimise impacts, no significant impacts on terrestrial flora and fauna, biological diversity and ecological integrity, are predicted.

Based on these findings, the exploration program is unlikely to have a significant impact on terrestrial ecology in the exploration program area. No significant adverse impacts on the terrestrial flora and fauna values of the Northern Territory are therefore predicted.

# SOCIAL, ECONOMIC AND CULTURAL SURROUNDINGS

## Stakeholder Engagement

The proponent has undertaken extensive stakeholder engagement in relation to the exploration program. This has included engagement with the ALC, as well as direct engagement with the clan groups that speak for the country within the Southern Lease. There has also been consultation with key government regulators.

Since the signing of the Exploration Agreement, the proponent and the ALC have had regular discussions about proposed exploration activities in the Southern Lease. These include formal, quarterly meetings between the proponent and the ALC (termed Mining Liaison Committee Meetings).

In addition to the formal Mining Liaison Committee Meetings, the proponent has undertaken consultation with the ALC specifically in relation to the exploration program. These meetings included an update on the environmental surveys undertaken in support of the exploration program, and a discussion of proposed exploration activities. In some instances, a need was identified to undertake additional consultation, including on-country consultation.

## Potential Socio-economic Impacts and Benefits

There is direct employment associated with the exploration program. The peak workforce required to complete the exploration program is up to 52 people, which includes existing employees and contractors. There will be an opportunity for employment of Traditional Owners, particularly in defining the most appropriate access to regional exploration holes to avoid culturally sensitive areas, in clearing vegetation and as cultural monitors.

In addition, the ALC obtains significant financial benefit for exploration activities to compensate Traditional Owners for use of country, in accordance with the Exploration Agreement between the proponent and the ALC. These funds allow the ALC to work closely with Traditional Owners to build economic and social capacity by improving education outcomes, promoting well-being, supporting business development, and promoting cultural protection and transmission of knowledge.

Although the exploration program will provide employment opportunities and financial benefit to the ALC, it is acknowledged that these are short-term opportunities, given the short-term nature of the exploration program. The key significance of the exploration program from a socio-economic perspective, relates to its role in securing the long-term future of the proponent's operations on Groote Eylandt. The existing mine has been operating for over 50 years and is an integral part of the economy of Groote Eylandt. The existing mine provides significant socio-economic benefits to the Traditional Owners, as well as the regional economy of the Northern Territory. The continuation of these benefits in the medium to long-term is dependent on additional manganese resources being developed and the Southern Lease is the key additional resource currently being evaluated by the proponent.

The exploration program is not anticipated to give rise to any significant adverse socio-economic impacts, given that the workforce required for exploration is small and short-term and will be housed in existing accommodation facilities. The details of the exploration program have been agreed with the ALC and Traditional Owners as part of execution of the Exploration Agreement and during ongoing consultation. Obtaining this input from the ALC and Traditional Owners will ensure that exploration is undertaken in a manner that is respectful of the Traditional Owners' wishes.

## Sacred Sites

The ALC has an anthropology department, which includes male and female cultural anthropologists. These anthropologists work with the Traditional Owners to research and record traditional culture, and identify areas where access is restricted for cultural reasons (ALC 2019b). The proponent has been working with the ALC to identify areas in the Southern Lease which have cultural significance in order to ensure that exploration does not give rise to any impacts on sacred sites. This process has been designed to ensure that the proponent exercises a duty of care in relation to sacred sites protected under the *Northern Territory Aboriginal Sacred Sites Act 1989*. Depending on the final outcomes of this work, it may be necessary to remove or relocate some of the exploration holes that are proposed in this NOI.

## Archaeology

Public registers were searched to determine if there are any objects or places on the Southern Lease that are protected on public registers. In addition, archaeological reports pertaining to the Southern Lease were reviewed to identify archaeological sites that may be impacted by the exploration program.

The registers and archaeological reports did not identify any Indigenous or non-Indigenous archaeological sites that may be impacted by the exploration program. However, in accordance with current site procedures, the following mitigation measures will be implemented which will mitigate impacts in the unlikely event that previously unrecorded sites of cultural heritage significance are located during disturbance associated with the exploration program:

- Cultural monitors will be provided an opportunity to inspect areas prior to clearing.
- As part of the workforce induction process, there is a module on cultural heritage and cultural awareness training.
- In the event that the proponent's employees or contractors suspect that they have uncovered an unexpected archaeological find a procedure for unexpected finds will be adopted.

Based on these findings, the exploration program will not have a significant impact on sacred sites or archaeological evidence. No significant adverse impacts on the social, economic, cultural and heritage values of the Northern Territory are therefore predicted.

# ENVIRONMENTAL MANAGEMENT

Given that the proponent has been undertaking exploration on Groote Eylandt for over 50 years, there are a suite of management measures and established procedures that are used at the existing mine to manage the potential environmental impacts of exploration. These will also apply to the exploration program. These management measures relate to awareness training, clearing procedures, and the management of invasive species, wastes and hazardous materials. The key points of relevance to the exploration program are as follows:

- The proponent has established induction and training procedures in relation to environmental management. All personnel (including contractors) who conduct vegetation clearing and exploration activities are provided with awareness training in the identification of the threatened species that may be encountered in the area, including specific habitat features of these species.
- All clearing will be undertaken in accordance with the proponent's Permit to Clear process. This process includes a pre-clearance survey to determine the precise locations of drill pads and access tracks, based on the presence of habitat features for threatened species and distance from local environmental constraints. The pre-clearance survey is designed to protect environmentally and culturally sensitive areas as well as to identify key habitat features of threatened fauna species that are required to be avoided.

- Clearing procedures require the extent of clearing to be restricted to the minimum area required to safely complete the drilling program. This includes minimising the width of access tracks and area of drills pads. Clearing of large, mature trees will also be generally avoided, where possible. Disturbance of topsoil will be kept to a minimum by using a “blade up” method, whereby the blade of the dozer is lifted so that the topsoil is not disturbed.
- Weed control and monitoring will be undertaken within cleared areas in accordance with the Weed Management Manual used at the existing mine. The Weed Management Manual is supported by a suite of relevant procedures, including the Exploration Weed Hygiene Procedure. These documents include measures that will ensure that exploration activities will not introduce or spread weeds in the Southern Lease.
- The proponent has a Cane Toad Management Plan and associated quarantine procedures in place. The prevention of the introduction of the Cane Toad is critical to maintaining populations of small mammals on Groote Eylandt, including threatened species such as the Northern Quoll. The management plan includes preventative measures such as quarantine procedures relating to barging of equipment, inspections of barges and vehicles, Cane Toads fencing at the port and use of a Cane Toad detection dog at the port. There are also monitoring measures and, in the event of a Cane Toad being found, reporting and disposal procedures.
- The proponent has a waste management system in place for the existing mine. Waste generated by the exploration program will be managed in accordance with this system. 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.
- Hazardous materials used by the exploration program (e.g. diesel) will be stored at the fuel storage facilities located at the existing mine. The transport, use and disposal of hazardous materials will be undertaken in accordance with existing mine procedures and relevant guidelines and legislation.

## CONCLUSION

This NOI focuses on addressing environmental factors and objectives that are most relevant to the proposed activities. The following proposal specific factors were identified:

- Terrestrial Flora and Fauna; and
- Social, Economic and Cultural Surroundings.

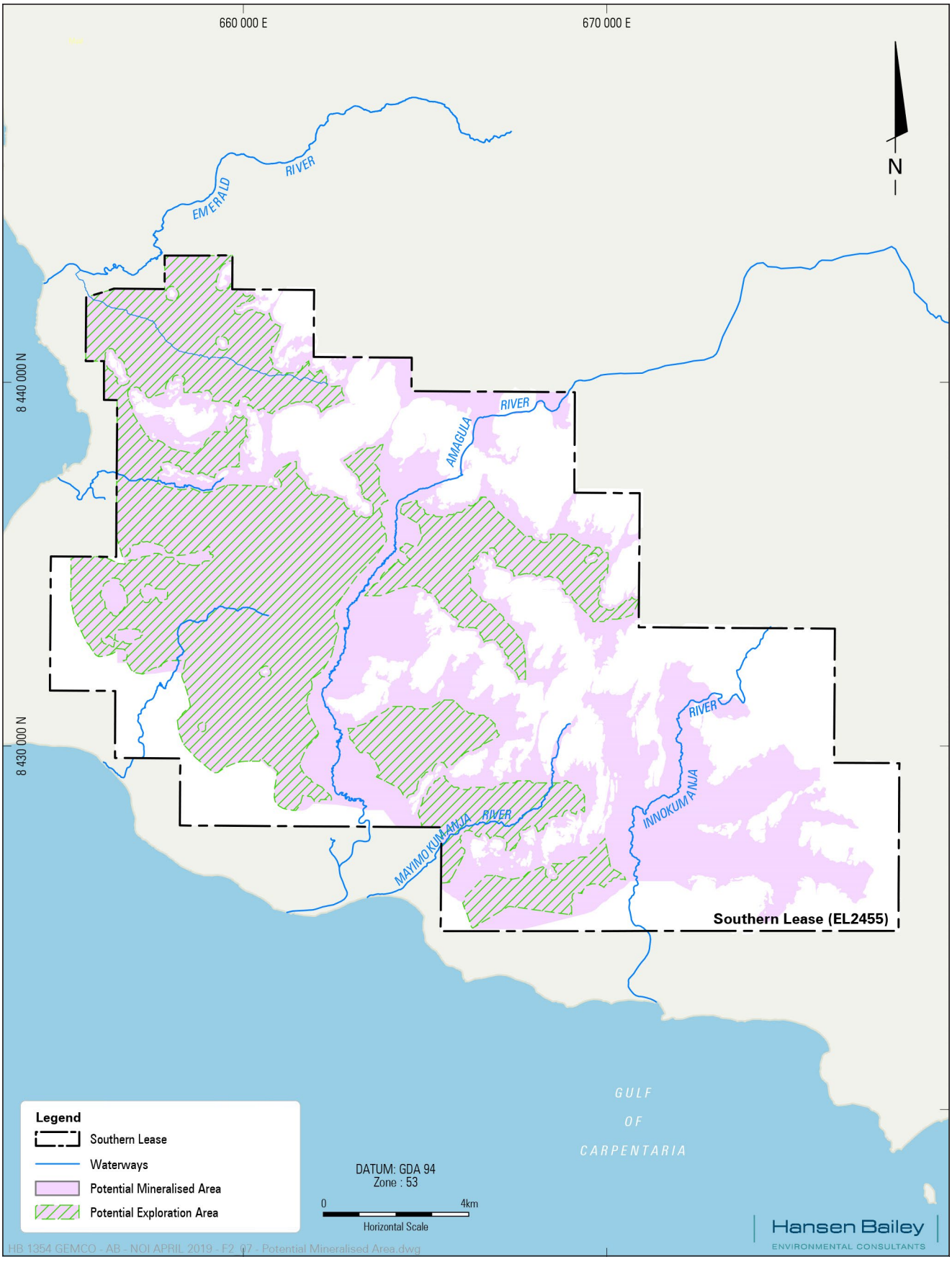
The impact assessments undertaken for these proposal specific factors conclude that the exploration program is not predicted to have a significant effect on terrestrial flora and fauna or social, economic and cultural surroundings. Consequently, the exploration program is not predicted to have a significant impact on the environment.

# FIGURES


SOUTHERN LEASE EXPLORATION PROGRAM

Location Plan

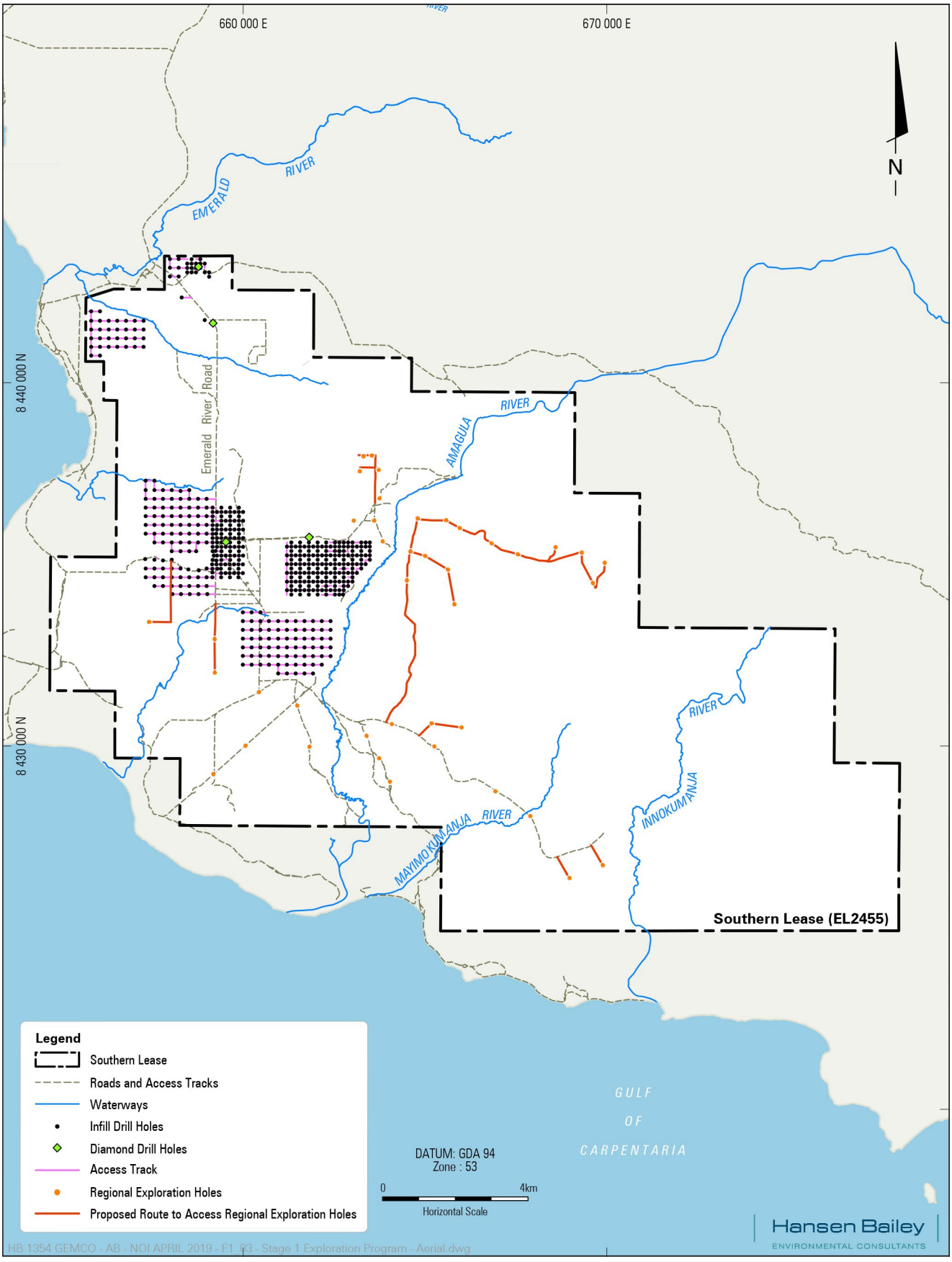
**FIGURE 1**




SOUTHERN LEASE EXPLORATION PROGRAM

Potential Mineralised Area

**FIGURE 2**




SOUTHERN LEASE EXPLORATION PROGRAM

Layout of Stage 1 Exploration Program

**FIGURE 3**

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# 1

# Introduction

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## Tables



## Figures

# 1 INTRODUCTION

## 1.1 INTRODUCTION

The Groote Eylandt Mining Company Pty Ltd (GEMCO) (the "proponent") is proposing to undertake an exploration program in Exploration Licence (EL) 2455, known as the Southern Lease. This section provides an introduction to the Notice of Intent (NOI) that has been prepared for the exploration program including background to the exploration program and the proponent, and a description of the environmental approval process. The structure of the NOI and the study team who have contributed to the NOI are also discussed.

## 1.2 BACKGROUND

The proponent operates a manganese mine (termed "the existing mine") on Groote Eylandt (Figure 1-1). The existing mine is the main development on the island and has been operating for over 50 years. Operations at the existing mine involve mining manganese ore by open cut mining methods. Once the ore has been sized and washed, it is transported to the proponent's port facility at Milner Bay (Figure 1-1). The proponent sells manganese ore to domestic and export markets and is currently one of the largest manganese ore producers in the world. The reserve life as at 30 June 2018 is approximately 7 years (South32 Annual Report 2018). The existing mineral licences include the existing mine plus the approved but undeveloped Eastern Leases (Figure 1-1).

As part of its long-term strategy, the proponent is assessing potential future resources. In October 2016, the proponent was granted the exploration rights to the Southern Lease, an exploration tenement located to the south of the existing mine (Figure 1-1). In 2016, the proponent undertook a drilling program in the Southern Lease which comprised infill drilling in two areas where mineralisation is known to occur, and a small number of regional exploration holes (Figure 1-2). This work was undertaken in accordance with a Mine Management Plan (MMP) (Authorisation 0887-01, 02 November 2016).

Based on information obtained from the 2016 exploration program, the proponent sought to undertake further exploration in the Southern Lease in 2017. In March 2017 the proponent met with Northern Territory government agencies to obtain advice on the environmental approval process for the proposed 2017 exploration program. The meeting was attended by representatives from the Northern Territory Environment Protection Authority (NT EPA), the Department of Primary Industry and Resources (DPIR) and the Department of Environment and Natural Resources (DENR). In this meeting the proponent was advised that an NOI should be prepared for the proposed exploration program to ensure that the potential environmental impacts were assessed, particularly impacts on threatened fauna species. Government representatives specifically highlighted the need to provide information in the NOI on potential impacts on the Northern Hopping-mouse (*Notomys aquilo*) and Brush-tailed Rabbit-rat (*Conilurus penicillatus*). It was noted that these two threatened species were potentially present within the Southern Lease but there was a scarcity of information about their distribution and habitat preferences, and the potential for exploration to impact them.

The proponent has since undertaken a large scale research project (termed "Small Mammal Research Project") on these species in order to confirm their presence and habitat preferences within the Southern Lease. An assessment of the potential for exploration activities to impact these species, and other threatened fauna species, has also been undertaken. Together, these studies comprise much of the information in this NOI. The findings of the Small Mammal Research Project and impact assessment for threatened species are described in more detail in Section 4 – Terrestrial Flora and Fauna.

## 1.3 OVERVIEW OF EXPLORATION ACTIVITIES

The proposed exploration program, which is scheduled to commence in 2019, is part of the proponent's broader exploration campaign within the Southern Lease. Exploration is undertaken in a structured manner, which is designed to progressively gain more information about the geology and mineralisation of the area. Regional exploration holes are initially drilled to determine if any manganese mineralisation is present, as well as the potential extent of mineralisation. Subsequent planning of infill drilling is based on the results of the regional exploration holes. In areas where manganese is found to be present, additional holes are required to be drilled in grid patterns to improve the understanding of the extent, thickness and quality of the mineralisation, with the goal of defining a resource.

The exploration work described in this NOI comprises the following activities:

- Approximately 40 regional exploration holes;
- Infill drilling areas in the western part of the Southern Lease; and
- Four diamond drill holes.

The layout of the exploration program is shown in Figure 1-3. The regional exploration holes are being drilled for the purpose of determining whether manganese is present, particularly in some of the more remote parts of the Southern Lease where there is very limited geological information available. The infill drilling areas are in locations where previous exploration has already confirmed that manganese is present. The infill drilling areas will provide further information on the manganese mineralisation (depth, thickness and quality). The diamond drill holes will provide core samples, which will be subject to laboratory testing of geometallurgical properties such as density.

The exploration work described in this NOI is termed the Stage 1 Exploration Program and, depending on the results of this program, further exploration may be required in the future. The details of any potential future exploration work cannot be determined at this point in time because the scope and location of future exploration will be dependent on the results of the Stage 1 Exploration Program. Separate approvals will therefore be obtained for any future exploration that may be required.

## 1.4 THE PROPONENT

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

South32 is an independent global metals and mining company. 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 operations in aluminium, bauxite, coal, lead, nickel, silver, zinc and manganese. Its operations include the existing manganese mine on Groote Eylandt, which is currently the largest and lowest cost manganese ore producer in the world. Product is shipped to a domestic manganese alloy plant in Tasmania and also exported globally.

Anglo Operations (Australia) Pty Ltd is a wholly owned subsidiary of Anglo American Plc, a mining group based in the United Kingdom 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.

Key contact details for the proponent and Hansen Bailey, its environmental consultant for this NOI, are provided in Table 1-1.

**Table 1-1 Contact Details**

| CONTACT DETAILS | PROPONENT | ENVIRONMENTAL CONSULTANT |
|---|---|---|
| Company Name | Groote Eylandt Mining Company Pty Ltd (GEMCO) | Hansen Bailey |
| Primary Contact Person | Mr Mike Chapman | Ms Laura Knowles |
| Title | Project Study & Approvals Manager | Principal Environmental Scientist |
| Postal Address | GEMCO, Rowell Highway, Alyangula NT 0885 | GPO BOX 3285, Brisbane QLD 4001 |
| Phone | +61 8 8987 4444 | +61 7 3226 0900 |
| Email | mike.chapman@south32.net | lknowles@hansenbailey.com.au |

## 1.5 REGULATORY APPROVALS

### 1.5.1 Overview

Table 1-2 lists the key approvals required for the Stage 1 Exploration Program.

**Table 1-2 Key Regulatory Approvals**

| APPROVAL | LEGISLATION | AGENCY | STATUS |
|---|---|---|---|
| Consent from landowners | *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA) | Federal Minister for Indigenous Affairs | Exploration Agreement under ALRA has been signed with the Anindilyakwa Land Council (ALC). Further detail is provided in Section 1.5.2. |
| Tenement | *Mineral Titles Act 2010* (NT) | DPIR | EL2455 was granted on 12 October 2016. |
| Environmental Approval | *Mining Management Act 2001* (NT) | DPIR | It will be necessary to obtain Authorisation for the exploration program under the *Mining Management Act 2001*. This Authorisation will not be granted until the NT EPA has undertaken any necessary environmental assessment. This NOI is being prepared as part of the environmental assessment process. Further detail is provided in Section 1.5.3. |

In addition to the approvals listed in Table 1-2, the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) requires approval to be obtained for activities that are likely to have a significant impact on Matters of National Environmental Significance (MNES), as prescribed under the EPBC Act. Threatened Species and Communities, and Migratory Species are the only two MNES that may be relevant to the exploration program. An assessment of significance has been undertaken using the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* prepared by the Department of the Environment (2013) (Appendix C). It has concluded that the exploration program is not likely to have a significant impact on these MNES and the proponent is therefore not proposing to make a referral under the EPBC Act.

## 1.5.2 Exploration Agreement

The ALRA is Commonwealth legislation which provides Aboriginal landowners with legal title to traditional lands. Freehold land granted under ALRA is referred to as Aboriginal land. Groote Eylandt is Aboriginal land under ALRA and the ALC is the land council responsible for this land.

The proponent signed an Exploration Agreement under ALRA with the ALC on 17 May 2016. The Exploration Agreement describes the conditions under which exploration may be undertaken within the Southern Lease. This includes environmental conditions such as ensuring culturally and environmentally sensitive areas are avoided and undertaking baseline environmental studies and ongoing monitoring. It also details the compensation to be provided to Traditional Owners for undertaking works in the Southern Lease and describes the process for engaging with Traditional Owners. The proponent holds regular meetings with the ALC, as well as meetings with Traditional Owner groups, to discuss activities in the Southern Lease, including environmental studies.

## 1.5.3 Environmental Approval

### Overview of Process

The Northern Territory *Environmental Assessment Act 1982* (NT) (EA Act) and *Environmental Assessment Administrative Procedures* (EAA Procedures) establish a framework for assessing potential environmental impacts of development projects (termed "actions"). The NT EPA is the administering authority for the EA Act. Actions with the potential to have a significant effect on the environment require environmental impact assessment under the EA Act. The assessment process commences with an action being referred to the NT EPA (or through the NT EPA "calling in" an action). The referral is in the form of an NOI document. The NOI is required to include sufficient information to enable the NT EPA to determine if the proposed action is capable of having a significant effect on the environment. The NT EPA initially reviews the NOI to determine if sufficient information has been provided to make an informed decision. As part of reviewing the NOI, the NT EPA consults with advisory agencies.

After completing its review, the NT EPA makes a determination of the assessment, as follows:

- The NT EPA may determine that the potential environmental impacts and risks are not significant and can be managed accordingly. In this instance no further environmental assessment is required.
- The NT EPA may determine that the potential risks and impacts are significant and further environmental assessment will be required. The environmental assessment is in the form of an Environmental Impact Statement (EIS) or Public Environmental Report (PER).

Once the process under the EA Act is complete (either through the NT EPA determining that further environmental assessment is not required or at the conclusion of an EIS or PER process), Authorisation under the *Mining Management Act 2001* can be sought.

Authorisation under the *Mining Management Act 2001* is sought through submitting a Mining Management Plan (MMP) to DPIR. The MMP describes the proposed activities and details the environmental management measures to be adopted. DPIR can request additional information before granting Authorisation, and can impose specific requirements on the way in which activities are undertaken. The Authorisation will note that compliance with the MMP is a requirement under the *Mining Management Act 2001*.

### Status of Approvals

Hansen Bailey has prepared this NOI on behalf of the proponent. The document has been prepared to enable the NT EPA to determine whether the Stage 1 Exploration Program is expected to give rise to significant impacts and hence whether it will require further environmental assessment. This NOI has been prepared in accordance with the NOI information requirements described in the NT EPA Guideline *Referring a Proposal to the NT EPA, A guide for proponents and referral agencies* (NT EPA 2018b). Section 10 of this NOI provides a cross reference to these requirements and indicates where the information required by the guideline can be found in this NOI.

As per the guideline, the NOI focuses on addressing environmental factors and objectives that are most relevant to the proposed activities. Section 3 – Review of Environmental Factors outlines the environmental factors that were considered and describes which factors and objectives are relevant to the exploration program (i.e. termed "proposal specific factors"). The following proposal specific factors were identified:

- Terrestrial Flora and Fauna; and
- Social, Economic and Cultural Surroundings.

These proposal specific factors are discussed in Section 4 – Terrestrial Flora and Fauna, and Section 5 – Social, Economic and Cultural Surroundings. These sections conclude that the exploration program is not predicted to have a significant effect on terrestrial flora and fauna or social, economic and cultural surroundings. The overall conclusion of the NOI is that the exploration program is not predicted to have a significant effect on the environment. There is a high level of confidence in this conclusion because of the large amount of baseline environmental work that has been undertaken, including large scale field programs. In addition, the proposed activities are very similar in scope to other exploration programs previously undertaken by the proponent in its other tenements. The potential impacts from exploration are therefore well understood and the management measures are well established.

The proponent has consulted with government agencies prior to preparing this NOI, including holding a meeting on 29 January 2019 with the following attendees:

- Lisa Bradley, Director Environmental Assessment, Environment Division, DENR[1];
- Kylie Fitzpatrick, Manager Environmental Assessment, Environment Division, DENR;
- Alaric Fisher, Executive Director, Flora and Fauna Division, DENR;
- Angelo Razafimamonjy, Environmental Officer, DPIR; and
- Dane Trembath, Senior Mining Officer, DPIR.

In addition, the proponent has undertaken detailed and regular consultation with the ALC and Traditional Owners. This consultation is described in Section 5 – Social, Economic and Cultural Surroundings.

## 1.6 REPORT STRUCTURE

This NOI document is structured as follows:

**Volume 1**

| | | | |
|---|---|---|---|
| Section 1 | Introduction | Section 6 | Environmental Management |
| Section 2 | Project Description | Section 7 | Glossary |
| Section 3 | Review of Environmental Factors | Section 8 | Abbreviations |
| Section 4 | Terrestrial Flora and Fauna | Section 9 | References |
| Section 5 | Social, Economic and Cultural Surroundings | Section 10 | NOI Information Requirements |

**Volume 2**

| | |
|---|---|
| Appendix A | Baseline Terrestrial Ecology |
| Appendix B | Southern Lease Small Mammal Research Project |
| Appendix C | Assessment of Impacts on Listed Species |

[1] *The NT EPA is an independent authority, comprising a small number of board members. The Environment Division of DENR provide services to the NT EPA.*

## 1.7 STUDY TEAM

This NOI has been prepared by Hansen Bailey in association with ecological specialists. Table 1-3 lists the NOI components and study team members involved in researching, writing and reviewing each section. Table 1-4 provides the qualifications and experience of the team members.

**Table 1-3 NOI Study Team**

| NOI COMPONENT | | TEAM MEMBER | COMPANY |
|---|---|---|---|
| **NOI Drafting and Management** | | | |
| Project Director | | Peter Hansen | Hansen Bailey |
| Project Manager | | Laura Knowles | Hansen Bailey |
| NOI contributors | | Lisa Sunderland<br>Jesse Campbell | Hansen Bailey |
| **Specialist Reports** | | | |
| A | Baseline Terrestrial Ecology | Katrina Wolf | Cumberland Ecology |
| B | Southern Lease Small Mammal Research Project | Katrina Wolf | Cumberland Ecology |
| C | Assessment of Impacts on Threatened Species | Katrina Wolf | Cumberland Ecology |

**Table 1-4 NOI Study Team Qualifications and Experience**

| TEAM MEMBER AND COMPANY | TITLE | QUALIFICATIONS | YEARS OF EXPERIENCE |
|---|---|---|---|
| **Hansen Bailey** | | | |
| Peter Hansen | Director | BE(Hons) | 29 |
| Laura Knowles | Principal Environmental Scientist | BSc(Hons), HDipEd, MPhil(EnvSc) | 20 |
| Lisa Sunderland | Senior Environmental Scientist | BSc(Hons) | 15 |
| Jesse Campbell | Environmental Scientist | BSc, MEnv | 1 |
| **Cumberland Ecology** | | | |
| David Robertson | Director | BSc(Hons), PhD(Ecology) | 30 |
| Katrina Wolf | Principal Ecologist | BSc | 11 |
| Trevor Meers | Senior Ecologist | BAppSc, PhD(Restoration Ecology) | 12 |

Personnel representing the proponent were involved in providing project information and reviewing the NOI. Personnel involved in this process include:

- Mike Chapman (GEMCO, Project Study & Approvals Manager);
- Melinda Simmons (GEMCO, Project Study & Approvals Advisor);
- Josh Harvey (South32, Principal Resource Geologist); and
- Kenneth Pegg (GEMCO, Exploration Superintendent).

The proponent would like to gratefully acknowledge the assistance of the Traditional Owners of Groote Eylandt and the ALC, including members of the Amagula, Maminyamanja, Wurrawilya, and Wurramara clans. The Traditional Owners who took part in fieldwork for this NOI were:

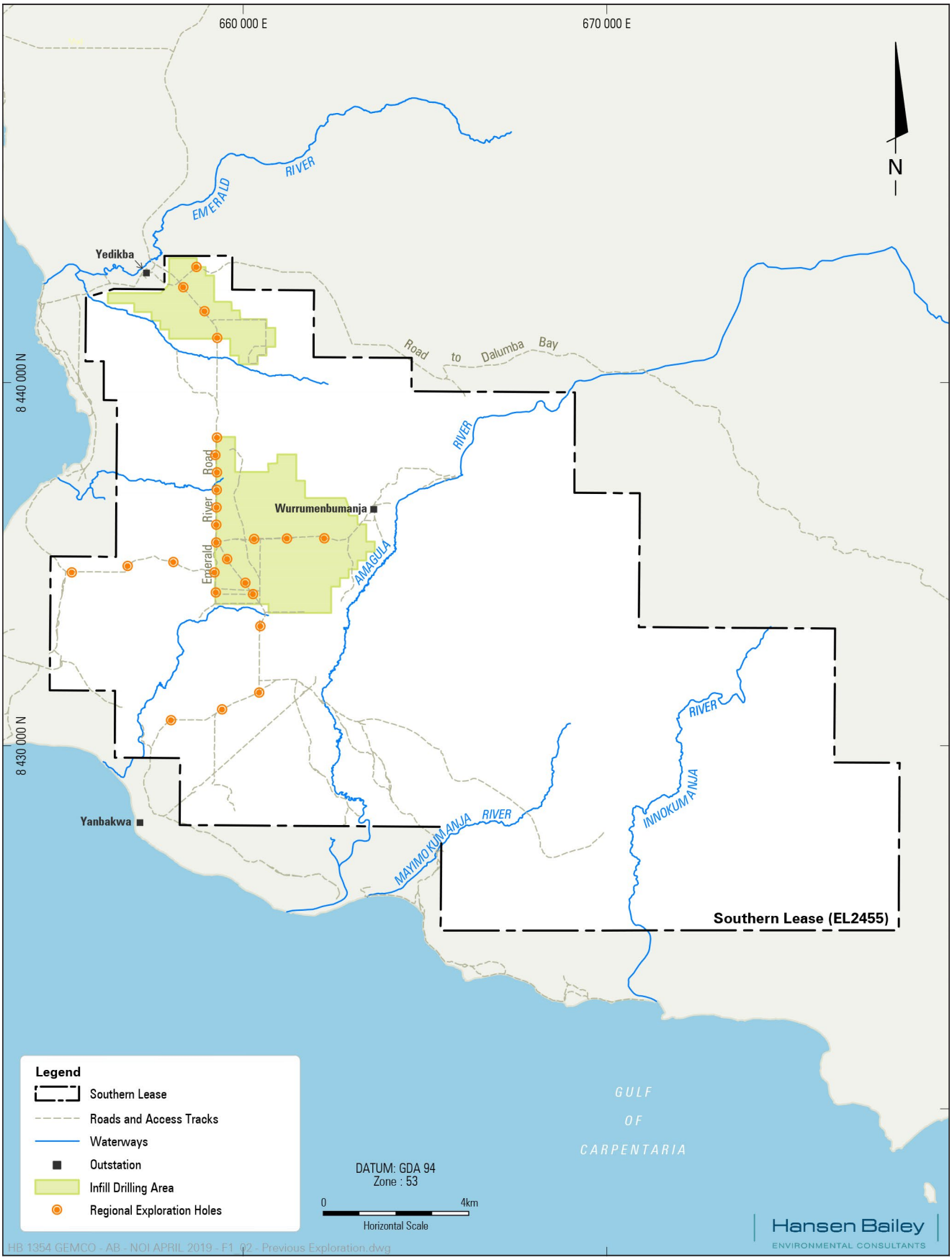
- Ronald Wurrawilya;
- Torrance Wurrawilya;
- Daniel Amagula;
- Leonard Amagula; and
- Rodson Amagula.

# FIGURES


SOUTHERN LEASE EXPLORATION PROGRAM

Location Plan

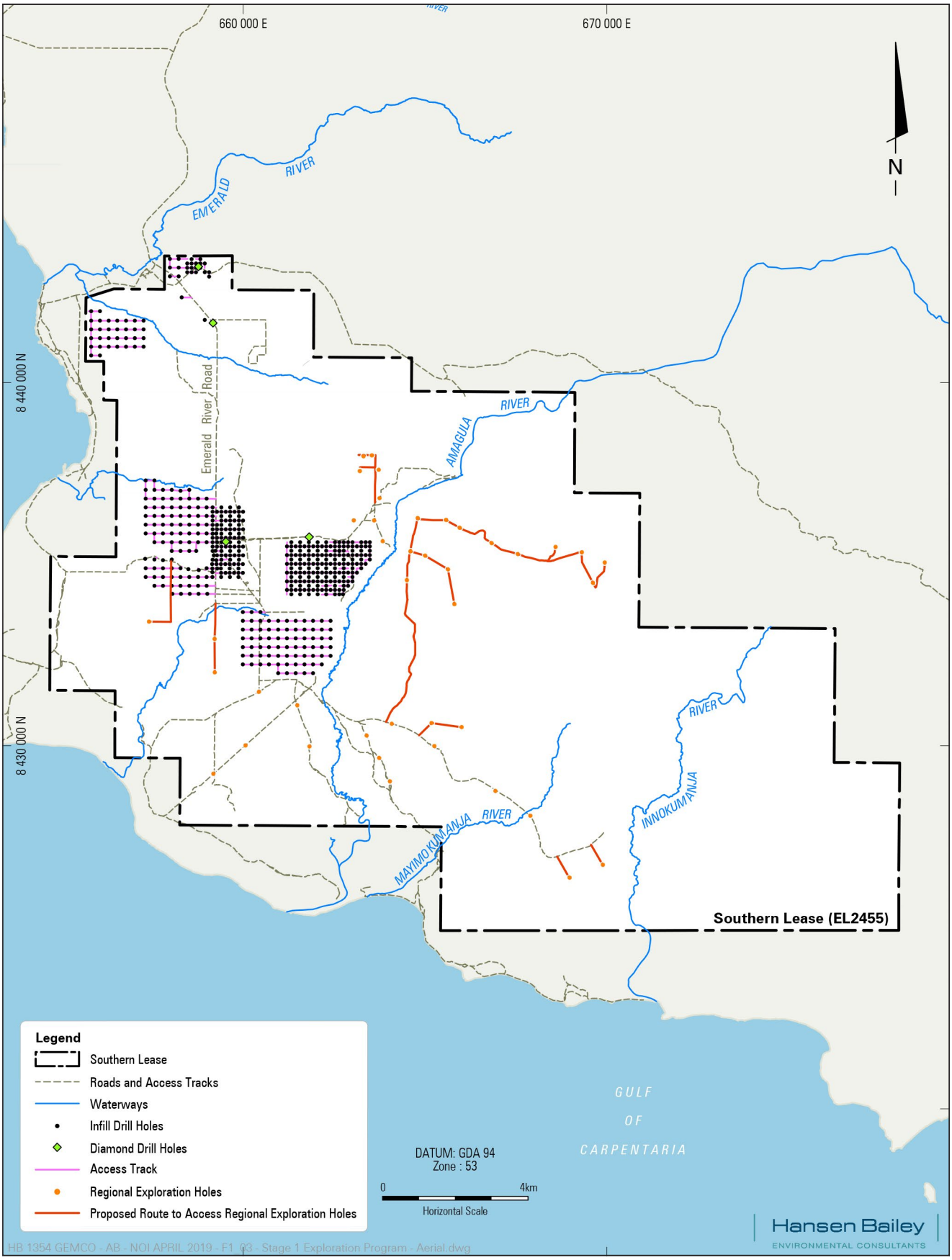
**FIGURE 1-1**




SOUTHERN LEASE EXPLORATION PROGRAM

2016 Exploration Program in the Southern Lease

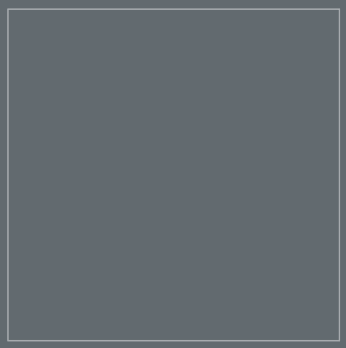
**FIGURE 1-2**




SOUTHERN LEASE EXPLORATION PROGRAM

Layout of Stage 1 Exploration Program

**FIGURE 1-3**











# 2

# Project Description

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# 2 PROJECT DESCRIPTION

## 2.1 INTRODUCTION

This section describes the Southern Lease Stage 1 Exploration Program (the exploration program). The regional and local setting are described along with the proposed exploration activities including vegetation clearing requirements, rehabilitation activities and environmental controls. The key alternatives to the proposed activities, and the significance of the exploration program in the context of the proponent's long-term operations on Groote Eylandt are also discussed.

As detailed in Section 1 – Introduction, depending on the results of this exploration program, further exploration may be required in the future. The scope of any potential future exploration work cannot be determined at this point in time because it will be dependent on the results of the Stage 1 Exploration Program. Therefore, this Notice of Intent (NOI) describes the Stage 1 activities only and future exploration programs will be assessed separately, as required.

## 2.2 SETTING

### 2.2.1 Regional Setting

The Southern Lease is located on Groote Eylandt in the Gulf of Carpentaria, approximately 650 km south-east of Darwin and 50 km off the coast of Arnhem Land (Figure 2-1).

Groote Eylandt is Australia's third largest island, with a land area of approximately 2,285 km$^2$. The Traditional Owners of the Groote Eylandt Archipelago are an amalgamation of two cultures, the Warnindilyakwa, and the Nunggubuyu (ALC 2019a). 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 practices such as hunting and gathering. The existing mine is the main development on the island and has been operating for over 50 years (Figure 2-1). There are three townships on Groote Eylandt, namely Alyangula, Angurugu and Umbakumba (Figure 2-1). They have a combined population of approximately 2,300 people (Australian Bureau of Statistics 2017b). There are also several small, rural Aboriginal settlements (termed "outstations") on Groote Eylandt. 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 (LGA), administered by the East Arnhem Regional Council (EARC).

Groote Eylandt, and the surrounding marine area, has significant ecological value. Groote Eylandt and various smaller surrounding islands are considered an International Site of Conservation Significance in the Northern Territory (Harrison et al. 2009). The islands have outstanding conservation values for nesting marine turtles and colonial seabirds. In addition, the threatened terrestrial fauna species present on the island are relatively protected from key threatening processes (such as Cane Toads) that exist on the mainland. Section 4 – Terrestrial Flora and Fauna provides further detail on the ecological value of Groote Eylandt.

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 (Department of Environment and Energy n.d). IPAs form part of the National Reserve System, established by the Federal Government to conserve unique landscapes, plants and animals. The Groote Eylandt Archipelago was declared the Anindilyakwa IPA in 2006, and

is administered by the Anindilyakwa Land Council (ALC). The ALC Rangers are funded by the Federal Government through the IPA. A key focus of the ALC Rangers is to ensure that the unique culture and environment of the Groote Eylandt Archipelago is conserved for future generations. There are no declared National Parks on Groote Eylandt.

### 2.2.2 Location

The Southern Lease is located in the south-western part of Groote Eylandt. It is adjacent and to the south of the existing mine and is also located adjacent to the southern boundary of the Eastern Leases, an area approved for future mining (Figure 2-1). The township of Angurugu is located approximately 10 km from the northern boundary of the Southern Lease and is the closest permanent residential community (Figure 2-1).

The Southern Lease covers an area of approximately 26,000 ha (Figure 2-2). The area is remote, containing only a few 4WD access tracks and one outstation (Wurrumenbumanja, also known as Leske Pools outstation). The Southern Lease is accessed from the existing mine via the Emerald River Road, an unsealed public road (Figure 2-2).

### 2.2.3 Natural Features

The Southern Lease contains elevated rocky outcrops and gently sloping valleys. Elevations range from approximately 0 m to 110 m Australian Height Datum (AHD). Outcrops of the geological basement form rocky outcrops, particularly in the eastern part of the Southern Lease, and are referred to as white rock. These areas are generally culturally significant to the Anindilyakwa People.

The Southern Lease is traversed by the Amagula River, Mayimokumanja River and Innokumanja River (Figure 2-3). All three rivers have headwaters starting in the white rock. As these rivers traverse the landscape towards the gulf, the relatively flat, low-lying topography forms densely vegetated shallow gradient valleys converging onto coastal plains. This topography promotes the establishment of off-channel wetlands during the wet season when floodwaters expand across the coastal plains. Many of the drainage lines throughout the site are highly ephemeral, only flowing for short periods (<2-3 months) after substantial rainfall events (e.g. the Mayimokumanja River). The Amagula River and the Innokumanja River are more significant drainages and maintain continuous flows year-round because they are spring fed rivers. In addition to the three rivers, there are also three minor, ephemeral drainage lines located on the western side of the Southern Lease. These include an ephemeral tributary which runs north-west to the Emerald River, Salt Creek (and its upper tributaries) which runs to the western coastline of the island, and the upper reaches of the Yanbakwa River (Figure 2-3).

The land within and surrounding the Southern Lease comprises natural bushland that is mainly eucalypt dominated open forest and woodland. The most common eucalypts are Darwin Stringybarks (*Eucalyptus tetrodonta*) and Darwin Woollybutt (*Eucalyptus miniata*), but a wide variety of other native plants and vegetation communities occur. *Melaleuca*-dominated vegetation also occurs within riparian zones and wetlands.

### 2.2.4 Land Ownership and Land Tenure

The whole of Groote Eylandt is Aboriginal land under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA). The ALC is responsible for managing this Aboriginal land. The proponent has an Exploration Agreement with the ALC, under ALRA, for the Southern Lease. It was signed on 17 May 2016.

Being Aboriginal land under ALRA, the majority of Groote Eylandt is not open to the general public. However, the ALC has nominated a number of recreation areas that can be accessed by the general public, subject to a permitting system. Figure 2-2 shows the location of the recreation areas within or in proximity to the Southern Lease.

### 2.2.5 Land Use

As discussed previously, the Southern Lease is remote, containing only a few 4WD access tracks. Accessible portions of the Southern Lease are periodically used by the Traditional Owners for collecting resources such as sugarbag (honey from native bees). As discussed above, there are also two recreation areas within the Southern Lease, namely Adabarrinjumanja (Amagula Pools) and Amakwula (Amagula River) (Figure 2-2). There is an additional recreational area (South Point Area) located to the west of the Southern Lease. These recreation areas are accessible to visitors under a permitting system and are used for fishing, camping and swimming. They do not contain any built infrastructure.

Wurrumenbumanja Outstation is the only permanent structure within the Southern Lease and is located approximately 240 m from the nearest proposed regional exploration hole and 890 m from the nearest infill drilling area. There are two additional outstations located beyond, but in close proximity to, the Southern Lease. These are Yedikba Outstation and Yanbakwa Outstation (Figure 2-2), located approximately 620 m and 2.4 km and from the nearest proposed drilling sites. The outstations are intermittently used by the Traditional Owners.

## 2.3 TENEMENTS

GEMCO holds an Exploration Licence (EL2455) over the Southern Lease (Figure 2-4). The Exploration Licence was granted on 12 October 2016 and expires 11 October 2022. Figure 2-4 also shows the mineral tenements in the vicinity of the Southern Lease. These include the mineral leases for the existing mine, as well as the mineral leases which comprise the Eastern Leases, an area in which mining is approved but has not yet commenced.

## 2.4 GEOLOGY

### 2.4.1 Exploration History

GEMCO commenced geological exploration of Groote Eylandt in 1962. This involved a program of test-pitting designed to prove up the economic significance of the manganese deposit. Following confirmation of the economic viability of the manganese resource, an exploration camp was established at the Emerald River a year later, with an announcement that manganese mining would proceed. Except for short periods where little to no exploration was undertaken, exploration has been ongoing since this time until the present day.

Several exploration campaigns were undertaken during the late 1960s and 1970s to inform the early stages of the mine development. Early drilling campaigns predominantly used open-hole and cored drilling methods to define the stratigraphy and ore extents within existing mineral leases.

In 1979, the first in a series of infill drilling campaigns was undertaken. With the exception of brief interludes, this series has continued uninterrupted to the present day. This includes the most recent exploration program undertaken in the Southern Lease in 2016, which included drilling of 358 holes in two areas in the north-western portion of the lease (Figure 1-2).

### 2.4.2 Regional Geology

Groote Eylandt was formed on a stable basement of Proterozoic quartzite. This basement quartzite forms extensive elevated outcrops in the centre of the island (Figure 2-5). The Proterozoic basement was eroded and redeposited during the early Cretaceous period, forming a sandstone unit comprising reworked quartzite.

A blanket of Cretaceous marine sediments was subsequently deposited over the paleosurface of basement and reworked basement materials in the west of the island. The distribution of the Cretaceous marine sediments is generally confined to the western plains and valleys of the island. The upper Cretaceous sediments contain the manganese deposit. Much of the Cretaceous sediment profile (including some of the manganese deposit) has been extensively modified by a long period of tropical weathering (or laterisation) during the Tertiary period.

This has resulted in the development of thick laterite profiles up to 25 m thick, and supergene upgrading of the manganese.

The surface geology typically comprises lateritic deposits between outcropping (i.e. exposed) quartzite. A thin veneer of Quaternary sediment overlies the lateritic materials in localised areas. The surface geology of the Southern Lease and surrounds is shown in Figure 2-5.

### 2.4.3 Local Stratigraphy

The indicative stratigraphy of the Southern Lease is shown in Figure 2-6 and is broadly consistent with the regional geology. Elevated basement outcrops form hills and escarpments in the east of the Southern Lease, and are referred to as white rock. Between these hills and escarpments, the basement paleosurface is deeply incised and has been in-filled by subsequent sediment deposition resulting in low-lying topography that is characterised by gently sloping valleys. Sediment deposits are generally observed to thin out near basement high points and outcrops.

## 2.5 PLANNING OF EXPLORATION

The exploration program was designed through the following process, which ensured that environmental and cultural factors were considered in the planning phase:

- The potential mineralised area was defined (i.e. the area in which manganese may potentially occur). This was based on high level geological information from previous exploration, as well as extensive geological information from the current mining area. The potential mineralised area represents the area in which exploration would be undertaken if there were no environmental constraints. It is shown in Figure 2-7.
- The environmental constraints in the potential mineralised area were identified. The identification of environmental constraints was based on an extensive fieldwork program over a 2-3 year period and included consultation with the ALC and regulators. The following work was undertaken to identify environmental constraints:
  - Baseline terrestrial ecology work. This is described further in Section 4 – Terrestrial Flora and Fauna.
  - Review of vegetation mapping, including vegetation mapping prepared by the Department of Environment and Natural Resources (DENR), supplemented by fieldwork.
  - An aquatic ecology field survey, and mapping of watercourses using field survey results, ground-truthing, aerial photography, drone imagery and LiDAR (i.e. topography).
  - Digitisation of white rock areas, based on LiDAR, aerial photography and ground-truthing.
  - Consultation with the ALC to understand cultural considerations.
- A risk-based approach was adopted to determine the significance of the constraints. This culminated in approximately 7,500 ha of the potential mineralised area being permanently excised from future drilling programs. The revised area is termed the potential exploration area and is shown in Figure 2-7. The potential exploration area was developed based on the principle that there would be no exploration within the following features:
  - Waterways and wetlands;
  - Monsoonal vine thicket, which is an environmentally sensitive vegetation type, but is also culturally sensitive;
  - Culturally sensitive areas including sacred sites; and

  - White rock, which is culturally sensitive in places. Although white rock does not tend to overlap with areas of potential mineralisation, the Traditional Owners require a buffer around white rock areas to ensure that exploration drilling does not encroach into these areas.

- The geological information from the potential exploration area was reviewed and the exploration program was developed with the aim of:
  - Gaining further information regarding the extent of mineralisation in areas that have already been confirmed as containing manganese; and
  - Determining whether manganese is present in areas where very little geological information is available.

This planning culminated in the development of the Stage 1 Exploration Program, which is the subject of this NOI and is described further in the following sections.

## 2.6 STAGE 1 EXPLORATION PROGRAM

### 2.6.1 Summary of Program

The exploration work described in this NOI comprises the following activities:

- Approximately 40 regional exploration holes;
- Infill drilling areas in the western part of the Southern Lease; and
- Four diamond drill holes.

The layout of the exploration program is shown in Figure 2-8. The regional exploration holes are being drilled for the purpose of determining whether manganese is present, particularly in some of the more remote parts of the Southern Lease where there is very limited geological information available. The infill drilling areas are in locations where previous has already confirmed that manganese is present. The infill drilling areas will provide further information on the manganese mineralisation (depth, thickness and quality). The diamond drill holes will provide core samples, which will be subject to laboratory testing of geometallurgical properties such as density.

### 2.6.2 Permit to Clear Process

Prior to any exploration work being undertaken, the proponent's Permit to Clear process will be followed. This process includes a pre-clearance survey to determine the precise locations of drill pads and access tracks, based on the distance from local environmental constraints and the presence of habitat features for threatened species. Although the potential exploration area already takes into account key environmental constraints (refer Section 2.5), pre-clearance surveys are required because the mapping scale used to delineate the potential exploration area is not suitable for defining the precise location of features such as small waterways.

The pre-clearance survey will address the following:

- The limits of clearing will be clearly delineated (via flagging) and will be restricted to the minimum areas required to safely complete the drilling program. This will include minimising the width of access tracks and drill pads.
- The pre-clearance survey will ensure compliance with the following adopted buffer distances from sensitive areas. Any drill holes or access tracks identified within these areas will be relocated.
  - A minimum of 100 m from waterways and wetlands.
  - A minimum of 100 m from monsoonal vine thicket.
  - A minimum of 100 m from white rock areas.

- Searches will be undertaken of each proposed clearing area by an experienced ecologist to identify and flag key habitat features of threatened fauna species. The key habitat features include hollow-bearing trees suitable for the Masked Owl (Northern), hollows suitable for the Brush-tailed Rabbit-rat, and spoil heaps and pop holes that may be indicators of the presence of the Northern Hopping-mouse. Such features will be flagged and measures implemented to protect this habitat. Further details of the measures to be implemented to protect any identified threatened species habitat are provided in Section 4 – Terrestrial Flora and Fauna.
- Any large, mature trees will be avoided, if possible. Such trees will be flagged.
- The area to be cleared will be inspected for weeds. In the unlikely event a weed is present, the location of these weeds will be GPS recorded and information will be provided to the proponent's Exploration and Environment Department as well as the Rehabilitation and Mine Services Team. Any weeds that are identified will be GPS recorded, and sprayed or removed prior to any clearing being undertaken.

Consultation will be undertaken with the ALC as part of the Permit to Clear process. As part of this process, a cultural monitor (i.e. a Traditional Owner who speaks for the country) will be invited to visit the exploration area and confirm that it is suitable from a cultural perspective and to nominate any necessary additional buffers from culturally sensitive areas. Further detail is provided in Section 5 – Social, Economic and Cultural Surroundings.

The pre-clearance surveys and advice from the ALC and/or cultural monitors may necessitate the relocation of drill holes and tracks. The location of drill holes and tracks shown in Figure 2-8 is therefore indicative and subject to change.

## 2.6.3 Drilling

### Regional Exploration Drilling

Regional exploration drilling is proposed to be undertaken in the more remote areas of the Southern Lease to provide an initial evaluation of the presence or absence of manganese (Figure 2-8). This drilling method collects only a small sample for preliminary analysis.

Regional exploration drilling is proposed to be undertaken using a low impact aircore drill rig which is mounted onto a medium sized 6WD truck (Plate 2-1). The rig is used in conjunction with a medium sized rigid support truck. The aircore drill rig uses steel or tungsten cutting tips to bore a hole. The drill cuttings are removed by the injection of compressed air into the hole. This method of drilling is used to drill weathered regolith (loose, heterogeneous material covering solid rock) as the drill rig and cutting tips cannot penetrate fresh rock. Regional exploration drilling is therefore limited to depths of 50 - 60 m. As it is a form of dry hole drilling, no water is required to be used, other than water for dust suppression.

Approximately 40 regional exploration holes are proposed to be drilled as part of this program (Figure 2-8). These holes are proposed to be located on existing or historic tracks, where possible. In areas where there aren't any existing tracks, the access route will be selected to avoid clearing of larger trees. This is possible due to the smaller size of the rig, which means it can manoeuvre between trees. The proposed alignment of the access route will be flagged and then a pre-clearance survey will be undertaken in consultation with Traditional Owners who will advise if there is any need to realign the track for cultural reasons. Once the proposed alignment of the access route has been confirmed, any necessary clearing will be undertaken. Clearing will be limited to the lower canopy such as small trees, shrubs and grasses, as well as moving fallen timber to the edges of the drilling area. Clearing will be undertaken using a chainsaw, axe or similar hand tool. This method of drilling does not require a drill pad to be cleared.

The regional exploration holes will be drilled during daylight hours only and, due to the smaller sized of the rig, it is expected the rig and support vehicle will travel between the mine site and drill holes on a daily basis.

A number of the regional exploration holes are located on the eastern side of the Amagula River (Figure 2-8) and the existing low-level crossing of the Amagula River is proposed to be used to access these regional exploration holes. As with all elements of the exploration program, this will be subject to obtaining the Traditional Owners' permission to use this crossing.

## Infill Drilling

Approximately 500 infill drill holes are proposed as part of the Stage 1 Exploration Program (Figure 2-9). Holes are distributed in a grid pattern and will be predominantly spaced approximately 240 m apart. However, in some sections infill drill holes will be spaced approximately 120 m apart. The drilling areas will be accessed via existing tracks, although additional tracks may be constructed to access the individual drill pads.

Infill drilling is proposed to be undertaken using a Reverse Circulation (RC) drill rig. RC drilling uses a pneumatically operated hammer at the face of the drill bit which pulverises the rock. The drill rods have an inner and outer tube. Air is forced down the hole in the outer tube which forces the pulverised rock up the inner tube. The pulverised rock is collected in a cyclone which separates the dust from the rock sample. The rock sample is then collected in a bucket for logging and further analysis. A photograph of a typical RC drill rig is shown in Plate 2-2. RC drilling is a form of dry hole drilling and no water is required to be added while drilling, apart from small volumes to control dust at the collar when dusty conditions are present. The water is generally absorbed into the sample, which comes out damp. Drilling will target the mineralised horizon, but can extend up to 10m below the mineralised horizon. Some holes may be drilled to intercept basement quartzites in order to test for multiple mineralised horizons.

For safety reasons, it will be necessary to clear a pad for each drill hole. Depending on the location of the drill pad, the clearing area will be approximately 10 m x 18 m or 18 m x 17 m. The slightly larger drill pads are required at the end of a drill traverse to allow sufficient turn around space for the RC drill rig and support equipment. Drill pads will be cleared of vegetation using a D6 scrub dozer. A spotter will work with the dozer operator during the clearing of any vegetation. The spotter is required to ensure compliance with the various restrictions identified during pre-clearance surveys (Section 2.6.2), as well as ensuring the dozer operator maintains the correct alignment. The dozer is also fitted with a GPS to assist with ensuring constraints identified during pre-clearance surveys are avoided.

Clearing will be conducted using the “blade up” method, whereby the blade of the dozer is lifted to reduce soil disturbance and the topsoil will not be disturbed. Grasses and cleared vegetation will be pushed into small windrows at the side of the drill pad.

Vegetation clearing procedures for access tracks will follow a similar process as outlined above for the drill pads. The access tracks will be approximately 3 m in width to allow for safe movement of vehicles and equipment. Tracks will be cleared using a D6 scrub dozer or equivalent.

The extent of clearing for the drilling program will be limited, as far as possible, including minimising the width of access tracks and drill pads. Soil disturbance will also be minimised. An area of approximately 29 ha will be cleared for infill drill holes, comprising approximately 7 ha for the clearing of drill pads and approximately 22 ha for the construction of access tracks. As detailed in Section 2.6.4, the cleared areas will be rehabilitated and naturally regenerate following drilling.

Multiple RC drill rigs will operate during the exploration program, plus support vehicles. Rigs will be left in-situ and workers transported daily, via light vehicles, to and from the drill rigs.

## Diamond Drilling

Diamond drilling is utilised to obtain core samples for more detailed geological and geometallurgical analysis. It is undertaken using a diamond drill rig. A photograph of a typical diamond drill rig is shown in Plate 2-3. A diamond impregnated (hollow) core bit is used which cuts until the core barrel is full. LIQUI POL, an organic polymer, will be mixed with water and injected down the drill hole to assist with lifting the drill cuttings. The majority of the LIQUI POL is retrieved with the drill cuttings returned from the drill hole, but any LIQUI POL that remains in the drill hole will biodegrade over time. Water used during drilling will be supplied by a support truck. Waste water will be recaptured in tanks on the support vehicle and reused for each hole. No sumps are required.

Four diamond drill holes are proposed in the exploration program and their locations are shown in Figure 2-9. The holes will be accessed via existing tracks. The drill pads will be approximately 18 m x 17 m and will be located on

existing tracks, reducing the need for additional clearing. One rig will be used. Similar to infill drilling, the rig will be left in-situ and workers will be transported to and from the drill rig daily by a light vehicle.

### 2.6.4 Rehabilitation

Following the completion of drilling, rehabilitation will be undertaken of drill holes, drill pads and access tracks. Rehabilitation methods are discussed in the following sections.

#### Capping of Holes

Two main aquifers occur in places in the Southern Lease, namely a shallow, unconfined laterite aquifer and a deeper, confined aquifer associated with the Cretaceous sandstone. Bentonite, an inert low permeability clay, will be used to create a seal in any holes where the confined aquifer is intersected. This will prevent any possible connection between the aquifers.

The top of the holes will then be plugged using a plastic hole plug and backfilled with drill cuttings to produce a mound on top of the hole to allow for compaction. The work will be undertaken in accordance with the proponent's existing procedure related to capping and plugging exploration drill holes.

#### Rehabilitation of Drill Pads and Access Tracks

Rehabilitation of drill pads and access tracks will occur at the completion of the exploration program. Drill pads and access tracks will be rehabilitated using the same methods successfully used for exploration drilling at the existing mine. The rehabilitation of drill pads and access tracks comprises:

- Removing and disposing of any rubbish;
- Respreading any remaining drill cuttings;
- Replacing surface materials such as logs, vegetation cover and leaf litter, on the disturbed areas, as far as practicable; and
- Allowing the area to naturally revegetate from seeds in the soil seed bank and from adjacent vegetation.

The drill pads and tracks will be inspected approximately 6 – 12 months after they are rehabilitated. The inspections will identify any erosion or subsidence of drill holes, and will determine if revegetation is occurring or if any weeds are present. Photographic monitoring records of representative sites will be maintained by the proponent. The ALC will also be provided with an opportunity to inspect rehabilitated exploration areas to confirm the rehabilitation has been undertaken to the satisfaction of the Traditional Owners.

The proponent has had considerable success with rehabilitation of exploration drill holes and access tracks. A recent survey of rehabilitated drill pads and tracks has been conducted of exploration sites from 2017 to as far back as the 1960s (Cumberland Ecology 2019). Analysis was made of vegetation in areas cleared or disturbed by exploration activities compared to adjacent, uncleared areas. The survey included assessment of 72 sample sites, with each site including a disturbed site (i.e. previous drill pads or tracks) and an analogue (undisturbed) site. Monitoring was undertaken across the Eastern Leases, the existing mine and the Southern Lease. Sites were monitored for vegetation structure, woody species regeneration, ground cover, time since fire, fire impact and weed species cover. Photographs of both disturbed and analogue sites were taken. Plates 2-4 to 2-7 show examples of regeneration recorded during the survey, including photographs of drill pads disturbed in the 1970s, 2006, 2014 and 2017 and their analogue sites. Survey results showed woody species composition appears to rapidly regenerate (within 1 to 2 years) following cessation of disturbance. This was attributed to the "blade up" method of clearing, which ensures that topsoil is undisturbed and contains vegetative material as well as the soil seed bank. This mimics natural regeneration following fire, where suckering occurs from in-situ roots and lignotubers and germination occurs of soil stored seed. Vegetation structure (assessed as basal area, mean tree height and canopy cover) was found to return more slowly to pre-disturbance levels, with comparable levels being achieved approximately 30 years after disturbance. Regeneration of vegetation structure was influenced by recurrent fires, with frequent fire regimes considered likely to extend the timeframe for the establishment of large stems. The proponent intends to consult with the ALC regarding frequency of fires within rehabilitation areas.

With the exception of one plot (of 72), no weeds were identified within any sites, indicating that measures to prevent the spread of weeds are effective (Section 2.6.5). Overall, the monitoring indicates that the rehabilitation techniques used by the proponent allow exploration areas to successfully regenerate over time.

### Rehabilitation of Regional Exploration Holes

There will only be very minor disturbance associated with the regional exploration holes, due to the small size of the low impact aircore drill rig and the fact that it is not necessary to clear drill pads or access tracks. This reduces the rehabilitation requirements for these holes. Any remaining drill cuttings will be respread and fallen timber or cleared vegetation will be reinstated as naturally as possible.

Disturbed areas will be allowed to naturally regenerate from seeds in the soil seed bank and from adjacent vegetation. Subject to the agreement of the Traditional Owners, a vehicle barrier (e.g. felled timber or earthen bund) will be placed at the entry point to the route used by the aircore drill rig to access the more remote regional exploration holes. This will assist to prevent a permanent public access track becoming established.

A low impact aircore drill rig, similar to the one proposed to be used for this exploration program, was used during recent exploration in South32's Cato Plateau tenement in East Arnhem Land. The rig was successfully able to manoeuvre to avoid large trees and results from monitoring undertaken 12 months after drilling has shown that regrowth along the tracks is being achieved.

## 2.6.5 Environmental and Cultural Controls

### Training

The proponent has established induction and training procedures in relation to environmental management. All personnel (including contractors) who conduct vegetation clearing and exploration activities will be trained in the identification of the threatened species that may be encountered in the area, including specific habitat features of these species (such as spoil heaps or tree hollows). Spill response training is also completed by all personnel at the time of induction and regularly thereafter.

All personnel are also required to complete a half day training course on cultural awareness prior to the commencement of the exploration program. The cultural awareness training is run by Traditional Owners and includes information on cultural sensitivities and restricted areas, and guidelines for interactions with Traditional Owners.

### Permit to Clear Process

The proponent's Permit to Clear process will be adopted prior to the commencement of any exploration activities. The process is described in Section 2.6.2. The Permit to Clear process includes undertaking pre-clearance surveys to delineate buffers (e.g. around waterways and/or threatened species habitat) and mark buffers with flagging tape. Compliance with these buffers is assured through a spotter working with the dozer operator during the clearing of vegetation. The spotter's role is to ensure compliance with the various restrictions identified during pre-clearance surveys, as well as ensuring the dozer operator maintains the correct alignment. The spotter has a GPS tablet with georeferenced maps containing the coordinates of all pre-clearance constraints. This information is also programmed into the dozer's GPS unit.

### Weed and Pest Management

Weed management of the exploration areas will be conducted in accordance with the Weed Management System (WMS) currently in place for the existing mine. The WMS is supported by a Weed Management Manual and a suite of procedures that are designed to manage and control weeds on the proponent's mining and exploration tenements. These documents include measures to ensure that exploration activities do not introduce weeds. All exploration rigs and support vehicles will be required to undertake weed inspections and wash down at the mine site, prior to entering the Southern Lease. Further detail is provided in Section 6 – Environmental Management.

GEMCO also has in place a management plan and quarantine program to prevent the introduction of Cane Toads to Groote Eylandt. This is critical to maintaining populations of threatened species such as the Northern Quoll.

The management plan includes preventative measures such as quarantine procedures relating to barging of equipment, inspections of barges and vehicles, Cane Toads fencing at the port and use of a Cane Toad detection dog at the port. There are also monitoring measures and, in the event of a Cane Toad being found, reporting and disposal procedures. Further detail is provided in Section 6 – Environmental Management.

### Erosion and Sediment Controls

Exploration drilling is only undertaken in the dry season, which limits the potential for issues with erosion and sediment control. Operational experience and monitoring from previous exploration programs in similar terrain indicates that specific erosion and sediment controls are generally not required. In addition, the exploration program has been designed to avoid waterways and new waterway crossings, and the areas disturbed for drill pads are small in area and are relatively flat. Drill pads will not be located within 100 m of waterways. There may be instances where it is necessary to drive across small waterways. The crossing point will be located to avoid significant habitat areas. The need for any erosion controls (e.g. placing riprap in the crossing) will be determined in consultation with the ALC.

Apart from diamond drilling, the selected drill methods do not require water, other than water for dust suppression. The management of water during diamond drilling is discussed in Section 2.6.3 and it is noted that only four diamond drill holes are proposed to be drilled.

## 2.6.6 Utilities

### Diesel

Where possible, light vehicles and equipment will be refuelled at the existing mine, prior to commencement of daily exploration activities. As drill rigs will be left in-situ, refuelling will be required to be undertaken at the drill pads. Infill drill rigs and the diamond drill rig are expected to be refuelled approximately every 2 days. Diesel will be transported and stored in 5000 L tanks on support trucks. The support trucks will also contain hydrocarbon spill kits. Any spillage during refuelling will be removed and disposed in accordance with the existing mine site procedures.

The aircore drill rig will likely return to the mine site daily, where refuelling will be preferentially undertaken. If refuelling is required to be undertaken at the regional exploration holes, fuel will be transported on the support truck in 205 L or 1,000 L tanks. Similar to other support vehicles, the support truck for the regional exploration holes will contain hydrocarbon spill kits and any spillage during refuelling will be removed and disposed in accordance with the existing mine site procedures.

Any spill reporting will be done in accordance with Northern Territory legislation.

### Water

Apart from the diamond drill rig, which will be used to drill only four holes, the water demands for the exploration program are minimal. The rigs used for infill drilling only use water for dust suppression (via water sprayers and down hole injection) when dusty conditions are present. The water is generally absorbed into the sample, which comes out damp. Water is stored in a 500 L tank on the drill rig and the support truck supplies additional water if required in a 5,000 L tank.

The diamond drill rig requires water during drilling to cool and lubricate the drill rig and lift cuttings to the ground surface. The water is supplied via a 5,000 L tank on the support truck. The water used in drilling is captured, stored in a tank and reused for each hole.

## 2.6.7 Waste Management

All rubbish and consumables used as part of the drilling activities will be collected and returned to the existing mine for disposal. Any spillage of hydraulic oils, diesel or other hydrocarbons and spent hydraulic fluids will be removed and disposed in accordance with the existing mine procedures. Waste management is described further in Section 6 – Environmental Management.

### 2.6.8 Timing

Exploration activities will commence once environmental approvals are obtained. Exploration will only be undertaken during the dry season. Detailed scheduling is still to be finalised and is dependent on the timing of regulatory approvals, particularly the timing relating to the commencement of the wet season.

Due to the number of drill holes, the infill drill program is expected to take the longest amount of time and will be completed within 12 months. The diamond drilling is expected to be completed in approximately 1 week, and the regional exploration holes are expected to be completed within a 6 month period. The exploration program is scheduled to commence in the second half of 2019 and will be completed in 2020.

The RC drill rigs will potentially operate 24 hours a day, whereas diamond drilling and drilling of regional exploration holes will occur during daytime hours only.

### 2.6.9 Workforce and Accommodation

The peak workforce required to complete the exploration program is up to 52 people, including three existing mine employees and 49 contractors. Due to the continuous operations proposed, only half of the peak workforce will be onsite at any one point in time. Up to four crews may operate simultaneously and as the respective exploration activities are completed, the number of crews and total workforce onsite will reduce accordingly. The workforce requirements of the various drill rigs are provided in Table 2-1.

**Table 2-1 Onsite Workforce Requirements**

| ROLE | NUMBER OF PEOPLE PER RIG | NUMBER OF RIGS | TOTAL^ |
|---|---|---|---|
| Infill Drill Holes | 3 | 2 | 6 |
| Diamond Drill Holes | 3 | 1 | 3 |
| Regional Drill Holes | 3 | 1 | 3 |
| Additional support staff (spotter, dozer operator, geologist etc.) | - | - | 14 |
| Total | - | 4 | 26 |

*^Workforce requirements are shown for onsite only and don't include workers who are off-shift*

Contractors undertaking exploration activities may be existing residents of Groote Eylandt or will be non-residents, employed on a fly-in and fly-out basis. Accommodation will be provided in the proponent's accommodation village, located in Alyangula. Contractors will be sourced from the existing contractor workforce as well as available contractors from the Northern Territory, Western Australia and Queensland. There will be an opportunity for employment of Traditional Owners for the exploration work, particularly in defining the most appropriate access to regional exploration holes to avoid culturally sensitive areas, in clearing vegetation and as cultural monitors.

### 2.6.10 Alternatives

The following alternatives were considered as part of the design of the exploration program:

- An alternative (larger) exploration area; and
- Selection of drill rigs.

As detailed in Section 2.5, a detailed risk-based approach, informed by fieldwork and consultation, has been undertaken to design the exploration program. It considered the cultural and environmental values in the Southern Lease. This has resulted in an area of approximately 7,500 ha being excised from the potential exploration area. The proponent has foregone undertaking exploration in this area due to environmental and cultural considerations.

A small, 6WD truck-mounted aircore drill rig has been selected for drilling the regional exploration holes due to its low environmental impact. Traditional RC drill rigs are much larger and require tracks and drill pads to be cleared. The use of the low impact aircore drill rig avoids the need to create tracks and drill pads and to clear large trees, therefore significantly reducing the potential impact of the regional exploration hole drilling activities. The selection of a smaller mobile aircore has some disadvantages, such as penetration depth and size of sample, however, the environmental benefits were found to outweigh the limitation on drilling capabilities associated with the low impact aircore rig.

## 2.7 SIGNIFICANCE OF THE EXPLORATION PROGRAM

As noted in Section 2.6.9, there is direct employment associated with the exploration program. This includes employment of Traditional Owners, particularly in clearing vegetation and as cultural monitors. However, the key significance of the exploration program relates to its role in securing the long-term future of the proponent's operations on Groote Eylandt.

The existing mine has been operating for over 50 years and is an integral part of the economy of Groote Eylandt. The existing mine provides significant socio-economic benefits to the Traditional Owners, as well as the regional economy of the Northern Territory. These benefits include:

- Continued provision of 1,669 jobs including 766 South32 employees and 903 contractors. These jobs include roles for Traditional Owners;
- Royalties for distribution to the ALC and Traditional Owner groups;
- Royalties, government taxes and business opportunities which significantly contribute to both the local economy and the regional economy of the NT;
- Education, training and apprenticeship opportunities for local residents, including Traditional Owners;
- Provision of social infrastructure and services, specifically health services, to the communities on Groote Eylandt;
- Procurement opportunities for businesses on Groote Eylandt and, in particular, Indigenous enterprises; and
- Coordination of community events by GEMCO.

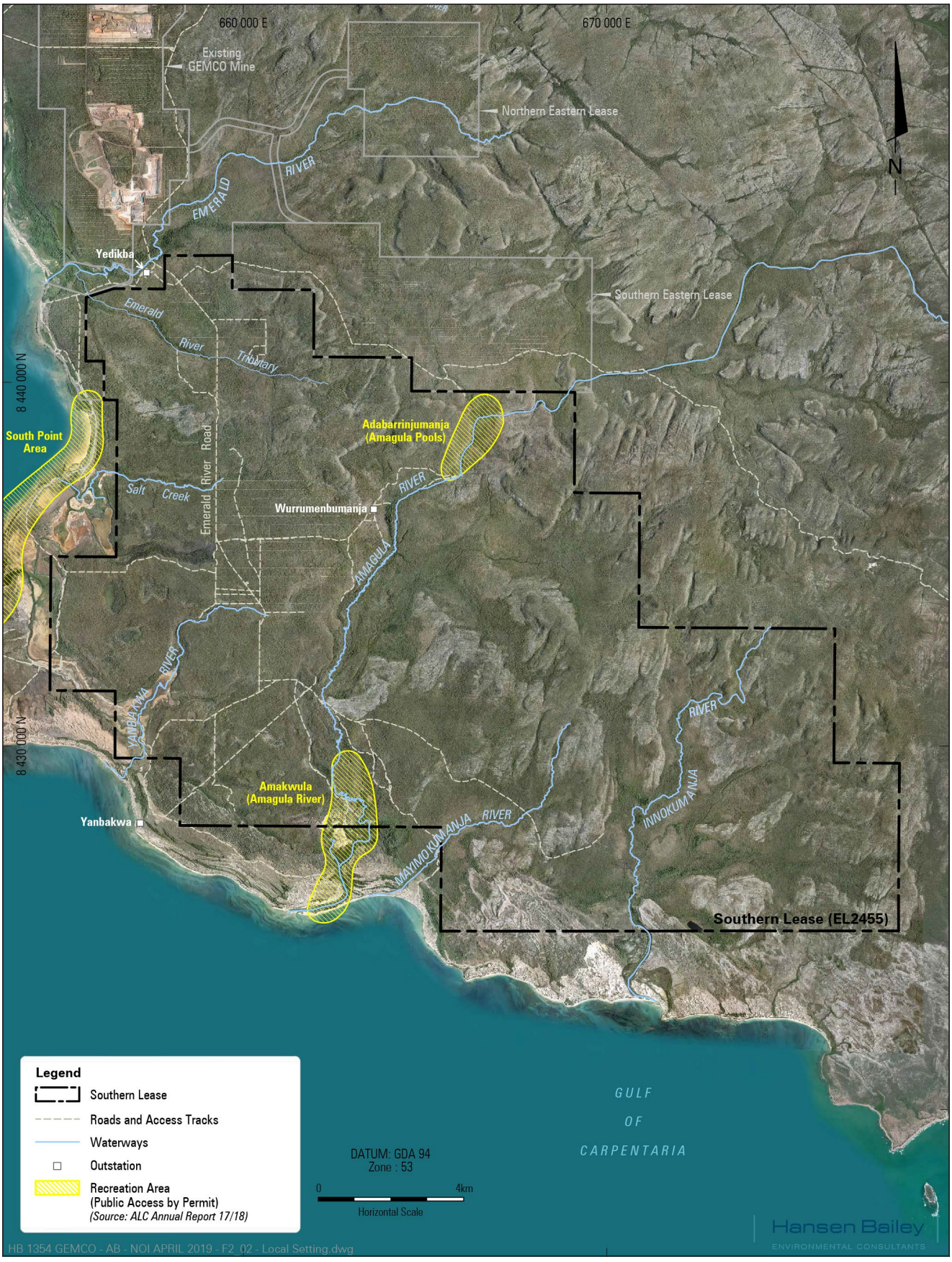
The continuation of these benefits in the medium to long-term is dependent on additional manganese resources being developed by GEMCO, and the Southern Lease is the most prospective exploration area on Groote Eylandt being evaluated by the proponent.

# FIGURES


SOUTHERN LEASE EXPLORATION PROGRAM

Location Plan

**FIGURE 2-1**




SOUTHERN LEASE EXPLORATION PROGRAM

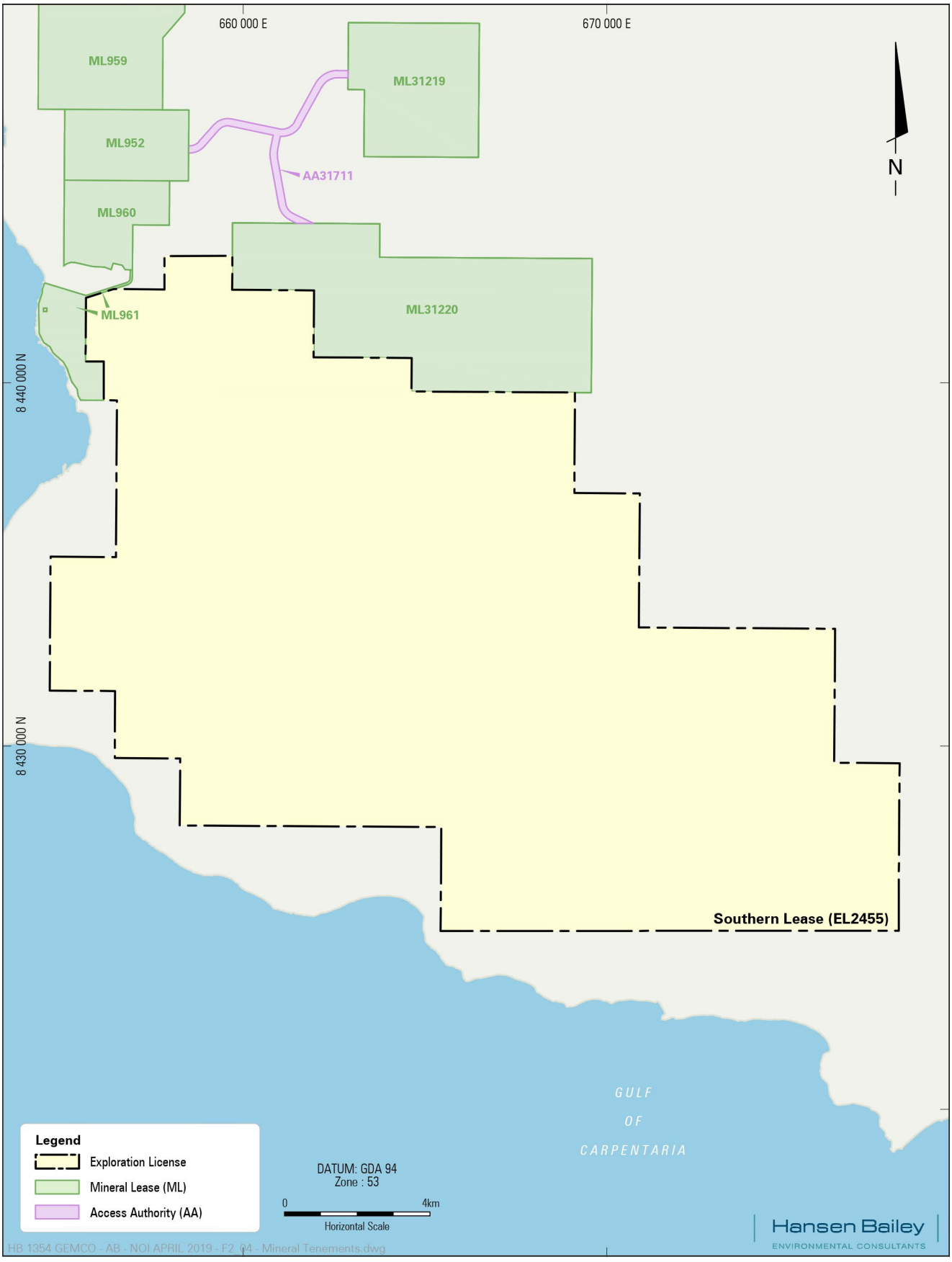
Local Setting

**FIGURE 2-2**


SOUTHERN LEASE EXPLORATION PROGRAM

Local Catchment Setting

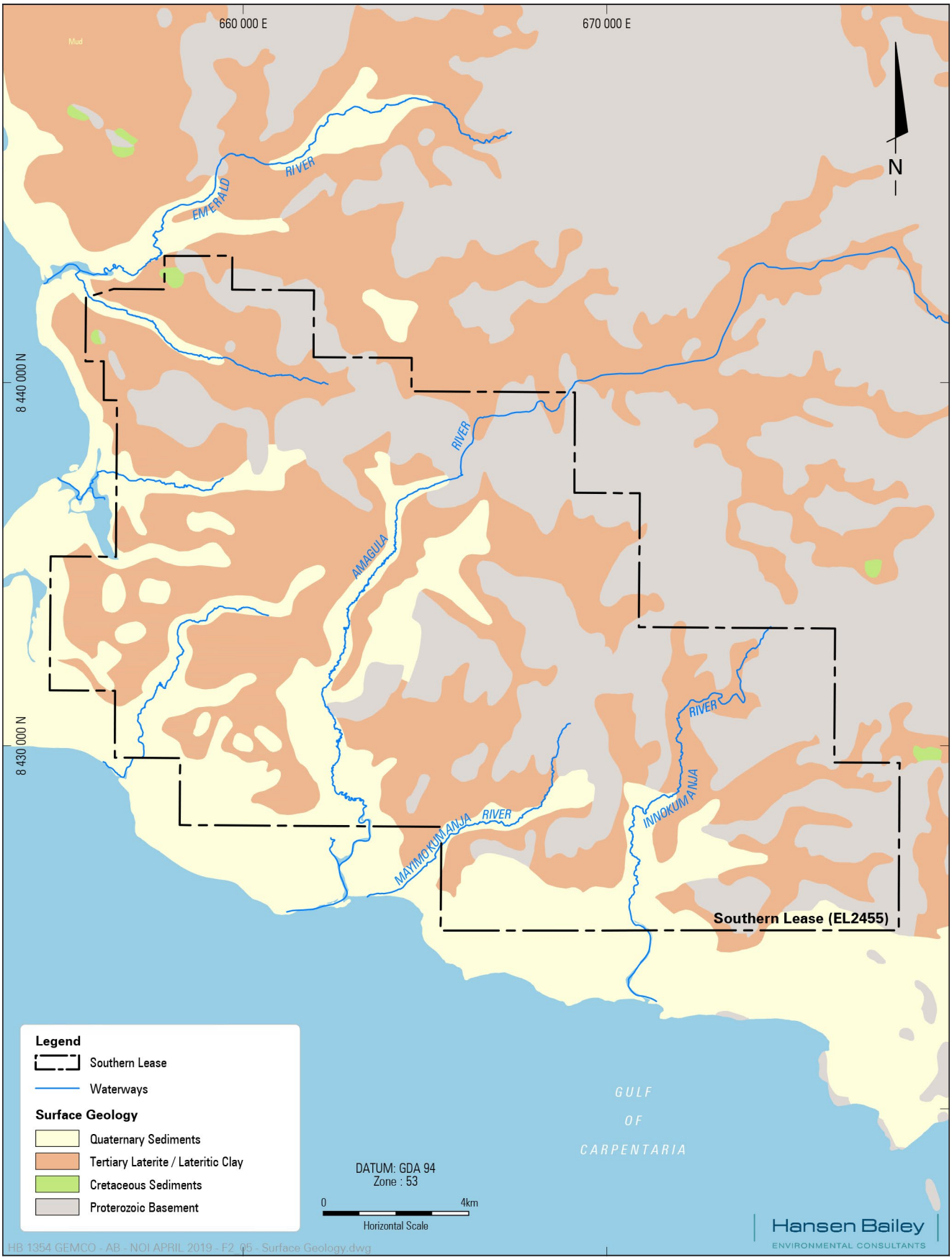
**FIGURE 2-3**




SOUTHERN LEASE EXPLORATION PROGRAM

Mineral Tenements

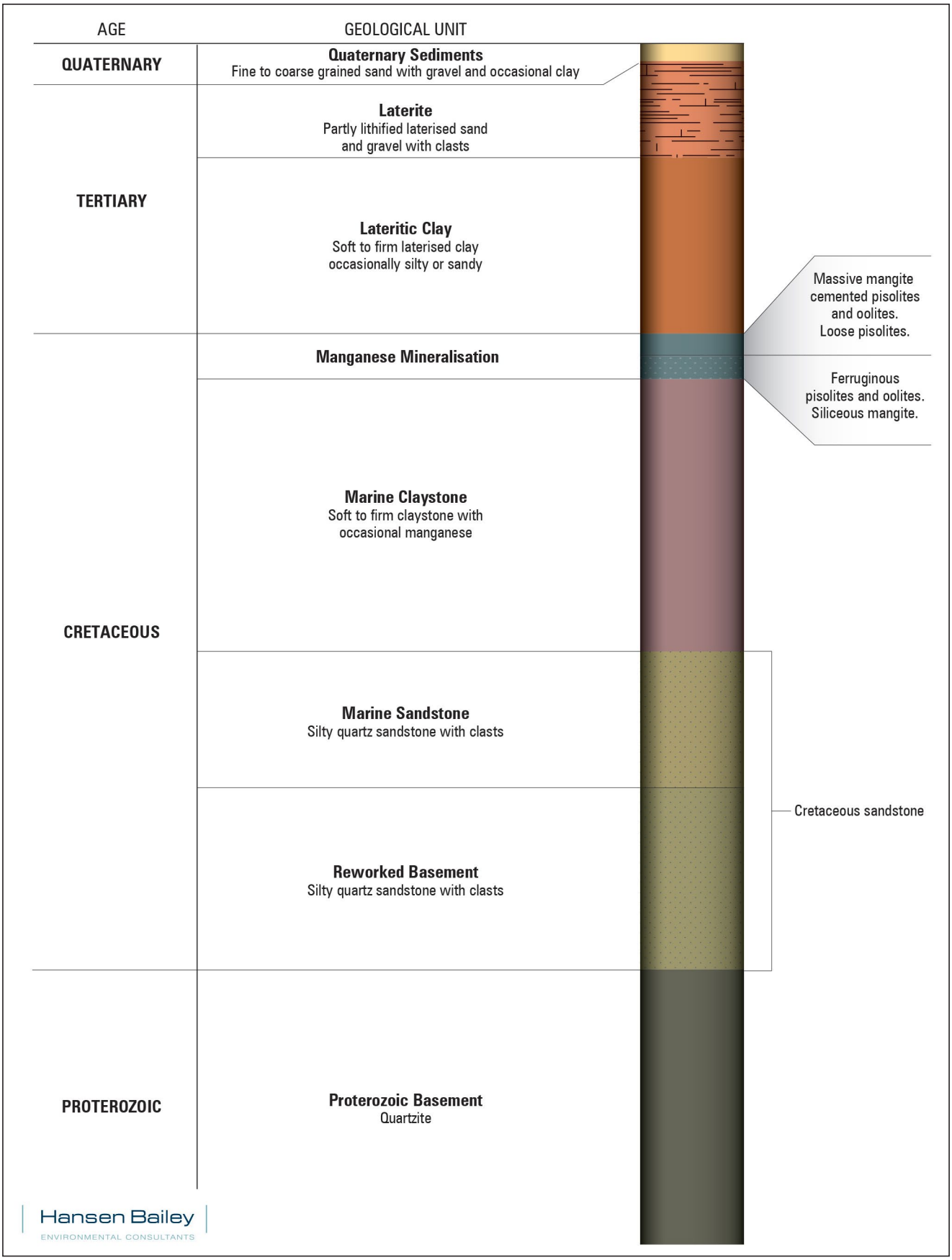
**FIGURE 2-4**




SOUTHERN LEASE EXPLORATION PROGRAM

Surface Geology

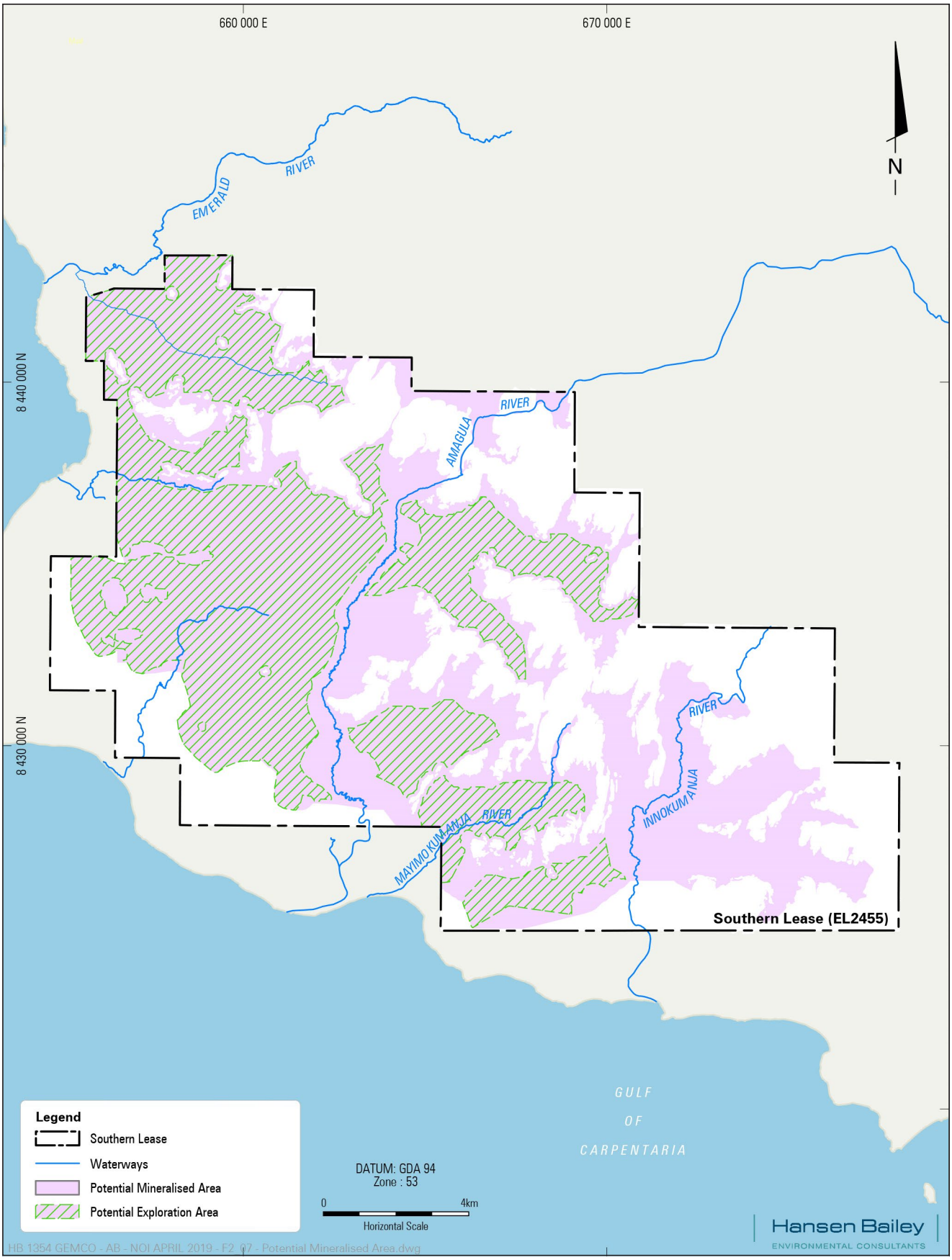
**FIGURE 2-5**




SOUTHERN LEASE EXPLORATION PROGRAM

Indicative Stratigraphy of the Southern Lease

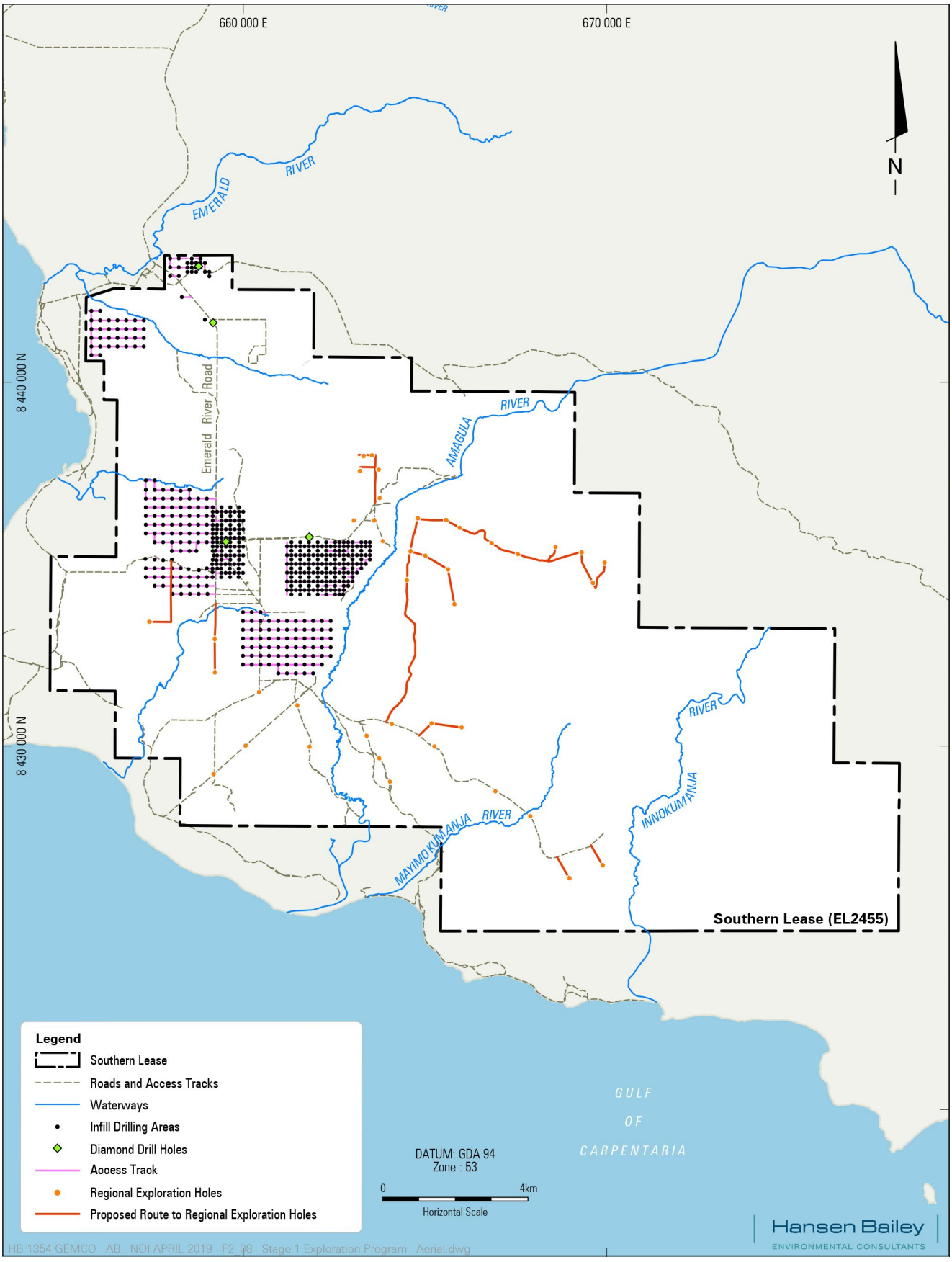
**FIGURE 2-6**




SOUTHERN LEASE EXPLORATION PROGRAM

Potential Mineralised Area

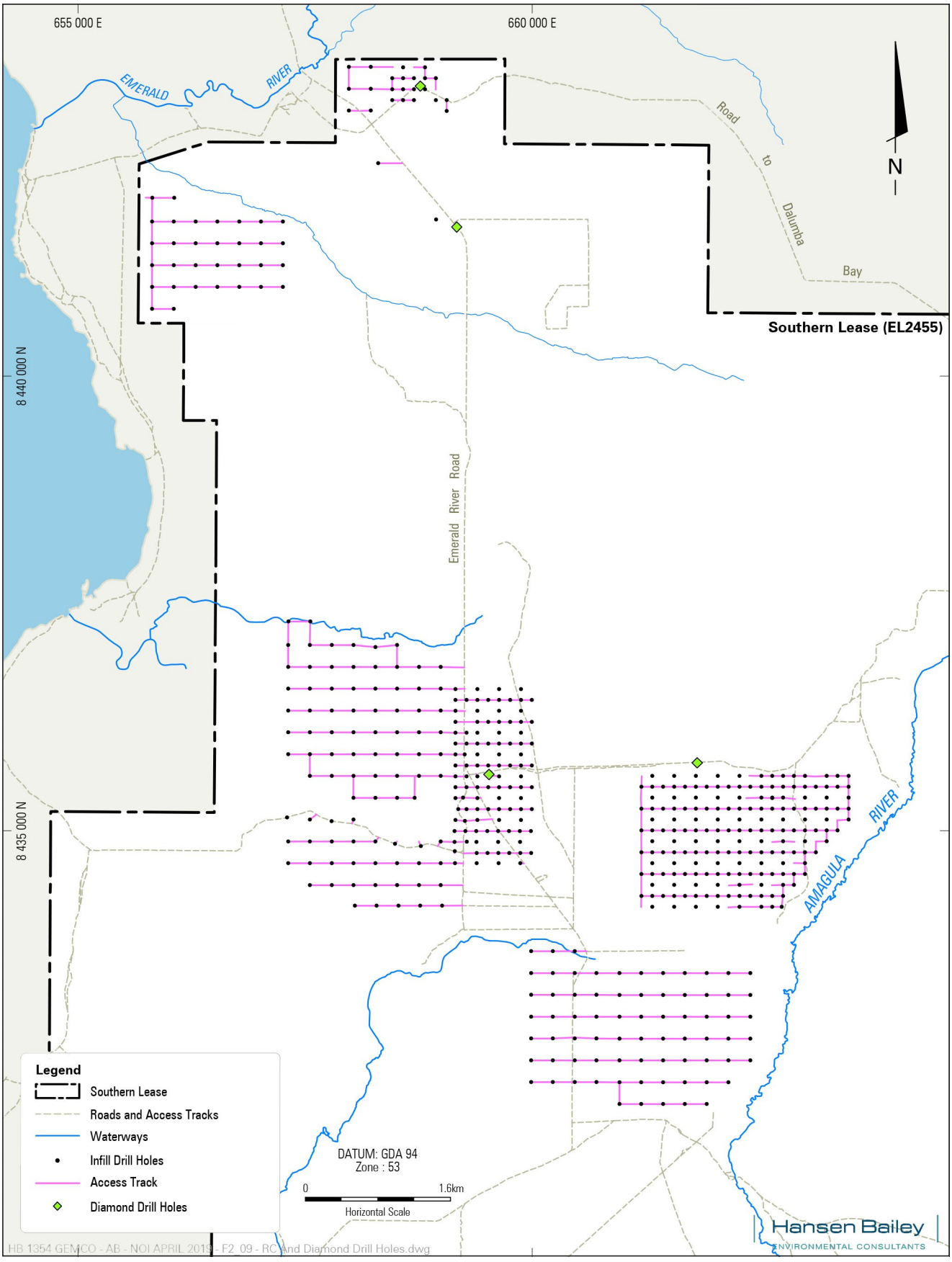
**FIGURE 2-7**




SOUTHERN LEASE EXPLORATION PROGRAM

Layout of Stage 1 Exploration Program

**FIGURE 2-8**




SOUTHERN LEASE EXPLORATION PROGRAM

Layout of the Infill and Diamond Drill Holes

**FIGURE 2-9**

# PLATES


**Plate 2-1** Example of a Low Impact Aircore Drill Rig

**Plate 2-2** Example of a Reverse Circulation Drill Rig


**Plate 2-3** Example of a Diamond Drill Rig



**Plate 2-4** Drill Pad (from the 1970s) in the Eastern Leases and Analogue Monitoring Site (Site 70-8; Cumberland Ecology 2019)



**Plate 2-5** Drill Pad (from 2006) in the Eastern Leases and Analogue Monitoring Site (Site 06-1; Cumberland Ecology 2019)



**Plate 2-6** Drill Pad (from 2014) in the Eastern Leases and Analogue Monitoring Site (Site 14-7; Cumberland Ecology 2019)



**Plate 2-7** Drill Pad (from 2017) in the Eastern Leases and Analogue Monitoring Site (Site 17-3; Cumberland Ecology 2019)

# 3

# Review of Environmental Factors

# CONTENTS



## Tables

# 3 REVIEW OF ENVIRONMENTAL FACTORS

## 3.1 INTRODUCTION

Environmental factors are broad components of the environment (e.g. flora and fauna, soil) that may be impacted by an action. This section describes the process that was adopted to identify the environmental factors relevant to the Stage 1 Exploration Program (the exploration program). It includes a review of the full suite of environmental factors identified by the Northern Territory Environment Protection Authority (NT EPA) in its guideline on environmental factors and objectives.

## 3.2 METHODOLOGY

The NT EPA has produced a guideline on environmental factors and objectives (NT EPA, 2018a), which is designed to provide a systematic way to categorise information in an environmental impact assessment. Environmental factors are broad components of the environment that may be impacted by an action. The guideline identifies a total of 13 environmental factors, characterised under five themes, namely Land, Water, Sea, Air, and People and Communities (NT EPA, 2018a). Objectives have been developed for each environmental factor and potential impacts must be considered relative to these objectives.

NT EPA (2018b) explains that when preparing a Notice of Intent (NOI), it is necessary for the proponent to identify which environmental factors may be potentially impacted by an action (termed “proposal specific factors”). The potential impacts and mitigation measures for these proposal specific factors should be presented in the NOI to assist the NT EPA with determining whether the proposal is likely to have a significant environmental impact. Table 3-1 provides a full list of environmental factors and identifies which environmental factors are considered to be proposal specific factors for the exploration program.

Table 3-1 provides a full list of environmental factors and identifies which environmental factors are considered to be proposal specific factors for the exploration program. The proposal specific factors are discussed further in Section 4 – Terrestrial Flora and Fauna and Section 5 – Social, Economic and Cultural Surroundings.

The consideration of environmental factors was based on the following:

- An understanding of the baseline environment in the Southern Lease, informed by:
  - Terrestrial ecology field surveys undertaken in the Southern Lease between 2016 and 2018, as well as a literature review and database searches, as documented in Appendix A - *Baseline Terrestrial Ecology*.
  - The Small Mammal Research Project, which was carried out in 2017 and 2018 and comprised a large scale research project into the distribution of threatened small mammals in the Southern Lease, as documented in Appendix B - *Southern Lease Small Mammal Research Project*.
  - Vegetation mapping of the Southern Lease, prepared by the Department of Environment and Natural Resources (DENR), and informed by fieldwork, including fieldwork undertaken on behalf of the proponent in the Southern Lease.
  - An aquatic ecology survey of the Southern Lease, undertaken in 2018 on behalf of the proponent (C&R Consulting 2019). This survey was undertaken to provide baseline information on aquatic ecology values in the Southern Lease, and it provided a map of waterways in the Southern Lease. Information from this report was used to guide the design of the exploration program, with the objective of ensuring that all exploration drilling will be located at least 100 m away from waterways. The aquatic ecology survey was

also undertaken to meet the terms of the Exploration Agreement with the Anindilyakwa Land Council (ALC). A copy of the report has been provided to the ALC and is available on request.

- Previous archaeological and anthropological surveys undertaken in the Southern Lease, as well as a literature review and database searches, as described in Section 5 - Social, Economic and Cultural Surroundings.

- Recent (2017) high quality mapping data, including LiDAR and recent aerial photography of the full extent of the Southern Lease, and the digitised mapping of the extent of white rock areas.
- A thorough understanding of the proposed exploration activities, their potential impacts and the management measures to be adopted, based on previous exploration drilling experience on Groote Eylandt in similar environments.
- Data from previous exploration programs, particularly monitoring data that has shown the success of the rehabilitation of drill pads and access tracks.
- Consultation undertaken with the ALC, Traditional Owners and regulators. As described in Section 5 – Social, Economic and Cultural Surroundings, there has been an extensive consultation program undertaken over several years. In addition, Traditional Owners were involved in the fieldwork described above and provided valuable insights regarding the environmental factors that they believed to be important.

## 3.3 REVIEW OF ENVIRONMENTAL FACTORS

Table 3-1 provides a full list of environmental factors and identifies which environmental factors are considered to be proposal specific factors for the exploration program.

**Table 3-1 Review of Environmental Factors**

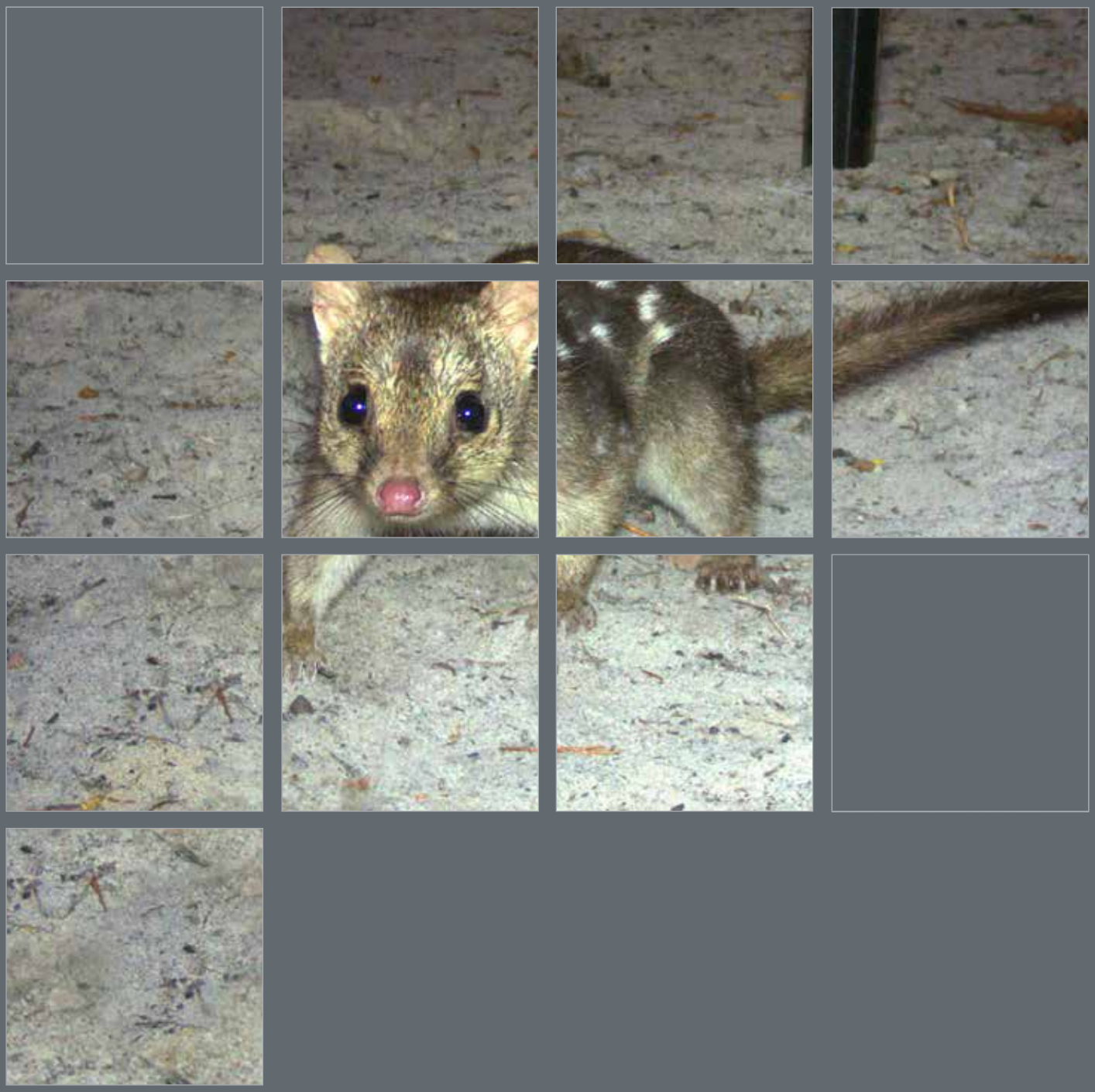
| OBJECTIVES | POTENTIAL IMPACT | PROPOSAL SPECIFIC FACTOR |
|---|---|---|
| **Terrestrial Flora and Fauna** | | |
| Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained. | The exploration program involves clearing drill pads and access tracks. Clearing native vegetation has the potential to give rise to impacts on terrestrial flora and fauna, although it is noted that cleared areas are rehabilitated and naturally regenerate once drilling has been completed. | ■ Yes. Refer Section 4 – Terrestrial Flora and Fauna. |
| **Terrestrial Environmental Quality** | | |
| Maintain the quality of land and soils so that environmental values are protected. | The exploration program does not involve any significant or permanent disturbance of land or soils. As detailed in Section 2 – Project Description, the blade up method of clearing is used, which ensures that topsoil is undisturbed and retains vegetative material, such as roots and tubers, as well as the soil seed bank. | ■ No |

| OBJECTIVES | POTENTIAL IMPACT | PROPOSAL SPECIFIC FACTOR |
|---|---|---|
| **Landforms** | | |
| Conserve the variety and integrity of distinctive physical landforms so that environmental values are protected. | The exploration program will not change the topography in any way, and hence no impacts on distinctive physical landforms are predicted.<br>Some areas of white rock would be considered to be distinctive physical landforms. A minimum 100 m buffer has been placed around white rock areas and there will be no exploration drilling within the white rock areas or their buffer. | ■ No |
| **Aquatic Ecosystems** | | |
| Protect aquatic ecosystems to maintain the biological diversity of flora and fauna and the ecological functions they perform. | The exploration program has been deliberately designed to avoid any direct impacts on waterways and associated aquatic ecology values. This has been achieved through ensuring that there will be no exploration activities within or adjacent to waterways. As detailed in Section 2 – Project Description, an integrated planning process was adopted to delineate the maximum possible extent of exploration and the presence of waterways was one of the factors considered in this planning process. This planning process culminated in large areas (approximately 7,500 ha) being excluded from the potential exploration area for environmental reasons, including the presence of waterways. In addition to this high level planning process, pre-clearance surveys will be undertaken to ensure that a buffer of at least 100 m is maintained around all waterways. The pre-clearance surveys will be undertaken because the mapping scale used to delineate the potential exploration area is not considered suitable for defining the precise location of features such as small waterways. Undertaking pre-clearance surveys provides an additional level of confidence that exploration drilling will not encroach on waterways. The proposed activities will not create any new waterway crossings (e.g. bridges, culverts). There may be instances where it is necessary to drive across small waterways. The crossing point will be located to avoid significant habitat areas. The need for any erosion controls (e.g. placing riprap in the crossing) will be determined in consultation with the ALC.<br>Indirect impacts on waterways and associated aquatic ecology values will be avoided by:<br>■ Ensuring that controls are in place to prevent spills and ensuring that each drill rig is supplied with a spill kit.<br>■ Rehabilitating exploration pads and access tracks to prevent erosion and any associated sedimentation.<br>■ Removing all rubbish and materials used as part of exploration drilling. | ■ No |

| OBJECTIVES | POTENTIAL IMPACT | PROPOSAL SPECIFIC FACTOR |
|---|---|---|
| **Inland Water Environmental Quality** | | |
| Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected. | The discussion on the aquatic ecosystems environmental factor details the measures that have been adopted to ensure that there will be no direct or indirect impacts on waterways, and hence no impacts on surface water quality.<br>The proponent has measures to prevent spills and each drill rig is supplied with a spill kit, and operators are trained and familiar with its application. Any spent hydraulic fluids from servicing the drill rigs will be contained and returned to the mine site for recycling.<br>The regional and infill drilling are dry hole drilling and the only water required is water for dust suppression.<br>LIQUI POL, an organic polymer, will be used to aid the drilling of the four diamond drill holes. The majority of the LIQUI POL is retrieved with the drill cuttings returned from the drill hole, but any LIQUI POL that remains in the drill hole will biodegrade over time. No impacts on groundwater quality are therefore predicted. | ■ No |
| **Hydrological Processes** | | |
| Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected. | As detailed in the aquatic ecosystems environmental factor, exploration drilling will be located at least 100 m away from all waterways. No changes to the hydrological regime are therefore predicted.<br>Two main aquifers occur in places in the Southern Lease, namely a shallow, unconfined laterite aquifer and a deeper, confined aquifer associated with the Cretaceous sandstone. Bentonite, an inert low permeability clay, will be used to create a seal in any holes where the confined aquifer is intersected. This will prevent any possible connection between the aquifers. The work will be undertaken in accordance with the proponent's existing procedure related to capping and plugging exploration drill holes. | ■ No |

| OBJECTIVES | POTENTIAL IMPACT | PROPOSAL SPECIFIC FACTOR |
|---|---|---|
| **Marine/Coastal Environment** | | |
| **Marine Flora and Fauna**<br>Protect marine flora and fauna so that biological diversity and ecological integrity are maintained.<br>**Benthic Habitat and Communities**<br>Protect benthic communities and habitats so that biological and functional diversity and ecological integrity are maintained. | The exploration program is located approximately 1 km from the coastline at the nearest point and consequently no impacts on the marine or benthic environment are predicted. The exploration program does not involve any activities that will give rise to changes in coastal processes. | ■ No |
| **Marine Environmental Quality**<br>Maintain the quality and productivity of water, sediment and biota so that environmental values are protected.<br>**Coastal Process**<br>Maintain the geophysical and hydrological processes that shape coastal morphology so that the environmental values of the coast are protected. | | |
| **Air Quality and Greenhouse Gases** | | |
| Maintain air quality and minimise emissions and their impact so that environmental values are protected. | The exploration program involves small scale activities, undertaken over a short timeframe (only a few months of drilling). The only emissions to the air that would arise from the exploration activities relate to the use of diesel for equipment (e.g. drill rig and support vehicle). | ■ No |
| **Social, Economic and Cultural Surroundings** | | |
| Protect the rich social, economic, cultural and heritage values of the Northern Territory. | A number of controls will be put in place to ensure that the exploration program will not give rise to adverse impacts on social, economic, cultural, and heritage values. However, given that there are numerous areas of cultural heritage significance in the Southern Lease; further discussion on cultural heritage is warranted. | ■ Yes. Refer Section 5 – Social, Economic and Cultural Surroundings. |

| OBJECTIVES | POTENTIAL IMPACT | PROPOSAL SPECIFIC FACTOR |
|---|---|---|
| **Human Health** | | |
| Ensure that the risks to human health are identified, understood and adequately avoided and/or mitigated. | The exploration program does not involve the use of chemicals or other substances that could give rise to potential impacts on human health. In addition, the exploration program is not located in close proximity to human settlements, with Angurugu located 10 km to the north, being the nearest town to the proposed exploration activities.<br>Potential impacts on the health and safety of the workforce involved in the exploration program will be managed in accordance with the proponent's existing occupational health and safety (OHS) procedures and OHS legislation applicable to exploration tenements. | ■ No |



# 4

# Terrestrial Flora and Fauna

# CONTENTS

## Figures



## Tables

# 4 TERRESTRIAL FLORA AND FAUNA

## 4.1 INTRODUCTION

This section describes the baseline terrestrial ecology values, potential impacts of the Stage 1 Exploration Program ("exploration program") and mitigation measures proposed to be adopted. It draws on information from three specialist ecology reports that have been prepared by Cumberland Ecology, as described below.

As discussed in Section 1 – Introduction, during meetings held with Northern Territory government agencies, the proponent was advised to provide information in the Notice of Intent (NOI) on potential impacts on the Northern Hopping-mouse (*Notomys aquilo*) and Brush-tailed Rabbit-rat (*Conilurus penicillatus*). It was noted that these two threatened species were potentially present within the Southern Lease, but there was a scarcity of information about their distribution and habitat preferences, and the potential for exploration activities to impact them. Following this meeting, the proponent undertook a large scale research project on these species in order to confirm their presence and habitat preferences within the Southern Lease. This project is referred to as the *Southern Lease Small Mammal Research Project* and the research project report is provided in Appendix B. A summary of the research project is also presented in Section 4.3.

An assessment of the baseline terrestrial ecology of the Southern Lease has also been undertaken, including characterisation of vegetation communities and fauna habitat types, and determination of the presence of threatened and migratory species. This included a desktop assessment of databases and available literature as well as review of recent ecological surveys undertaken within the Southern Lease and elsewhere on Groote Eylandt. The assessment of the potential for threatened and migratory species to occur in the Southern Lease included species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and the *Territory Parks and Wildlife Conservation Act 2006* (NT) (TPWC Act). The *Baseline Terrestrial Ecology* report is provided in Appendix A and a summary is presented in Section 4.4.

An assessment of the impacts of the exploration program on terrestrial ecology has also been completed. This included assessment of the impact of clearing required for drill pads and access tracks. The potential for indirect impacts from drilling were also assessed, including habitat fragmentation, introduction of invasive species and potential changes to the fire regime. Measures to avoid and mitigate impacts were also considered. The findings of the impact assessment are presented in the *Assessment of Impacts on Listed Species* provided in Appendix C and are summarised in Sections 4.5 and 4.6.

## 4.2 OVERVIEW OF REGULATORY REQUIREMENTS

### 4.2.1 Key Regulatory Requirements of the Federal Government

#### EPBC Act

The EPBC Act prescribes the Federal Government's role in environmental assessment, biodiversity conservation and the management of protected Matters of National Environmental Significance (MNES). MNES include listed threatened species and migratory species. The Department of the Environment and Energy (DoEE) is the administering authority for the EPBC Act.

Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES is termed a controlled action and is subject to assessment and approval under the EPBC Act.

Threatened and migratory species listed under the EPBC Act have been included in this assessment.

### EPBC Act Guidance Materials

A variety of documents have been produced in accordance with the requirements of the EPBC Act to provide guidance on listed threatened and migratory species, key threatening processes that may impact those species, and survey techniques for the species. In addition, recovery plans and conservation advice are available for many species. These documents were consulted in assessing the baseline ecology values and the potential impacts on EPBC Act listed species.

## 4.2.2 Key Northern Territory Legislation and Guidelines

### Territory Parks and Wildlife Conservation Act

The TPWC Act is the principal legislation that provides for the protection and conservation of the Northern Territory's biodiversity. The TPWC Act classifies threatened flora and fauna into a number of conservation categories, including Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened and Least Concern. These categories are based on the recognition of how threatened a species is, and what action needs to be taken to protect it. The TPWC Act also provides for the classification and control of feral animals; permits for taking wildlife and entering land; designation and management of protected areas; and private sanctuaries. The TPWC Act is administered by the Parks and Wildlife Commission NT.

No permits are required under this Act for clearing associated with the exploration program, given the program will be authorised under the *Mining Management Act 2010* (NT).

### Weeds Management Act

The *Weeds Management Act 2001* (NT) (WM Act), which is administered by the Department of Environment and Natural Resources (DENR), makes provision for the control and eradication of declared weeds in the Northern Territory. Weeds that have been identified to have an impact on the Northern Territory's economic, environmental, cultural and social values are declared under the WM Act. Weed management measures to be implemented are discussed in Section 4.6.2.

# 4.3 SMALL MAMMAL RESEARCH PROJECT

## 4.3.1 Introduction

This section provides an overview of the Small Mammal Research Project. The report for the research project is provided in Appendix B.

The Northern Hopping-mouse and Brush-tailed Rabbit-rat are small, threatened rodents that are known to occur on Groote Eylandt. The Northern Hopping-mouse is listed as Vulnerable under the EPBC Act and TPWC Act and the Brush-tailed Rabbit-rat is listed as Vulnerable under the EPBC Act and Endangered under the TPWC Act.

As noted in Section 4.1, DENR recommended to the proponent that research on the following issues be undertaken in order to inform an assessment of potential impacts from exploration activities in the Southern Lease:

- Determine the distribution of the Northern Hopping-mouse and Brush-tailed Rabbit-rat within the Southern Lease and adjacent areas.
- Identify the parts of the Southern Lease considered to be the most important for the two species.
- Determine which environmental factors or combination of factors (e.g. habitat type, fire history) have the greatest influence on the two species.

DENR designed a research project to address these key issues. DENR's survey design formed the basis of the Small Mammal Research Project that was undertaken by Cumberland Ecology, on behalf of the proponent.

The Study Area for the Small Mammal Research Project included the Southern Lease and additional areas adjoining the northern, western and southern boundaries of the lease.

## 4.3.2 Methodology

The Small Mammal Research Project involved the following components:

- Identification of a Sampling Area (within the Study Area) for the research project. This included habitat types considered to be suitable for the species, but excluded areas deemed culturally sensitive, (i.e. white rock), and areas with insufficient data on habitat type and fire history. The Sampling Area comprises 23,180 ha and is shown on Figure 4-1.
- Design of a sampling program within this Sampling Area. The survey design included 152 sampling sites within the Sampling Area (Figure 4-1).
- Field surveys, including the following surveys at each of the 152 sampling sites. The standard layout of the sampling sites is shown on Figure 4-2:
  - Infra-red motion-sensor camera trapping to determine species occurrence and detection rates. This trapping included the use of four cameras, two of which were established as unfenced sites and two of which were established as fenced sites. The cameras were left in place for a minimum of four weeks;
  - Habitat assessment, including collection of information on recent fire, trees and logs, vegetative cover, and soils. The attributes collected by the habitat assessment were intended to be used for investigating any correlation with species occurrence; and
  - Northern Hopping-mouse burrow surveys to collect environmental attributes of any observed burrows. Information on the presence of burrows was intended to be used for investigating correlation with species occurrence.
- Data analysis, including review of camera images, collation of field survey data and desktop analysis of environmental and management attributes; and
- Habitat occupancy modelling. Assuming records of the Northern Hopping-mouse and Brush-tailed Rabbit-rat were obtained, habitat occupancy models would have been developed based on species occurrence data and environmental gradients (e.g. habitat types, fire history). The habitat occupancy modelling would have identified areas in the Southern Lease that were most important for the species.

The fieldwork was undertaken from August 2017 to August 2018, and required six separate fieldtrips. Approximately 26,000 trap nights of data were recorded.

In addition to undertaking camera trapping within the Sampling Area, camera trapping was also undertaken at the “Cave Paintings”, an area located to the east of the existing mine (Figure 4-3), where the Northern Hopping-mouse was known to occur, based on results from Diete (2016). Although a similar survey method to that used for the Small Mammal Research Project had been used by other researchers to record the Northern Hopping-mouse and Brush-tailed Rabbit-rat, the cameras were placed at the Cave Paintings in the same configuration and methodology described above to provide further confirmation that the camera survey method was able to detect the species.

## 4.3.3 Results

### Overview

Over 1.58 million images were captured on cameras during the research project. Approximately 12% of the total images were from fauna triggers.

Seventy (70) fauna species were identified to species level, including 42 birds, 15 mammals and 13 reptiles. A number of other species were unable to be identified to species level. The most commonly recorded species

included the Northern Brown Bandicoot (*Isoodon macrourus*), Delicate Mouse (*Pseudomys delicatulus*), Northern Quoll (*Dasyurus hallucatus*) and Agile Wallaby (*Macropus agilis)*.

### Northern Hopping-mouse and Brush-tailed Rabbit-rat

The Small Mammal Research Project detected a number of fauna species including several small mammals such as the Delicate Mouse and Grassland Melomys (*Melomys burtoni*). However, no individuals of the Northern Hopping-mouse or Brush-tailed Rabbit-rat were recorded within the Sampling Area. Although no records of the target species were obtained from the Sampling Area, records of the Northern Hopping-mouse were obtained at the Cave Paintings, an area outside of the Study Area that is known to support a population of the species (Figure 4-3). These records from the Cave Paintings provide evidence that the camera trapping method is able to record the Northern Hopping-mouse if a population is present. A very similar camera trapping methodology has also been used successfully in the past by DENR on Groote Eylandt for recording the Brush-tailed Rabbit-rat (Heiniger and Gillespie 2017). It was concluded that there is a low probability of occurrence for the two species in the Sampling Area, although it was noted that there is still some potential for one or both species to be present in low numbers in parts of the Sampling Area that were not specifically sampled.

The research project did not identify any important habitat areas for the Northern Hopping-mouse and Brush-tailed Rabbit-rat and did not identify any areas of the Southern Lease that should be excluded from future exploration in order to protect these species.

## 4.4 BASELINE ECOLOGY SETTING

### 4.4.1 Introduction

The baseline terrestrial ecology of the Southern Lease was evaluated by accessing databases; conducting a literature review; and reviewing aerial photographs, LiDAR imagery, the latest DENR vegetation mapping as well as geological and soils mapping. In addition, numerous ecological surveys have been undertaken within and in proximity to the Southern Lease, including several detailed flora and fauna assessments. The following two studies are particularly relevant, given that they included considerable field survey effort within the Southern Lease and were recently undertaken:

- The Small Mammal Research Project, which is described in Section 4.3.
- A baseline terrestrial ecology assessment undertaken in the north-western part of the Southern Lease in 2016.

A full list of the ecological surveys reviewed as part of the baseline ecology assessment is included in *Baseline Terrestrial Ecology* report (Appendix B).

The baseline ecology assessment aimed to gain an understanding of the vegetation communities, fauna habitat types and likely presence of threatened and migratory species in the Southern Lease. A likelihood of occurrence assessment was undertaken for listed species to determine the potential for them to occur within the Southern Lease, and more specifically, within the exploration program area. The likelihood of occurrence was based on the species known range, number and age of records, and habitat preferences, which were evaluated considering site characteristics identified during recent field surveys.

A summary of the baseline terrestrial ecology assessment is included in the following sections.

### 4.4.2 Vegetation Structure

The vegetation across the Southern Lease comprises remnant vegetation, and there has been no significant clearing of vegetation within the lease. Overall the vegetation is in very good condition and it is characterised by a high species and structural diversity. Parts of the Southern Lease are regularly burnt by the Traditional Owners, which has resulted in a reduction in the amount of woody debris and has potentially also affected the species composition and structure of the vegetation. Some species are highly sensitive to changes in fire regime, and it is likely that this may have influenced the suite of species that currently utilise the Southern Lease.

## 4.4.3 Vegetation Communities

The vegetation community patterns within the Southern Lease strongly reflect the geology, soils, topography, and the impacts of frequent fires. Rocky sandstone hills are often sparsely vegetated by woodlands (depending on the depth of soil formed on the sandstone), but also include open forests, shrublands and grasslands. Gently undulating, well-drained sand plains are typically forested. On flatter, low relief areas, forests give way to woodlands, swamps and sedgelands (depending on drainage). *Callitris intratropica* (Northern Cypress Pine) forms thickets in places and are prevalent where the sand plains meet the rocky hillsides. Riparian forests and woodland occur along permanent and seasonal streams and adjacent floodplains including seasonal wetlands. Rainforests and vine thickets occur in areas protected from fires and, as such, are generally found adjacent to streams, soaks and springs, in protected rocky sites, and in the lee of sand dunes. Coastal vegetation varies in structure depending on the degree of coastal exposure and occurs near the south-western and southern boundaries of the Southern Lease in proximity to the coastline, including tidal flats near the western boundary.

The most extensive vegetation communities within the Southern Lease comprise open woodlands to open forests dominated by *Eucalyptus tetrodonta* (Darwin Stringybark), which occur on both gently undulating sandy and lateritic soils, as well as within rocky sandstone areas.

### Mapping Units

Vegetation mapping of the Southern Lease was undertaken by DENR (2018 updated mapping), which identified over 100 individual Vegetation Management Units (VMUs) or combination VMUs. A detailed list of the individual VMUs and combination VMUs occurring within the Southern Lease is provided in the *Baseline Terrestrial Ecology* report (Appendix B).

### Threatened Ecological Communities

The EPBC Act Protected Matters Search Tool (PMST) did not record any Threatened Ecological Communities (TECs) as occurring or potentially occurring within a 20 km radius of the Southern Lease. There is currently no mechanism for listing TECs under Northern Territory legislation. Therefore, the TPWC Act does not contain listings for TECs.

### Habitat Types

The Southern Lease contains extensive areas of remnant vegetation which provide a range of habitats for fauna species. The matrix of fauna habitats occur within the various vegetation communities, topographical formations and water resources (permanent and ephemeral). The habitat features are numerous and provide potential foraging, shelter and breeding opportunities for a suite of fauna species. Key habitats identified within the Southern Lease are summarised in Table 4-1 and are shown on Figure 4-4.

**Table 4-1 Key Habitats within the Southern Lease**

| HABITAT TYPE | SOUTHERN LEASE | |
|---|---|---|
| | AREA (HA) | % |
| Closed forest (rainforest) | 227.0 | 0.9 |
| Laterite woodland and forest | 13,816.2 | 53.0 |
| Sandstone woodland and forest | 6,850.3 | 26.3 |
| Coastal dune/swale complex | 989.6 | 3.8 |
| Riparian/wetland | 3,849.8 | 14.8 |
| Estuarine complex | 319.0 | 1.2 |
| Cleared | 1.7 | <0.0 |
| **Total^** | **26,054** | **100** |

^*In some cases totals may not equal the appropriate total number due to rounding.*

### 4.4.4 Flora Species

Over 120 plant species were recorded within the north-western portion of the Southern Lease by Cumberland Ecology (2016). The data indicated that the floristic assemblage across the north-western portion of the Southern Lease is very similar to the assemblage recorded in the Eastern Leases (Cumberland Ecology 2015) and is well represented by Poaceae (grasses), Fabaceae (acacias and peas), Cyperaceae (sedges) and Myrtaceae (*Eucalyptus spp*. and *Melaleuca spp.*). The total number of flora species in the Southern Lease is likely to be higher than 120, given that the survey by Cumberland Ecology (2016) was restricted to the north-western portion of the Southern Lease.

No declared weeds were recorded within the Southern Lease during terrestrial ecology field surveys.

#### Threatened Flora Species

No threatened EPBC Act listed flora species were recorded within the Southern Lease during recent terrestrial surveys by Cumberland Ecology (2016; 2019).

Database records identified the presence of one threatened flora species on Groote Eylandt, namely *Hernandia nymphaeifolia* (Lantern Tree). A number of records of this species occur on the north-eastern coast of Groote Eylandt, approximately 40 km from the Southern Lease, with the last record being from 1988. This species was not recorded during recent terrestrial surveys by Cumberland Ecology (2016; 2019). Areas of coastal habitat that occur near the western and southern boundaries of the Southern Lease may provide suitable habitat for the Lantern Tree. This species is therefore considered to have a moderate likelihood of occurrence in coastal habitat areas within the Southern Lease. However, the remainder of the Southern Lease, including the area in which the exploration program is planned to be undertaken, does not contain coastal habitat, and is considered unsuitable for this species.

### 4.4.5 Fauna Species

A total of 96 fauna species have been recorded within the Southern Lease during the recent terrestrial surveys by Cumberland Ecology (2016; 2019), including 56 birds, 19 mammals and 21 reptiles.

## EPBC Act Listed Threatened Fauna Species

The following EPBC Act listed fauna species are present in the Southern Lease and within the exploration program area:

- Masked Owl (northern) (*Tyto novaehollandiae kimberli*) (EPBC Act status: Vulnerable; TPWC Act status: Vulnerable); and
- Northern Quoll *(Dasyurus hallucatus)* (EPBC Act status: Endangered; TPWC Act status: Critically Endangered).

Records of these species within the Southern Lease are shown in Figure 4-5.

The results of database searches indicated that a further 16 fauna species listed under the EPBC Act could potentially occur within the Southern Lease. A likelihood of occurrence assessment was undertaken as described in Section 4.4.1. One species, the Ghost Bat (*Macroderman gigas*) (EPBC Act status: Vulnerable; TPWC Act status: not listed) is considered to have a high likelihood of occurring in the Southern Lease and within the exploration area. The remaining species were assessed as having a low likelihood of occurring in the Southern Lease and are therefore not considered further in the assessment. Further detail on these species and the likelihood of occurrence assessment is provided in the *Baseline Terrestrial Ecology* report (Appendix B).

## EPBC Act Listed Migratory Fauna Species

One EPBC Act listed migratory species has been identified on the Southern Lease, namely the Salt-water Crocodile (*Crocodylus porosus*). The location that this species was recorded within the Southern Lease is shown in Figure 4-5, although it is likely that it occurs in the majority of the larger waterways in the Southern Lease.

The results of database searches indicated that a further forty-nine migratory fauna species listed under the EPBC Act could potentially occur within the Southern Lease. A likelihood of occurrence assessment was undertaken as described in Section 4.4.1. Of these, the Fork-tailed Swift (*Apus pacificus*) has a moderate potential to occur in the exploration program area.

The remaining species were assessed as having a low likelihood of occurring within the exploration program area and are therefore not considered further in the assessment. Further detail on these species and the likelihood of occurrence assessment is provided in the *Baseline Terrestrial Ecology* report (Appendix B).

## TPWC Listed Fauna Species

One species listed only under the TPWC Act was found to be present within the Southern Lease, namely the Mertens' Water Monitor (*Varanus mertens*) (TPWC Act Status: Vulnerable). Records of these species within the Southern Lease are shown in Figure 4-5.

The results of database searches indicated that a further fauna species listed only under the TPWC Act could potentially occur within the Southern Lease, namely the Yellow-spotted Monitor (*Varanus panoptes*) (TPWC Act Status: Vulnerable). A likelihood of occurrence assessment was undertaken, as described in Section 4.4.1, and concluded there was a high potential for the species to occur within the Southern Lease and the exploration program area. Further detail on these species and the likelihood of occurrence assessment is provided in the *Baseline Terrestrial Ecology* report (Appendix B).

## Exotic / Feral Species

Domestic Dogs (*Canis familiaris*) and Dingoes (*Canis lupus*) were frequently recorded within the Southern Lease, along with a number of infrequent sightings of Feral Cats (*Felis catus*). One House Gecko (*Hemidactylus frenatus*) was recorded during spotlighting surveys on sandstone outcropping.

## 4.5 IMPACT ASSESSMENT

The exploration program has the potential to give rise to direct and indirect impacts on flora and fauna. These include:

- Direct impacts such as clearing of vegetation and potential habitat for drill pads and access tracks; and
- Indirect impacts such as habitat fragmentation, the introduction of invasive species, increased fire frequency and other minor indirect impacts.

These impacts are described in the remainder of this section and mitigation measures for these impacts are discussed in Section 4.6.

### 4.5.1 Clearing

A total of approximately 29 ha of vegetation will be cleared for the exploration program. This includes 22 ha for clearing along access tracks and 7 ha to clear drill pads for the infill drill holes. This impact will be limited to areas to the west of the Amagula River, as the low impact rig used to drill the regional exploration holes will manoeuvre between trees, reducing the need for mechanical clearing for these holes.

The broad area in which the exploration program will be undertaken is shown on Figure 4-6 and clearing of the infill drill pads and access tracks will be undertaken within this broad area. The actual clearing will be restricted to the width of the access tracks (3 m) and the footprint of the drill pads, which varies between 180 $m^2$ and 360 $m^2$ (Figure 2-9 in Section 2 – Project Description shows the detailed layout of the drill holes).

Table 4-2 shows the proposed extent of clearing relative to habitat types. As shown in this table, the majority of clearing (26.5 ha) is within laterite woodland and forest habitat. Although Table 4-2 shows that 2.6 ha of riparian/wetland vegetation is proposed to be cleared, this is considered to be an overestimate. A pre-clearance survey will be undertaken to confirm the precise location of small waterways and wetlands and any of the drill holes or access tracks that are located within 100 m of waterways or wetlands will be relocated. The pre-clearance survey will consequently reduce the extent of riparian vegetation required to be cleared.

**Table 4-2 Extent of Clearing of Habitats**

| HABITAT TYPE | SOUTHERN LEASE | CLEARING REQUIRED FOR EXPLORATION PROGRAM |
|---|---|---|
| | AREA (HA) | AREA (HA) |
| Closed forest (rainforest) habitats | 227.0 | - |
| Laterite woodland and forest habitats | 13,816.2 | 26.5 |
| Sandstone woodland and forest habitats | 6,850.3 | - |
| Coastal dune/swale complex habitats | 989.6 | - |
| Riparian/wetland habitats | 3,849.8 | 2.6 |
| Estuarine complex habitats | 319.0 | - |
| Cleared | 1.7 | - |
| **Total** | **26,054** | **29** |

The dominant habitat type to be cleared for the exploration program is laterite woodland and forest. Laterite woodland and forest habitat type is associated with undulating laterite plains. Laterite woodland and forest habitats are typically dominated by a canopy of Darwin Stringybark, with *Eucalyptus miniata* (Darwin Woolly-butt) being locally common at some locations. *Eucalyptus polycarpa* and *Eucalyptus tectifica* (Darwin Box) also occur within this habitat type.

Laterite woodland and forest habitat covers approximately 53% of the Southern Lease and are also widespread on Groote Eylandt. The laterite woodland proposed to be cleared represents 0.2 % of the laterite woodland within the Southern Lease. Large areas of this habitat type will remain, beyond the area to be affected by exploration activities. It should also be noted that the proposed clearing will be dispersed across the exploration program area. There will be patches of native vegetation remaining between the cleared areas which will continue to provide habitat for native species. It is anticipated that the types of flora and fauna species utilising the habitat within the cleared areas will continue to persist in these adjacent areas where suitable habitat is present.

Laterite woodland and forest habitat provide habitat for a range of flora and fauna species, as well as specific habitat features that provide foraging, shelter and breeding opportunities for fauna. The impacts of clearing on this habitat will be minimised by implementing a pre-clearance procedure that includes retaining trees with large hollows [i.e. hollows that may be suitable for the Masked Owl (Northern)]. In addition, as described in Section 2 – Project Description, disturbed areas will be rehabilitated upon completion of the drilling program. Drill holes will be capped and rehabilitation will be undertaken of drill pads and access tracks. Rehabilitation of drill pads and access tracks will include:

- Removing and disposing of any rubbish;
- Respreading any remaining drill cuttings;
- Replacing surface materials such as logs, vegetation cover and leaf litter, on the disturbed areas, as far as practicable; and
- Allowing the area to naturally revegetate from seeds in the soil seed bank and from adjacent vegetation.

Monitoring of the quality of regeneration has been recently undertaken in areas subject to GEMCO's previous exploration drilling on Groote Eylandt including within the Eastern Leases, Southern Lease and existing GEMCO mine (Cumberland Ecology 2019). Regeneration monitoring shows that woody species composition appears to rapidly regenerate (within 1 to 2 years) following rehabilitation. Vegetation structure (assessed as basal area, mean tree height and canopy cover) was found to return more slowly to pre-disturbance levels, with comparable levels being achieved approximately 30 years after disturbance. Regeneration of vegetation structure was influenced by recurrent fires, with frequent fire regimes considered likely to extend the timeframe for the establishment of large stems. Overall, monitoring indicates that rehabilitation techniques used by the proponent allow exploration areas to successfully regenerate over time.

In addition, exploration activities are undertaken within a relatively short term period (< 12 months). This, along with retaining areas of native vegetation in between cleared areas, will assist the understorey of the cleared areas to regenerate relatively rapidly and, over time, the disturbed areas of habitat will be replaced through natural regeneration. This expected regeneration is based on the results from regeneration monitoring of previously cleared areas (Cumberland Ecology 2019).

### 4.5.2 Indirect Impacts

In addition to the direct removal of vegetation for the establishment of drill pads and access tracks, the exploration program will potentially give rise to a range of indirect impacts. These indirect impacts include habitat fragmentation, the introduction of invasive species, and altered fire regimes. Additionally a number of drilling impacts, such as those relating to noise and vibration, dust, light, erosion and sediment control and vehicle strike have the potential to impact fauna. The indirect impacts are discussed in the following sections.

## Habitat Fragmentation

The exploration program will increase habitat fragmentation through the clearing of areas of open forest and woodland for the creation of access tracks and drill pads. This may impact less mobile species or species with small home ranges, such as small terrestrial mammals. This is mostly likely to occur within the infill drilling areas where there will be a relatively higher density of drill holes and a network of access tracks that will be created to enable access by the drill rigs. However, the access tracks are relatively narrow (approximately 3 m wide), and most of the threatened species potentially impacted are likely to be able to cross these access tracks.

The impact of clearing tracks and drill pads is not a permanent impact given that disturbed areas are expected to naturally regenerate into native vegetation once the exploration program has been completed. Regeneration monitoring undertaken by Cumberland Ecology (2019a) within areas subject to previous exploration drilling found that vegetation composition in areas subject to previous exploration activities achieved a state similar to undisturbed areas through seasonal regrowth after 1-2 wet seasons.

## Introduced Species

The exploration program has the potential to introduce invasive species to the Southern Lease. This includes weeds and feral animals. Alterations to habitat conditions often favour introduced and/or hardy native plant and animal species that can proliferate in disturbed conditions. Such species have the potential to impact upon the local native plant and animal species.

The proponent has a quarantine procedure that provides guidance on how to correctly inspect barges and their cargo coming to the port facility at Milner Bay. This applies to shipping containers, vehicles and equipment. The procedure is designed to prevent unwanted pests and weeds arriving on Groote Eylandt.

The potential for invasive species to be introduced by the exploration program is discussed in the following sections.

### *Weeds*

Although the Southern Lease is currently unaffected by weed species, it will be important to ensure that exploration is undertaken in a manner that does not give rise to the introduction of weeds. Weeds have the potential to out-compete native plant species for resources such as nutrients, sunlight and space. Weeds are most likely to occur at disturbed locations where they can be readily spread. The invasion of weeds within native vegetation can alter the diversity and functioning of vegetation communities.

Weed species that are known to occur in the existing mining tenements are likely to have the highest potential to establish in the exploration program area. Weeds that are more common in the existing mining tenements include *Hyptis suaveolens* (Hyptis), *Passiflora foetida* (Stinking Passionflower), *Urochloa mosambicensis* (Sabi Grass) and *Stylosanthes* spp. (the Stylos) (Addison 2013). Weed management measures in the Southern Lease will continue to focus on employee awareness, preventing the introduction of weeds, and on the early detection and eradication of weeds before they establish. Weed management measures are discussed in more detail in Section 4.6.2. During recent surveys of regeneration of previous exploration areas, only one monitoring plot (of 72 plots) detected the presence of weeds, indicating that measures being used to prevent the spread of weeds are effective.

### *Feral Animals*

Feral animals can cause problems for native fauna species by preying upon them or by competing with them for food and resources. The only feral animals that have been recorded in the Southern Lease are the Domestic Dog (*Canis familiaris*), Dingo (*Canis lupus*), Feral Cat (*Cattus cattus*) and House Gecko (*Hemidactylus frenatus*). The exploration program has the potential to increase the numbers of Domestic Dogs, Dingos and Feral Cat due to the creation of transport vectors such as access tracks. However, as access tracks will be rehabilitated following the completion of the exploration program, and regeneration is expected to occur relatively rapidly, the exploration program is considered unlikely to increase the risk of introduction of these species.

The Cane Toad (*Rhinella marina*) is currently absent from Groote Eylandt. In addition to the quarantine procedure described above, the proponent also has a specific Cane Toad Management Plan which operates across all

mineral and exploration leases and across the island. This plan will continue to operate and will be applicable to the exploration program. The exploration program is unlikely to exacerbate the risk of the introduction of this species to the island beyond current conditions, given that it will not significantly increase transport vectors for the Cane Toad. Further details about the management of Cane Toads is provided in Section 4.6.2.

### Fire Frequency

The creation of additional access tracks in the Southern Lease has the potential to increase accessibility within the lease, particularly in areas that were previously inaccessible, including areas to the east of the Amagula River. Increased access may lead to more frequent fires, which may alter the floristic composition and structure within these areas.

Increased frequency and intensity of fires alters floristic composition, removes coarse woody debris, simplifies understorey and mid-story vegetation structure, and ultimately removes large, old trees (DENR and ALC, 2019). These changes disadvantage many fauna species through reduced food resources (e.g. perennial grass seeds, nuts and fruit), breeding habitat (e.g. tree hollows and hollow logs), and habitat complexity, and increasing vulnerability to predation (DENR and ALC 2019).

A low impact aircore drill rig has been selected for drilling the regional exploration holes, which are predominately located to the east of the Amagula River (Figure 4-6). There are few vehicle tracks in this area and consequently this area presents the highest risk for increasing access. The selection of this drill rig avoids the need to create a dozer-cleared access track, which aims to avoid increasing accessibility to this area. Subject to the agreement of the Traditional Owners, a vehicle barrier (e.g. felled timber or an earthen bund) will be placed at the entry point to the route used by the low impact aircore drill rig to access the more remote regional exploration holes. This will assist to prevent a permanent public access track becoming established.

### Other Indirect Impacts

There are a number of minor indirect impacts that may arise from the exploration program, including:

- Noise and vibration from clearing activities and drilling;
- Dust from clearing activities and drilling;
- Artificial lighting at night;
- Erosion and sedimentation; and
- Vehicle strike.

These minor indirect impacts are discussed in the following sections. However, the majority of these potential indirect impacts will only occur during exploration activities and will cease upon completion of the drilling program. The exploration program is considered to be short term (< 12 months), so impacts will be limited. For these reasons, these minor indirect impacts are not considered likely to result in a significant impact on terrestrial ecology values.

The exploration program will generate noise and ground vibration during the establishment of access tracks and during drilling. However, this will be a temporary disturbance to fauna because of the short duration of the proposed activities (e.g. approximately 45 minutes to complete each infill drill hole). The impacts from noise emissions and vibrations will also be localised close to the drill pads and access tracks and will cease as drilling of each area is completed. Noise and vibration is therefore not likely to have a significant, long-term impact on wildlife populations.

Increased levels of dust could potentially impact vegetation within woodland communities, reducing the health of some species along the edge of drill pads and access tracks. It could also impact on potential foraging resources for wildlife. Dust minimisation strategies such as speed limits and employing dust suppression practices during drilling will minimise the creation of dust. The impacts from dust are likely to be localised close to the access tracks and drill pads. Considering the scale of the exploration program, dust is not considered likely to cause a significant impact on the ecological values of the exploration program area.

The exploration program will potentially operate 24 hours a day and may therefore require night lighting. This has the potential to impact fauna species, particularly nocturnal species. Sources of light will be limited to vehicle headlights and lighting plants for infill drilling areas. Lighting required for infill drilling activities is only required for a short time period (approximately three months) and will move throughout the exploration program area as holes are completed. The impacts from night light pollution are likely to remain close to the light sources, with only limited glare into the surrounding natural vegetation. It is likely that most fauna species would temporarily move away from areas of night lighting and return once the night lighting has ceased. Light is therefore unlikely to have a significant or long-term impact on fauna species.

The exploration program has the potential to increase the amount of erosion occurring in the exploration program area due to vegetation clearing required to create the access tracks and drill pads. The exploration program area is in a tropical climate, and during the wet season heavy rainfall can erode and wash away any disturbed earth relatively easily. Erosion and sedimentation impacts will be limited by rehabilitating drill pads and access tracks within the same year as disturbance occurs, and prior to the wet season commencing. Inspections of the rehabilitated drill pads and tracks will also be undertaken to monitor the success of rehabilitation, including any areas of erosion. The impacts from erosion and sedimentation are, therefore, likely to be localised close to the access tracks and drill pads and are not likely to have a significant, long-term impact on waterways used by wildlife.

The exploration program will create access tracks which will be used by exploration vehicles. Exploration vehicles traversing these tracks can have an impact on animals that may cross and navigate these tracks. Due to the limited number of vehicles required for the exploration program and the low frequency of movement along these tracks, the potential for vehicle strikes is considered to be low.

### 4.5.3 Impacts on Vegetation Communities

None of the vegetation communities occurring within the Southern Lease are listed as a TEC under the EPBC Act and no TECs are considered to occur within the surrounding areas. As such, no impacts to EPBC Act listed communities are anticipated. The TPWC Act contains no listings for TECs.

### 4.5.4 Impacts to Threatened Flora Species

No threatened flora species listed under the EPBC Act or TPWC Act were found within the Southern Lease and none are predicted to occur within the footprint of the exploration program. As such, no impacts to threatened flora species are anticipated.

### 4.5.5 Impacts to Threatened Fauna Species

As described in Section 4.4.5, a number of threatened fauna species listed under the EPBC Act and/or TPWC Act have been recorded or have a high potential to be found within the exploration program area. The impacts to these species are discussed in the following sections.

#### *EPBC Act Listed Terrestrial Fauna Species*

Assessments of significance were conducted on three threatened EPBC Act listed species found to be either present or to have a high potential for occurrence in the exploration program area. The assessments of significance were undertaken in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment 2013), or species-specific Significant Impact Guidelines, where relevant (refer to the *Assessment of Impacts on Listed Species* - Appendix C).

The assessments of significance identified that the exploration program will not give rise to significant impacts on these threatened species for the following reasons:

- Masked Owl (northern): The exploration program will result in the removal of approximately 29 ha of potential foraging habitat for the species amounting to a very small proportion of the available habitat on the island. This is unlikely to have a significant impact on the species, as the species is highly mobile and is expected to

occupy the large areas of suitable habitat that will remain across Groote Eylandt. A key mitigation measure to be implemented for this species is the avoidance of hollow-bearing trees suitable for nesting, which are identified as part of the pre-clearance survey. Suitable habitat trees for the masked owl will be retained and a buffer put in place to avoid impacts on the habitat tree. Regeneration of disturbed laterite woodland and forest habitat will also, over time, provide suitable foraging habitat and assist to reduce potential impacts on the species.

- Northern Quoll: This species is widely distributed across Groote Eylandt and has been recorded extensively throughout all habitat types on the Southern Lease. It has also been recorded within the rehabilitated areas of the existing mine. This species is known to occur in areas adjacent to main roads, and is assumed to have a relatively high tolerance of light and noise. The exploration program will remove approximately 29 ha of habitat for the Northern Quoll, amounting to a very small proportion of the available habitat on the island. Following the completion of drilling, drill holes will be capped and the drill pads and access tracks will be rehabilitated. Rehabilitated areas will, over time, provide suitable habitat for this species, and will assist the persistence of this species within the Southern Lease. It is unlikely the exploration program will have a significant impact on the species.
- Ghost Bat: This species was not recorded within the Southern Lease during recent surveys but has been previously recorded within the existing mine and in the central and northern parts of the island. The exploration program will remove approximately 29 ha of foraging habitat that is potentially suitable for the species. The Ghost Bat is likely to forage in a wide range of habitat types and the area to be cleared represents a very small proportion of the potential habitat for this species on the island. Given the species has been previously recorded within the existing mine it is, therefore, likely to have some tolerance to disturbance. A key measure to avoid impacts on this species, is the commitment to avoid exploration drilling within 100 m of sandstone outcropping (white rock areas), which may support suitable roosting or breeding features for this species.

The Brush-tailed Rabbit-rat and Northern Hopping-mouse are listed under the EPBC Act and TPWC Act and are present on Groote Eylandt. As discussed in Section 4.3, the *Southern Lease Small Mammal Research Project* report (Appendix B) targeted these species, but did not record them, and it was concluded that there was a low likelihood of these species occurring in the Southern Lease. Nevertheless, *Assessment of Impacts on Listed Species* (Appendix C) contains a high level description of potential impacts and describes the way in which the mitigation measures developed for the exploration program would be relevant to these species, if they were present. It concluded that the exploration program is not predicted to give rise to significant impacts on the Brush-tailed Rabbit-rat and the Northern Hopping-mouse.

The assessments of significance undertaken on EPBC Act listed migratory species concluded that the exploration program area did not contain important habitat for the species and no significant impacts were likely to occur as a result of the exploration program.

Impact avoidance and mitigation measures relevant to listed threatened and migratory species are provided in Section 4.6.

### *TPWC Act Listed Terrestrial Fauna Species*

The impacts of the exploration program were also assessed for TPWC Act threatened species present or with a high potential to occur in the exploration program area (further to those TPWC listed species that are also listed under the EPBC Act, and are discussed above). The assessment identified that the exploration program will not give rise to significant impacts on these species for the following reasons:

- Mertens' Water Monitor: The exploration program will largely avoid any suitable breeding and foraging habitat for the Mertens' Water Monitor by designing the exploration program to be a minimum of 100 m from waterways. Ground-truthing will occur as part of pre-clearance surveys to ensure adopted buffer distances from waterways are maintained. The exploration program may result in the disturbance to small areas of riparian habitats that are located more than 100 m from waterways. However, large areas of similar habitat will remain and continue to provide high quality habitat for this species. As such, no significant impact is predicted to occur to the species as a result of the exploration program.

- Yellow-spotted Monitor: This species is wide ranging, and has the potential to occur in all habitat types. Although the species was not recorded during recent surveys in the Southern Lease, the species has been recorded in areas adjacent to main roads and in both mining areas and mine rehabilitation areas at the existing mine. The species is, therefore, assumed to have a relatively high tolerance to light and noise. The exploration program will reduce the area of potential habitat for this species by removing approximately 29 ha of forest and woodland habitat. The area of potential habitat to be removed constitutes a very small proportion of the open forest and woodland on Groote Eylandt and the overwhelming majority of this habitat on the island would remain. Furthermore, regeneration monitoring undertaken within areas subject to previous exploration drilling found that woody species composition appears to regenerate rapidly following the cessation of disturbance.

Impact avoidance and mitigation measures for these species are discussed in Section 4.6.

## 4.6 IMPACT MITIGATION

Impact mitigation is based on a hierarchy of impact reduction principles, namely avoidance, mitigation and compensation. These principles, and how they relate to the exploration program, are discussed in this section.

### 4.6.1 Measures to Avoid Impacts

Exploration programs cannot completely avoid impacts to biodiversity where the target mineral resource is potentially located beneath flora and fauna habitats. However, the exploration program within the Southern Lease has been designed to avoid impacts on several sensitive vegetation types and environmental areas. This has been achieved by restricting the layout of the exploration program.

Potential mineralised areas occur throughout large parts of the Southern Lease. The proponent has committed to forgoing exploration and sterilising potential manganese ore in a number of areas in the Southern Lease, due to the environmental and cultural sensitivity of these areas. The potential mineralised area has been restricted to ensure that exploration activities do not occur within 100 m of the following sensitive environmental areas:

- Waterways.
- Sensitive vegetation types including monsoon vine thicket and wetlands.
- Areas containing white rock.

In addition, any exploration in the area to the east of the Innokumanja River will be avoided (Figure 4-6) to prevent impacts on this environmentally and culturally sensitive area.

The areas that have been excluded from the exploration program provide important resources for many species, including threatened species. The undisturbed vegetation along waterways will also provide a connection between areas disturbed by exploration activities and undisturbed vegetation, ultimately allowing fauna to colonise rehabilitation areas. Impacts from exploration activities on these areas will be avoided not only for the proposed exploration program, but also any future exploration within the Southern Lease. Section 2 – Project Description provides further detail on the development of the exploration program layout.

In addition to the restriction of the potential exploration area, the exploration program design has also considered the following measures to avoid impacts:

- Using existing, cleared tracks where possible; and
- Positioning drill holes in previously cleared areas or on access tracks, where possible.

## 4.6.2 Measures to Mitigate Impacts

The proponent has been undertaking exploration activities on Groote Eylandt since the 1960s. There are a number of policies and procedures that have been progressively developed to mitigate impacts of exploration on terrestrial ecology values. These will apply to the exploration program and are discussed in the following sections.

### Permit to Clear Process and Pre-clearance Survey

All clearing will be undertaken in accordance with the proponent's Permit to Clear process. This process includes a pre-clearance survey to determine the precise locations of drill pads and access tracks, based on the presence of habitat features for threatened species and distance from local environmental constraints.

The process also includes endorsement from the ALC, where appropriate. Further information on the Permit to Clear process is included in Section 2 – Project Description.

The pre-clearance survey is designed to protect environmentally and culturally sensitive areas as well as to identify key habitat features of threatened fauna species that are required to be avoided. The pre-clearance survey will be undertaken by an experienced ecologist prior to the commencement of clearing. It is noted that although the potential exploration area already takes account of key environmental constraints (as detailed in Section 4.6.1), pre-clearance surveys are required because the mapping scale used to delineate the potential exploration is not suitable for defining the precise location of features such as small waterways.

The pre-clearance procedure to be followed is based on previous EPBC Act referral decisions provided by the DoEE for the Eastern Leases (EPBC Act referrals 2013/6848, 2010/5455, and 2008/4563). These previous exploration programs were found to be Not a Controlled Action, subject to undertaking the work in a particular manner. Specific pre-clearance measures were required to be undertaken and these measures form the basis of the pre-clearance surveys proposed to be undertaken for the exploration program.

A pre-clearance survey area is established by flagging the centre line of the proposed track or centre of each drill hole. The distances from local environmental constraints will be checked to ensure that the following adopted buffers are maintained:

- A minimum of 100 m from waterways and wetlands;
- A minimum of 100 m from monsoonal vine thicket; and
- A minimum of 100 m from white rock areas.

The location of any drill pads or access tracks will be adjusted to provide these minimum buffers, if required.

In addition, searches will also be undertaken of each survey area to identify and flag key habitat features of threatened fauna species (listed under the EPBC Act) that are to be protected from clearing. The key habitat features include hollow-bearing trees or logs, and spoil heaps and pop holes that may indicate the presence of the Northern Hopping-mouse. In the event these features are identified, the following measures will be implemented:

- The habitat feature will be flagged to be avoided.
- A 10 m buffer will be created around non-occupied hollow-bearing trees suitable for the Masked Owl.
- A 100 m buffer will be created around hollow-bearing trees assessed as occupied by a Masked Owl, as determined by indirect evidence of occupation (e.g. white wash, prey).
- Controlled felling will be undertaken for hollow-bearing trees which may be suitable for nesting by the Brush-tailed Rabbit-rat. This process includes:
  - Trees are tapped to encourage any animals within the tree to vacate; and
  - Trees will be felled with any hollows facing upward to enable the continued use of the felled tree as possible habitat.

- Where two or more spoil heaps or pop holes are found within 200 $m^2$, cameras will be installed to determine if these features are due to the presence of the Northern Hopping-mouse. The Delicate Mouse, a common species, produces spoil heaps and pop holes that are similar from those of the Northern Hopping-mouse and hence it is necessary to determine the source of the spoil heaps and pop holes. If the Northern Hopping-mouse is confirmed as present using the cameras, a 100 m buffer will be established and the access track/drill hole re-aligned to ensure the area is avoided. If cameras do not identify the presence of the Northern Hopping-mouse, the exploration can proceed as planned. Where drill pads or access tracks are located within areas identified as having key habitat features, their locations will be moved to beyond the buffer areas and searches undertaken at the new locations.

## Clearing Procedures

The extent of clearing will be restricted to the minimum area required to safely complete the drilling program. This will include minimising the width of access tracks and area of drills pads. Clearing of large, mature trees will also be generally avoided, where possible. Disturbance of topsoil will be kept to a minimum by using a “blade up” method, whereby the blade of the dozer is lifted so that the topsoil is not disturbed.

A spotter will work with the dozer operator during the clearing of any vegetation. The spotter will ensure compliance with the various restrictions identified during pre-clearance surveys, such as maintaining adopted buffer distances from flagged trees, as well as ensuring the dozer operator maintains the correct alignment. The dozer used for clearing will be fitted with a GPS to assist with ensuring constraints identified during pre-clearance surveys are avoided.

Clearing of regional exploration holes will not be undertaken with a dozer and will use the following mitigation measures that are proposed specifically for the regional exploration holes:

- Regional exploration holes will be drilled using a low impact aircore rig, mounted on a medium sized 6WD support truck. This equipment has been selected to ensure the lowest impact on vegetation possible;
- Only minor clearing will be undertaken so as to allow safe access for the 6WD vehicle to manoeuvre between trees. The impact on vegetation will be limited to clearing of the lower canopy (small trees, shrubs and grasses) using hand tools (i.e. chainsaw, axe or similar and not a dozer) and moving fallen timber;
- In areas where there are no tracks, the rig will select a route which avoids the need to clear any mature trees;
- Subject to the agreement of the Traditional Owners, a vehicle barrier (e.g. felled timber or an earthen bund) will be placed at the entry point to the route used by the low impact aircore drill rig to access the more remote regional exploration holes. This will assist to prevent a permanent public access track becoming established; and
- Personnel responsible for vegetation clearing and exploration drilling will also be subject to training on threatened species and environmental management.

## Rehabilitation

Following cessation of the exploration activities, the cleared areas will be left to naturally regenerate as described in Section 2 - Project Description. As previously mentioned, the proponent has had considerable success with the rehabilitation of drill pads and access tracks. Drill pads and access tracks created by the exploration program will be inspected approximately 6 – 12 months after they are rehabilitated. The inspections will identify any erosion or subsidence of drill holes, and will determine if revegetation is occurring or if any weeds are present. Photographic monitoring records of representative sites will be maintained by the proponent. The ALC will also be provided with an opportunity to inspect rehabilitated exploration areas to confirm the rehabilitation has been undertaken to the satisfaction of the Traditional Owners.

## Weed Management

Weed management measures in the Southern Lease will focus on employee awareness, preventing the introduction of weeds, and on the early detection and eradication of weeds before they establish. Weed control

and monitoring will be undertaken within cleared areas in accordance with the Weed Management Manual used at the existing mine. The Weed Management Manual is supported by a suite of relevant procedures, including the Exploration Weed Hygiene Procedure. These documents include measures to ensure that exploration activities will not introduce or spread weeds in the Southern Lease.

Monitoring of the quality of regeneration in areas subject to previous exploration drilling has been undertaken (Cumberland Ecology 2019). With the exception of one plot (of 72), no weeds were identified within rehabilitation sites, indicating that measures to prevent the spread of weeds are effective. Further information on weed management is discussed in Section 6 – Environmental Management.

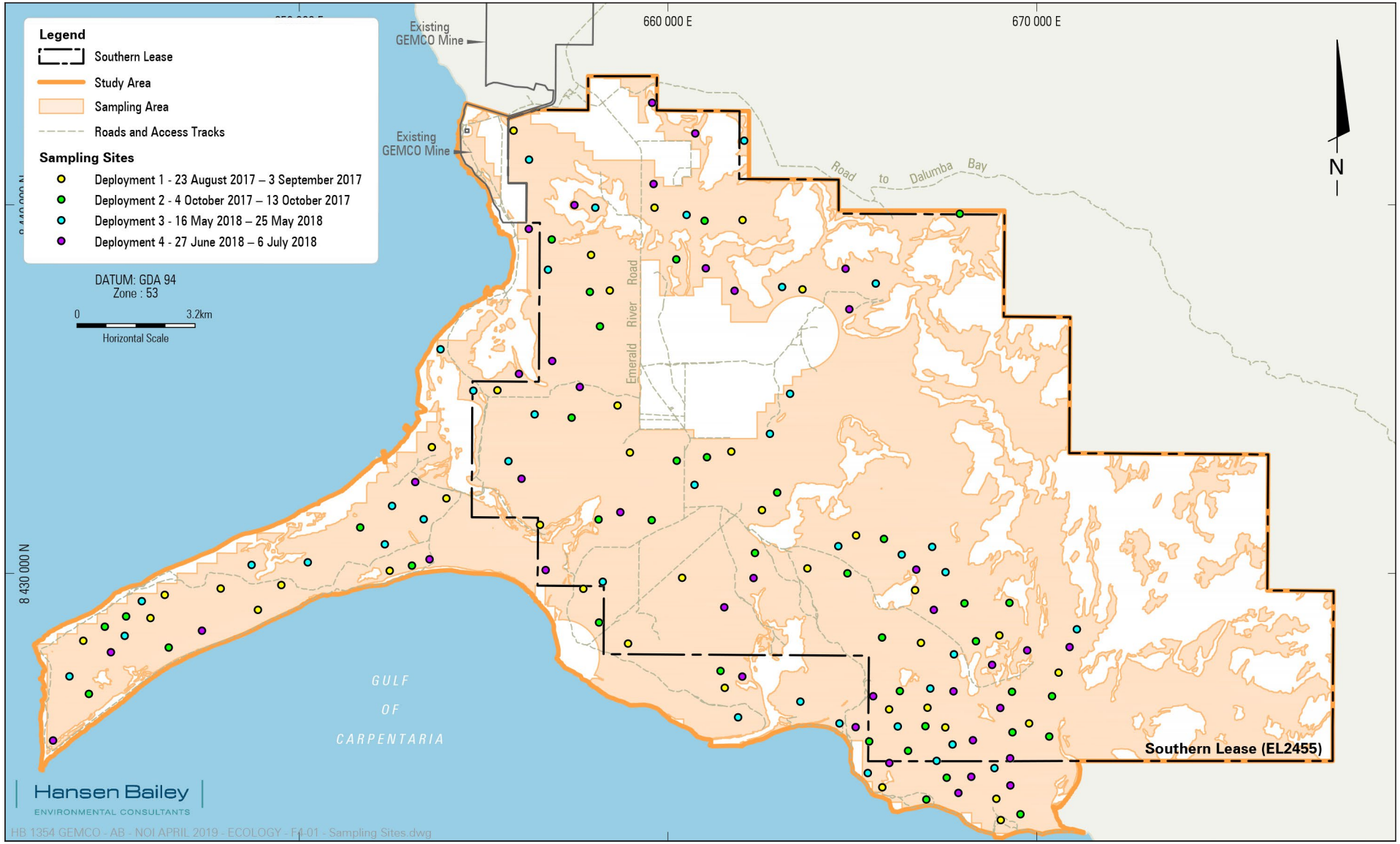
### Cane Toad Management

The proponent has a Cane Toad Management Plan and associated quarantine procedures in place. The prevention of the introduction of the Cane Toad is critical to maintaining populations of small mammals on Groote Eylandt, including threatened species such as the Northern Quoll. The management plan includes preventative measures such as quarantine procedures relating to barging of equipment, inspections of barges and vehicles, Cane Toads fencing at the port and use of a Cane Toad detection dog at the port. There are also monitoring measures and, in the event of a Cane Toad being found, reporting and disposal procedures. These procedures would apply to the exploration program. Further information on cane toad management is discussed in Section 6 – Environmental Management.

## 4.7 CONCLUSION

The objective for the Terrestrial Ecology environmental factor is to "*Protect the Northern Territory's flora and fauna so that biological diversity and ecological integrity are maintained*" (NT EPA 2018a). Section 4.5 describes the potential impacts on terrestrial flora and fauna, including direct and indirect impacts, and Section 4.6 describes the way in which the exploration program has been designed to avoid and minimise impacts. These sections conclude that, given the measures to avoid and minimise impacts, no significant impacts on terrestrial flora and fauna, biological diversity and ecological integrity, are predicted.

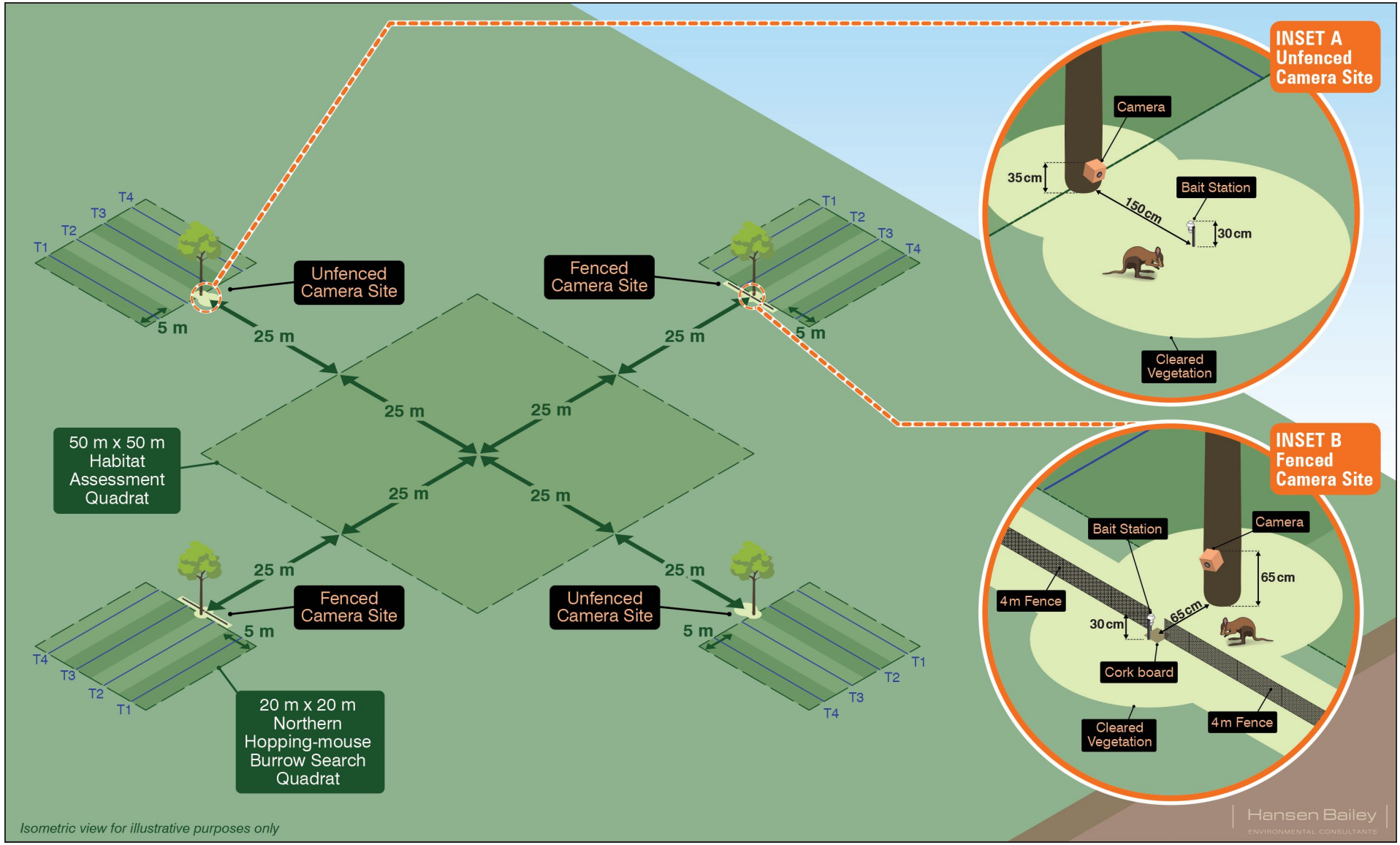
# FIGURES




SOUTHERN LEASE EXPLORATION PROGRAM

Small Mammal Research Project Sampling Sites

**FIGURE 4-1**




SOUTHERN LEASE EXPLORATION PROGRAM

Standard Layout of Small Mammal Research Project Sampling Sites

**FIGURE 4-2**

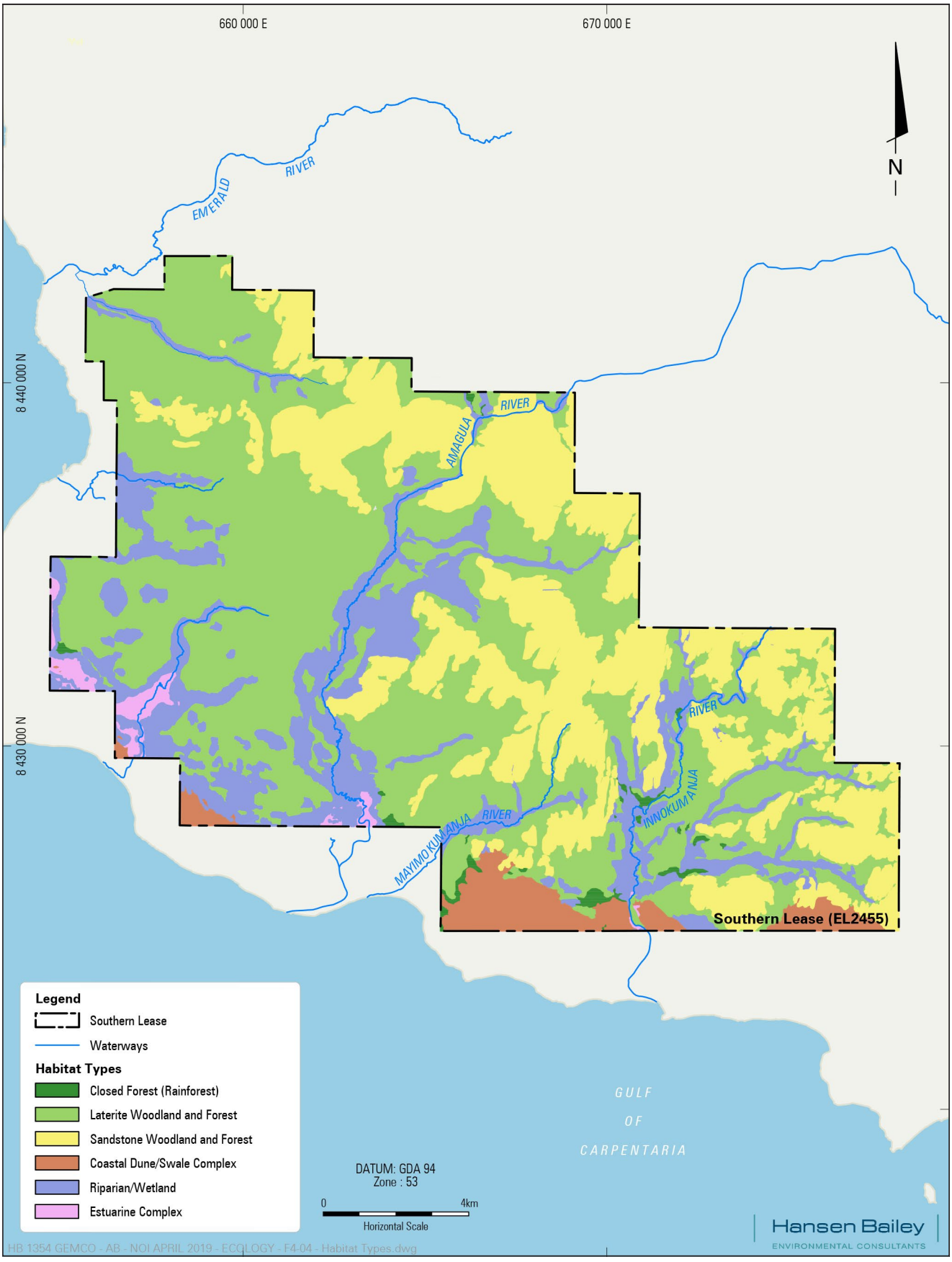
SOUTH32


SOUTH32

SOUTHERN LEASE EXPLORATION PROGRAM

Location of Small Mammal Research Project Sampling Sites near the "Cave Paintings"

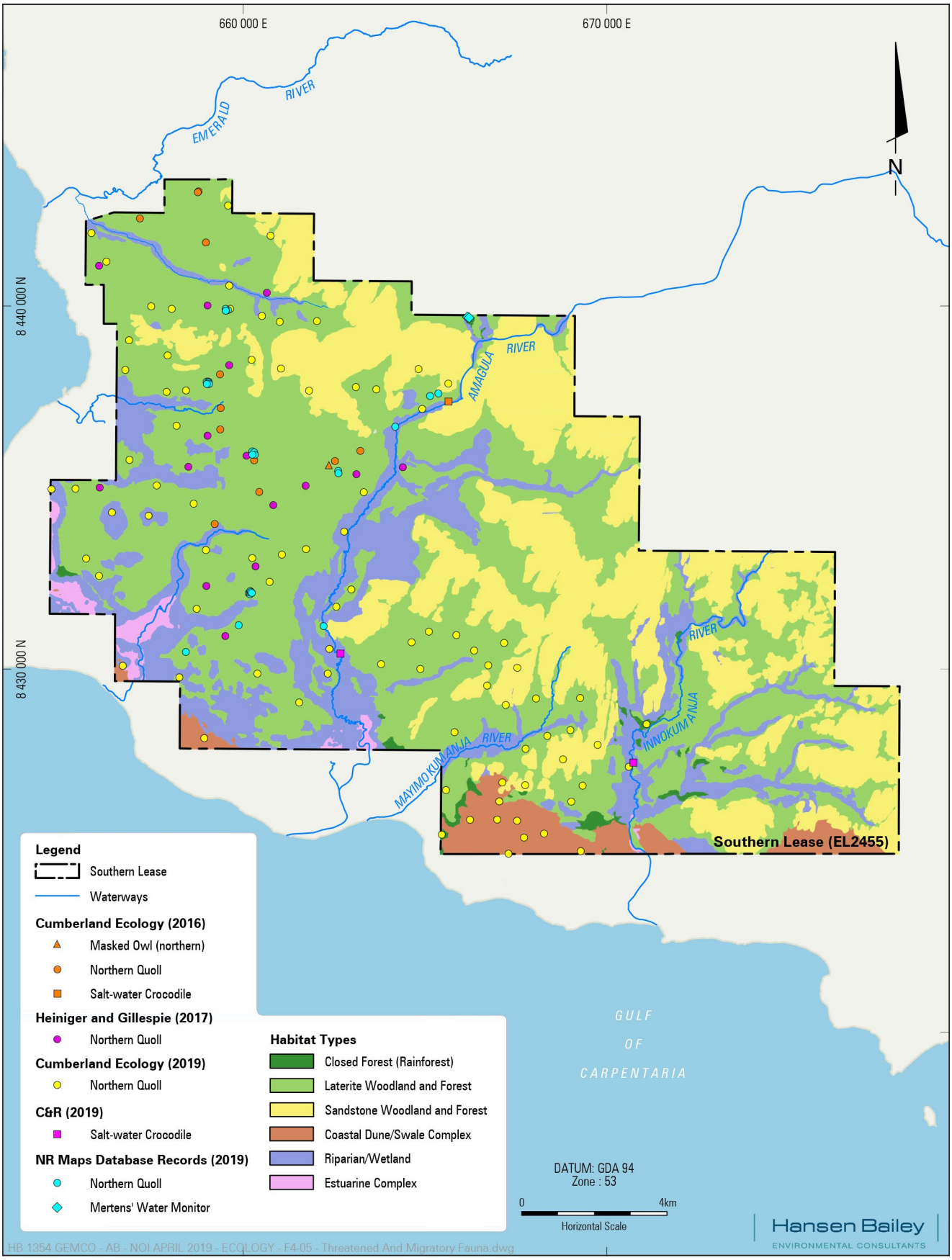
**FIGURE 4-3**




SOUTHERN LEASE EXPLORATION PROGRAM

Habitat Types

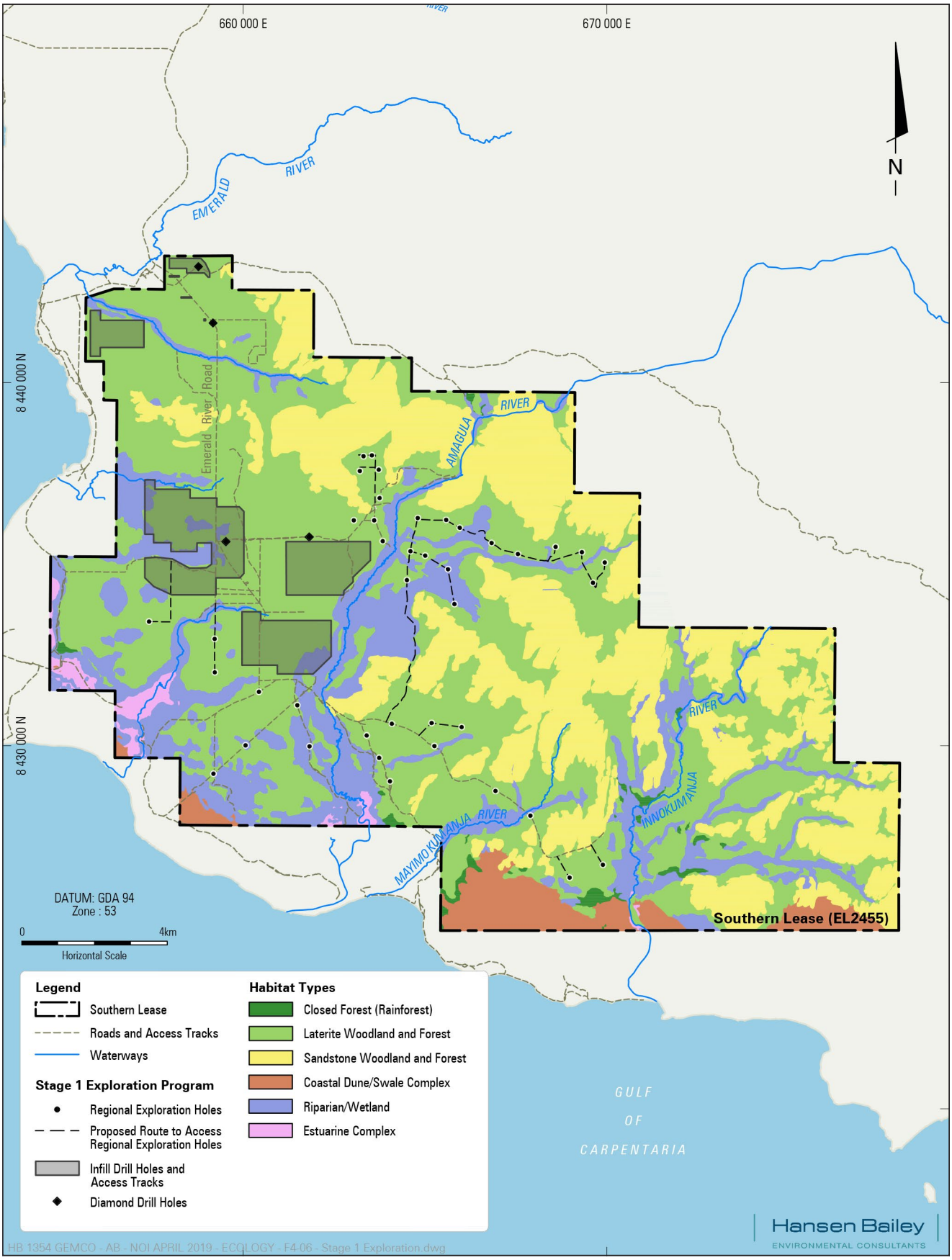
**FIGURE 4-4**




SOUTHERN LEASE EXPLORATION PROGRAM

Threatened and Migratory Fauna Records within the Southern Lease

**FIGURE 4-5**




SOUTHERN LEASE EXPLORATION PROGRAM

Layout of Stage 1 Exploration Program

**FIGURE 4-6**

# 5

# Social, Economic and Cultural Surroundings

# CONTENTS



## Tables



## Figures

# 5 SOCIAL, ECONOMIC AND CULTURAL SURROUNDINGS

## 5.1 INTRODUCTION

This section describes the socio-economic setting relevant to the Stage 1 Exploration Program (the exploration program) and discusses cultural heritage issues, including sacred sites and archaeology. This section draws on the Socio-economics Report (Hansen Bailey 2015) that was prepared for the Eastern Leases EIS for a description of the socio-economic setting as well as more recent documentation such as the Anindilyakwa Land Council's (ALC's) 2017/2018 Annual Report (ALC 2018) and census data. Several archaeological reports have also been prepared for the Southern Lease and these are described in this section.

## 5.2 LOCAL SETTING

The Southern Lease is located on Groote Eylandt in the Gulf of Carpentaria. Groote Eylandt is Aboriginal land under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA). The ALC is the land council for Groote Eylandt.

The Groote Eylandt Archipelago, which includes Groote Eylandt, Bickerton Island and a number of small, neighbouring islands, has a population of approximately 2,500 persons (Australian Bureau of Statistics 2017a). The Aboriginal Traditional Owners of the Groote Eylandt Archipelago are the Anindilyakwa People. The Anindilyakwa People are an amalgamation of two cultures, the Warnindilyakwa, and the Nunggubuyu (ALC 2019a). 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 (and sometimes only) language, and the land, people and culture are also referred to by this term.

The remote location of the Groote Eylandt Archipelago has fostered a strong attachment to traditional culture among the Anindilyakwa People. Ceremony and spirituality play a central role in Anindilyakwa life and traditional practices and cultural norms are still prominent on the Archipelago. Anindilyakwa People are proud and protective of their culture.

There are three main settlements on Groote Eylandt, namely the mining township of Alyangula, and the two Aboriginal settlements of Angurugu and Umbakumba.

There is a long history of Aboriginal settlement on Groote Eylandt, and more recent European settlement. The proponent's existing mine on Groote Eylandt was established in the 1960s and has been operating for over 50 years. The existing mine has a workforce of approximately 1,669, including 766 South32 employees and 903 contractors, and it plays a significant role in the economic development of Groote Eylandt. Royalties and a number of other related payments from the existing mine benefit the Traditional Owners of Groote Eylandt through investment in housing, infrastructure, services, and capacity development.

## 5.3 STAKEHOLDER ENGAGEMENT

The proponent has undertaken extensive stakeholder engagement in relation to the exploration program. This has included engagement with the ALC, as well as direct engagement with the clan groups that speak for the country within the Southern Lease. This consultation is discussed in the following section. There has also been consultation with key government regulators. Consultation with regulators is discussed in Section 1 – Introduction.

### 5.3.1 Consultation with the ALC and Traditional Owners

The proponent and the ALC signed an Exploration Agreement under ALRA for the Southern Lease in 2016. The Exploration Agreement is designed to ensure that exploration is undertaken in a manner that is respectful of the Traditional Owners' preferences and that areas considered by the Traditional Owners to be environmentally or culturally significant are protected. The signing of an Exploration Agreement was preceded by several years of discussions between the proponent, the ALC and Traditional Owners.

Since the signing of the Exploration Agreement, the proponent and the ALC have had regular discussions about proposed exploration activities in the Southern Lease. These include formal, quarterly meetings between the proponent and the ALC (termed Mining Liaison Committee Meetings). In addition to the attendees from the ALC and the proponent, Traditional Owner representatives from each clan are invited to be part of this committee. In these meetings, the proponent provides an update on activities undertaken in the Southern Lease and activities proposed to be undertaken. In addition to discussing the proponent's proposed activities, opportunities are identified for Traditional Owners to undertake site visits and assist with fieldwork. The *Southern Lease Small Mammal Research Project* (Appendix B) provided a number of opportunities for Traditional Owners to assist with fieldwork.

In addition to the formal Mining Liaison Committee Meetings, the proponent has undertaken consultation specifically in relation to the exploration program. These meetings included an update on the environmental surveys undertaken in support of the exploration program, and a discussion of proposed exploration activities. In some instances, a need was identified to undertake additional consultation, including on-country consultation.

In addition to the consultation described above, the Permit to Clear process (Section 2 – Project Description) includes informing the ALC of proposed exploration activities and obtaining the ALC's endorsement of the location of the activities. As part of this process, the ALC may arrange for a cultural monitor to visit the proposed clearing area and provide advice on areas that should be avoided for cultural reasons.

## 5.4 POTENTIAL SOCIO-ECONOMIC IMPACTS AND BENEFITS

As noted in Section 2 – Project Description, there is direct employment associated with the exploration program. The peak workforce required to complete the exploration program is up to 52 people, which includes existing employees and contractors. Contractors undertaking exploration activities may be existing residents of Groote Eylandt, or non-residents, employed on a fly-in and fly-out basis and accommodated in the proponent's accommodation village, located in Alyangula. The accommodation village has sufficient capacity for these contractors. There will be an opportunity for employment of Traditional Owners for the exploration work, particularly in defining the most appropriate access to regional exploration holes to avoid culturally sensitive areas, in clearing vegetation and as cultural monitors.

In addition, the ALC obtains significant financial benefit for exploration activities to compensate Traditional Owners for use of country, in accordance with the Exploration Agreement between the proponent and the ALC. These funds allow the ALC to work closely with Traditional Owners to build economic and social capacity by improving education outcomes, promoting well-being, supporting business development, and promoting cultural protection and transmission of knowledge.

Although the exploration program will provide employment opportunities and financial benefit to the ALC, it is acknowledged that these are short-term opportunities, given the short-term nature of the exploration program. The key significance of the exploration program from a socio-economic perspective, relates to its role in securing the long-term future of the proponent's operations on Groote Eylandt. The existing mine has been operating for over 50 years and is an integral part of the economy of Groote Eylandt.

The existing mine provides significant socio-economic benefits to the Traditional Owners, as well as the regional economy of the Northern Territory. The continuation of these benefits in the medium to long-term is dependent on additional manganese resources being developed and the Southern Lease is the key additional resource currently being evaluated by the proponent. Section 2 – Project Description provides an overview of the key socio-economic benefits of the existing mine.

The exploration program is not anticipated to give rise to any significant adverse socio-economic impacts, given that the workforce required for exploration is small and short-term and will be housed in existing accommodation facilities. The details of the exploration program have been agreed with the ALC and Traditional Owners as part of execution of the Exploration Agreement and during ongoing consultation. Obtaining this input from the ALC and Traditional Owners will ensure that exploration is undertaken in a manner that is respectful of the Traditional Owners' wishes. Consultation has included discussions in relation to the use of existing tracks and a process for obtaining the ALC's specific approval for any individual drill sites within 1 km of the Wurrumenbumanja Outstation (Figure 5-1).

## 5.5 SACRED SITES

The *Northern Territory Aboriginal Sacred Sites Act 1989* (NT) (Sacred Sites Act) is designed to protect sacred Aboriginal sites. Sacred sites are places in the landscape that have a special significance under Aboriginal tradition. They may include features in the landscape such as rivers, trees or rocky outcrops. Sacred sites often have a Dreaming association. The Aboriginal Areas Protection Authority (AAPA) is an independent statutory organisation established under the Sacred Sites Act, which is responsible for overseeing the protection of Aboriginal sacred sites.

The ALC has an anthropology department, which includes male and female cultural anthropologists. These anthropologists work with the Traditional Owners to research and record traditional culture, and identify areas where access is restricted for cultural reasons (ALC 2019b). The proponent has been working with the ALC to identify areas in the Southern Lease which have cultural significance in order to ensure that exploration does not give rise to any impacts on sacred sites. This process has included:

- The Exploration Agreement (signed in 2016) which includes a map identifying culturally sensitive areas (including sacred sites) that were known at the time. This map was informed by anthropological work and consultation.
- As detailed in Section 2 – Project Description, the proponent developed a potential exploration area that takes account of environmental and cultural constraints, including the culturally sensitive areas identified by the ALC. Restricting exploration to this area is a key mechanism for ensuring that no exploration is undertaken in areas that have been identified as culturally sensitive.
- Consultation was undertaken with the ALC and Traditional Owners in relation to the design of the exploration program. This included consultation in relation to culturally sensitive areas (including sacred sites) and has included involvement of the ALC's anthropologist and on-country consultation with Traditional Owners. This consultation is ongoing, and further on-country consultation is proposed in the coming months.
- As detailed in Section 2 – Project Description, the proponent has a Permit to Clear process that is followed before any areas are disturbed. This includes flagging of areas proposed to be cleared and then submission of proposed clearing plans to the ALC for approval. As part of this process, the ALC invites cultural monitors (i.e. Traditional Owners acknowledged as being able to speak on behalf of the country) to inspect areas proposed to be cleared. In the case of the proposed regional exploration holes, although no clearing of mature trees is proposed, the route to be followed to access the regional exploration holes will be flagged. The proponent intends for cultural monitors to be present when the route is flagged so that they can confirm that the alignment of the route is suitable from a cultural perspective.

The process described above has been designed to ensure that the proponent exercises a duty of care in relation to sacred sites. Depending on the final outcomes of this work, it may be necessary to remove or relocate some of the exploration holes that are proposed in this Notice of Intent (NOI).

In addition to exercising a duty of care in relation to sacred sites, the proponent intends to ultimately obtain an Authority Certificate for the Southern Lease. An Authority Certificate provides conditions for any works undertaken on or near sacred sites. Although it is not a legal requirement to be in possession of an Authority Certificate, having an Authority Certificate and undertaking the work in accordance with the requirements of the certificate indemnifies the holder against prosecution under the Sacred Sites Act for damage to sacred sites in the area of the Authority Certificate. The AAPA is responsible for issuing Authority Certificates under the Sacred Sites Act. The first step in obtaining an Authority Certificate will be the preparation of an Instructions Report to clearly document all of the sacred sites in the Southern Lease. The Instructions Report will then be submitted to AAPA in support of an application for an Authority Certificate. The proponent is currently in discussions with the ALC in relation to preparing an Instructions Report for the Southern Lease. In the interim, the proponent will exercise a duty of care to ensure that the exploration program does not give rise to impacts on sacred sites.

## 5.6 ARCHAEOLOGY

### 5.6.1 Overview of Regulatory Requirements

Several pieces of legislation establish lists or registers which offer statutory protection to places and objects that are considered to have cultural values. The Federal government registers are established under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) (ATSIHP Act). The *Heritage Act 2011* (NT) covers all places and objects of heritage value in the Northern Territory. The relevant Acts are discussed in the following sections.

#### Environment Protection and Biodiversity Conservation Act

The EPBC Act, which is administered by the Federal Department of the Environment and Energy (DoEE), provides for the protection of a hierarchy of heritage places and objects that are listed in three registers. These include the World Heritage Register, the (Australian) National Heritage Register and the Commonwealth Heritage Register. The EPBC Act sets out a framework for the protection of places and objects listed on these registers.

#### Aboriginal and Torres Strait Islander Heritage Protection Act

The ATSIHP Act is also administered by DoEE and provides protection for Aboriginal cultural heritage. Under this Act, the Environment Minister can make declarations of preservation in relation to Aboriginal cultural heritage. Declarations can be made if the Minister is satisfied that the area is a 'significant Aboriginal area' and is under threat of injury or desecration.

#### Heritage Act

The *Heritage Act 2011* is administered by the Heritage Council of the Northern Territory Department of Tourism, Sport and Culture. It is a requirement of the *Heritage Act 2011* that a Work Approval be obtained from the Heritage Council prior to any disturbance of a heritage place or object that is declared or protected under this Act.

The *Heritage Act 2011* provides protection for the following two classes of cultural heritage:

- All places and objects formally assessed and added to the Northern Territory Heritage Register; and
- All Aboriginal and Macassan places and objects (whether previously documented or not), as listed in the Aboriginal and Macassan Sites Database.

### 5.6.2 Archaeological Assessment

Public registers were searched to determine if there are any objects or places protected on public registers. In addition, archaeological reports pertaining to the Southern Lease were reviewed. These are listed in Table 5-1.

**Table 5-1 Archaeological Studies Undertaken in the Southern Lease**

| STUDY | SCOPE OF STUDY |
|---|---|
| Welch, D (2013) *Groote Eylandt Rock Art Survey 2013.* Prepared for the Anindilyakwa Land Council | This study documented the location of Rock Art sites within the south-western part of Groote Eylandt, including the Southern Lease. The intent was to establish their locations, recommend appropriate management measures (particularly in relation to future exploration in the Southern Lease), and collate information for both the Northern Territory Heritage Site Register and various local cultural community centres. |
| Welch, D (2014) *South Central Survey, Groote Eylandt Rock Art*. Prepared for the Anindilyakwa Land Council | This study documented the location of Rock Art sites within the south-western part of Groote Eylandt, including parts of the Southern Lease that were not assessed as part of the Welch (2013) study. The intent was to establish their locations, recommend appropriate management measures (particularly in relation to future exploration in the Southern Lease), and collate information for the Northern Territory Heritage Site Register and local cultural community centres. |
| SHIM (2014) *A Report on an Archaeological Survey of the South West of Groote Eylandt including the Southern Leases Conducted in 2013*. Prepared for the Anindilyakwa Land Council | This study documented the archaeology of the south-western part of Groote Eylandt, including the Southern Lease. This included surveying for artefact scatters, stone arrangements and quarries, shell middens, rock art, and contact sites. The intent was to provide a baseline of cultural heritage sites, particularly in relation to future exploration or mining activities in the Southern Lease. |
| Martin-Stone, K (2016) *An archaeological assessment of south-east Groote Eylandt, July 2015 – March 2016*, a report to the Anindilyakwa Land Council, v1.2 July 2016 | This study documented the archaeology of the south-eastern part of Groote Eylandt, including eastern sections of the Southern Lease. This included surveying for rock art, isolated artefacts, occupation shelters, stone arrangements, shell scatters and middens, and burial sites. The intent was to combine results with those of earlier studies to provide a baseline of cultural heritage and to confirm a predictive model for archaeology site distribution in the area. |

## 5.6.3 Results

### Database Searches

The results of database searches were as follows:

- The World Heritage Register, the (Australian) National Heritage Register and the Commonwealth Heritage Register do not list any sites within or in close proximity to the exploration program.
- No declarations under the ATSIHP Act have been made for areas within or in close proximity to the exploration program.
- The Northern Territory Heritage Register lists the following sites, which are shown on Figure 5-1:
  - The Emerald River Cemetery, which is located in the northern part of the Southern Lease; and
  - The site of the Emerald River Mission, which is located to the west of the Southern Lease.

### Indigenous Archaeological Sites

Figure 5-1 shows the location of Indigenous archaeological sites recorded from the archaeological studies described in Table 5-1. None of the archaeological sites are located within the area proposed to be cleared as part of the exploration program. The database searches did not reveal any Indigenous archaeological sites within or in close proximity to the exploration program. No impacts on Indigenous archaeological sites are therefore predicted. Nevertheless, a procedure for unexpected finds will be adopted, as detailed in Section 5.6.4.

### Non-Indigenous Archaeological Sites

The Emerald River Cemetery is located within the Southern Lease, to the south-east of the former Emerald River Mission, also known as Yedikba Mission. The cemetery contains 13 graves, including an ornate headstone for a Reverend Ernest Wynne Evans from the Church Missionary Society. The boundary of the cemetery has been accurately surveyed and is shown on Figure 5-1. As indicated on this figure, the exploration program is located beyond the boundary of the cemetery and no impacts from exploration are predicted. The exploration program is located at least 500 m from the site of the former Emerald River Mission (Figure 5-1) and no impacts from exploration are predicted.

Although not listed on any heritage registers, it is noted that the Emerald River Road and an access track that crosses it were originally World War II airfields (Figure 5-1). Given that these areas have been used as tracks for approximately 70 years, there is little evidence remaining of the original airfield. The vegetation surrounding the original airfields has now regenerated. The proponent undertook exploration in this area in 2016 in accordance with its Mining Management Plan. As part of this work an inspection for unexploded ordnances was undertaken. None were located, although there were pieces of scrap metal and old drums in the area. The proposed drilling in this area is not expected to result in any impacts on heritage values, given the current state of the airstrip. Nevertheless, a procedure for unexpected finds will be adopted, as detailed in Section 5.6.4.

## 5.6.4 Mitigation Measures

Mitigation measures include the following:

- Cultural monitors will be provided an opportunity to inspect areas prior to clearing.
- As part of the workforce induction process, there is a module on cultural heritage and cultural awareness training.
- In the event that the proponent's employees or contractors suspect that they have uncovered an unexpected archaeological find, the following process will apply:
  - Immediately cease disturbance of any areas surrounding the find;

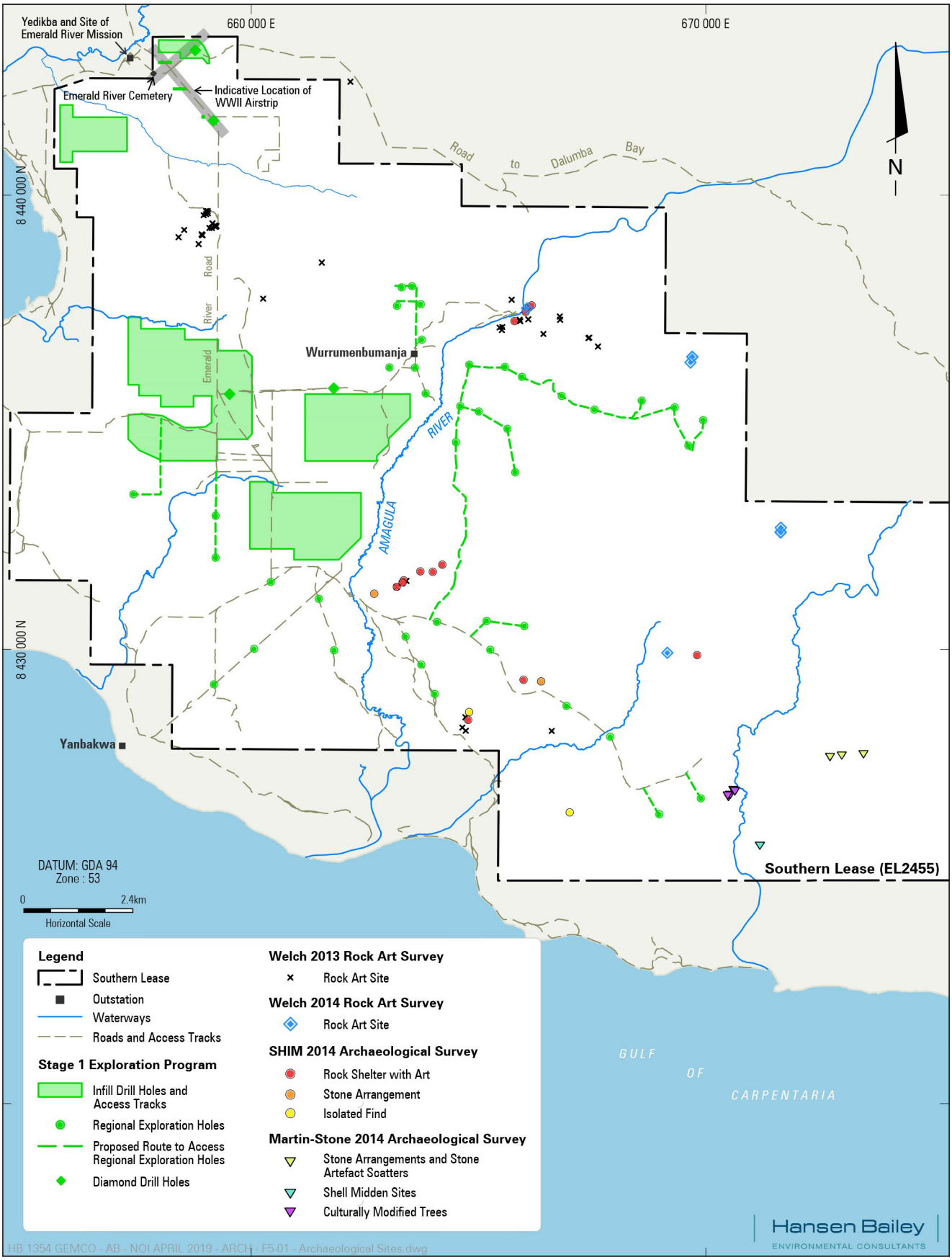
- If it is considered that the find is at risk of being inadvertently damaged by exploration activities, a temporary fence/barricade will be erected around the find with GPS coordinates obtained;
- The ALC will be notified of the discovery of areas of potential archaeological significance immediately following the discovery, and prior to any disturbance;
- The ALC, and if necessary, a suitably qualified archaeologist will be requested to inspect the find and determine its significance; and
- Should the find be of archaeological significance, the Northern Territory Heritage Council will be notified, and appropriate mitigation strategies will be developed in consultation with the ALC and the Northern Territory Heritage Council.

These measures will help mitigate impacts in the unlikely event that previously unrecorded sites of cultural heritage significance are located during disturbance associated with the exploration program.

## 5.7 CONCLUSION

The objective for the Social, Economic and Cultural Surroundings environmental factor is to "*Protect the rich social, economic, cultural and heritage values of the Northern Territory.*" (NT EPA 2018a). Section 5.4 explains that the exploration program is anticipated to provide socio-economic benefits. Section 5.5 and Section 5.6 describe the potential impacts of the exploration program on sacred sites and archaeological evidence. These sections conclude that the exploration program will not have a significant impact on sacred sites or archaeological evidence. No significant adverse impacts on the social, economic, cultural and heritage values of the Northern Territory are therefore predicted.

# FIGURES




SOUTHERN LEASE EXPLORATION PROGRAM

Documented Archaeological Finds

**FIGURE 5-1**

SOUTH32

# 6

# Environmental Management

# CONTENTS



## Tables

# 6 ENVIRONMENTAL MANAGEMENT

## 6.1 INTRODUCTION

This section describes the proposed environmental management measures that will be developed and implemented to address the potential environmental impacts associated with the Southern Lease Stage 1 Exploration Program (the exploration program).

## 6.2 ENVIRONMENTAL MANAGEMENT FRAMEWORK

### 6.2.1 Environmental Policy and Standards

The proponent places the highest value on being a responsible operator and is committed to minimising the impact of its business on the environment. The proponent adheres to strict internal environmental management standards, and has an environmental management system in place that is consistent with the requirements of *ISO 14001 Environmental Management Systems – Requirements with Guidance for Use*.

The proponent has internal documentation which specifies the minimum mandatory environmental standards and performance requirements for its operations. These standards and procedures are relevant to the management of land, biodiversity, water, air, greenhouse gas, hydrocarbons and waste. Various internal targets and key performance indicators (KPIs) are routinely set by management for site operations and departments. Monitoring and internal reporting of results relative to these KPIs occurs monthly in order to review the effectiveness of management and mitigation strategies. In the event that a non-compliance (or a notifiable incident occurs), the proponent reports these incidents to the Anindilyakwa Land Council (ALC) and to the Northern Territory Department of Primary Industry and Resources (DPIR) consistent with Section 29 of the *Mining Management Act 2001* (NT).

In addition, South32 has a Sustainability Policy which guides environmental and social management as well as sustainability planning for the business. The policy is supported by a number of standards which assist to minimise environmental and social impacts, support regulatory compliance and drive continual improvement in regards to environmental performance. The standards include the:

- Environment Standard (and the associated Implementation Guide);
- Health, Safety, Environment, and Community Reporting Standard;
- Community Standard; and
- Closure Standard.

These South32 standards apply to the existing mine and will also apply to the exploration program, as relevant.

### 6.2.2 Mining Management Plan

Prior to commencing the exploration program, it will be necessary for the proponent to submit a Mining Management Plan (MMP) to DPIR in support of an approval for authorisation under the *Mining Management Act 2001.* DPIR has published a guideline on the required structure and content of the MMP. The MMP will be prepared in accordance with this guideline. The MMP will include a description of the exploration program and the environmental management measures to be adopted to mitigate and manage potential impacts (consistent with those described in this NOI).

### 6.2.3 Environmental Incident Reporting

The proponent has well established procedures in place for reporting and investigating environmental non-conformances and hazards. All environmental incidents are recorded on an internal database, risk ranked, and investigated to determine the cause. Corrective actions are then implemented and monitored. Key learnings from the incidents are noted on the internal database, and the learnings are communicated to the workforce via email and during daily pre-start safety meetings, and are incorporated into training and site induction processes. In accordance with the *Mining Management Act 2001*, environmental incidents must be reported to the DPIR as soon as possible. The MMP will also detail any environmental incidents from the previous reporting period.

### 6.2.4 Community Complaints

The proponent encourages community members to submit any complaints or issues so they may be investigated and resolved as appropriate. Where necessary, this may include monitoring or changes to environmental management plans and procedures.

The proponent also liaises closely with the ALC regarding community issues, and undertakes quarterly forums with the ALC to raise, discuss and communicate any environmental issues.

### 6.2.5 Review and Auditing

The environmental management framework encourages continual improvement in environmental performance through the review and, if necessary, revision of environmental management plans or procedures. Internal and external compliance audits of the environmental management framework are conducted to ensure compliance with the proponent's mandatory environmental standards and regulatory requirements.

### 6.2.6 Environmental Training and Education

The proponent is committed to educating all employees about their individual responsibilities regarding health, safety and environmental management, through specific induction, training and education programs. An important component of the existing site induction program covers targeted environmental issues, including:

- Key environmental legislation and other requirements, and the consequences of non-compliance;
- Potential environmental impacts across the site and at each work area, and how the proponent controls these impacts;
- Groote Eylandt's threatened species and the importance of the island's bio-security (Cane Toads, weeds etc.);
- Measures to increase energy efficiency and reduce greenhouse gas emissions;
- The importance of water efficiency;
- The importance of managing dust;
- Where to dispose of waste appropriately and the proponent's land based spill response procedure; and
- The importance of, and how to, report environmental incidents/hazards.

## 6.3 ENVIRONMENTAL MANAGEMENT MEASURES

### 6.3.1 Introduction

Given the proponent has been undertaking exploration on Groote Eylandt for over 50 years, there are a number of procedures in place that assist to manage the potential environmental impacts of exploration. These procedures will be used for the exploration program in the Southern Lease, where relevant. These procedures and an overview of what they include are listed in Table 6-1.

**Table 6-1 Environmental Management Procedures Relevant to Exploration**

| PROCEDURE | OVERVIEW OF CONTENT |
|---|---|
| Exploration and Weed Hygiene Procedure (PRO-4162) | A procedure for the purposes of inspecting and de-contaminating all mine site and contractor vehicles and equipment travelling to and from exploration areas. The procedure ensures that mining and exploration areas are not cross-contaminated with invasive species. |
| Quarantine Inspection Procedure (PRO-3198) | A procedure for the purposes of preventing new exotic flora and fauna from establishing on Groote Eylandt. The procedure provides guidance on how to correctly inspect barges and their cargo for invasive species such as weeds and the Cane Toad. |
| Permit to Clear and Burn Vegetation (PRO-4149) | A procedure that describes the process to record and assess vegetated areas prior to clearing and burning on mining or exploration leases so that environmentally and culturally significant areas can be identified and protected. The information collected is also used for the purpose of rehabilitation. |
| Vegetation Clearing Procedure (PRO-4192) | A procedure that provides the standard requirements for vegetation clearing associated with mining operations. The procedure ensures that clearing will be conducted in a manner that allows for successful rehabilitation of disturbed areas. |
| Land Based Spill Response (PRO-3115) | A procedure that describes the safe and effective process to be used in response to spills of materials (both on and off lease areas) which have the potential to cause environmental harm. |
| Exploration – Collar Cutting, Capping & Plugging (SWI-21441) | A procedure that describes the process of grouting exploration drill holes. |

In addition to the procedures outlined in Table 6-1, the proponent will also manage the key environmental impacts of the exploration program using a suite of management measures that are also used at the existing mine. These management measures relate to awareness training, clearing procedures, and the management of weeds invasive species, wastes, and hazardous materials. These management measures are described in the following sections.

## 6.3.2 Awareness Training

The proponent has established induction and training procedures in relation to environmental management. All personnel (including contractors) who conduct vegetation clearing and exploration activities are provided with awareness training in the identification of the threatened species that may be encountered in the area, including specific habitat features of these species (such as spoil heaps or tree hollows). Contamination risk management, including spill response training, is also completed by all personnel at the time of induction and is included as a hazard for consideration as part of the Job Safety Analysis and Take 5 processes.

## 6.3.3 Clearing Procedures

Clearing will be undertaken in accordance with the proponent's Permit to Clear process. The process is described in Section 2 – Project Description and includes undertaking pre-clearance surveys to identify or confirm environmentally and culturally sensitive areas, as well as consultation with the ALC to confirm the locations of exploration holes prior to any clearing being undertaken. Pre-clearance surveys are undertaken by experienced ecologists.

Pre-clearance surveys aim to delineate buffers (e.g. around waterways and/or threatened species habitat features) and mark buffers with flagging tape. Compliance with these buffers during clearing is assured through a spotter working with the dozer operator. The spotter's role is to ensure compliance with the various restrictions identified

during pre-clearance surveys, as well as ensuring the dozer operator maintains the correct alignment. The spotter has a GPS tablet with georeferenced maps containing the coordinates of all pre-clearance constraints. This information is also programmed into the dozer's GPS unit.

The following measures will also be implemented in order to minimise clearing impacts and unnecessary disturbance to native vegetation. The measures will be implemented as part of the proponent's clearing process:

- The limits of clearing will be delineated prior to the commencement of any clearing and marked clearly on plans and on the ground;
- Clearing will be confined to the smallest practicable area required to safely perform the task;
- Disturbance of the topsoil will be kept to a minimum; and
- Large mature trees will be avoided, where possible.

### 6.3.4 Rehabilitation Monitoring

The drill pads and tracks will be inspected approximately 6 – 12 months after they are rehabilitated. The inspections will identify any erosion or subsidence of drill holes, and will determine if revegetation is occurring or if any weeds are present. Photographic monitoring records of representative sites will be maintained by the proponent. The ALC will also be provided with an opportunity to inspect rehabilitated exploration areas to confirm the rehabilitation has been undertaken to the satisfaction of the Traditional Owners.

### 6.3.5 Weed Management

The proponent has in place a Weed Management System (WMS) which is consistent with Northern Territory legislation. The current WMS is supported by a number of internal procedures designed to manage and control weeds on the proponent's mining and exploration tenements and in the Alyangula township. These procedures are readily available to the proponent's workforce and contractors and, for the purposes of the exploration program, will be cross-referenced in associated contractual obligations. The procedures include:

- Weed Management Manual (MAN-4051);
- Vegetation Clearing Procedure (PRO-4192);
- Exploration and Weed Hygiene Procedure (PRO-4162);
- Quarantine Inspection Procedure (PRO-3198); and
- Vehicle and Equipment Inspection Checklist (GEM-FRM-3872).

These procedures are regularly reviewed.

Given that there are currently very few weeds in the Southern Lease, weed management activities will focus on employee awareness, preventing the introduction of weeds, and the early detection and eradication of weeds before they establish. The activities described below will be undertaken to reduce the potential risk of introducing weeds into the Southern Lease.

#### Monitoring

- A pre-clearance survey will be undertaken of the area to be cleared. This survey will include identifying any weeds that exist in the area to be cleared. The location of these weeds will be GPS recorded and information will be forwarded to the proponent's Exploration and Environment Department as well as the Rehabilitation and Mine Services Team. Any weeds that are identified will be sprayed or removed prior to clearing.
- Areas of exploration rehabilitation will be monitored for the presence and distribution of weeds. The location of weeds in areas of exploration rehabilitation will be GPS referenced in monitoring reports and recorded as part of the mine site weed management register. Recommended actions that are necessary for controlling weeds will also be recorded and scheduled as part of the work program for the proponent's Rehabilitation and Mine Services' Team.

- Weeds that are recorded within the Southern Lease, either through pre-clearance surveys, monitoring of rehabilitation, or through incidental sighting of weeds will be recorded in the proponent's geographic information system (GIS) database. The database will also include a record of weed control actions that are required in response to the sighting, a record of the actions that have been undertaken, and details of follow up monitoring.

## Preventing the Spread of Weeds

The following measures will be undertaken within the Southern Lease to reduce the spread and establishment of weeds:

- Vehicles will be subject to washdown and inspection procedures before entering the Southern Lease. This will apply to all mine and contractor vehicles that will be working in these areas, including drill rigs, scrub dozers, light vehicles and other support vehicles.
- The existing vehicle wash bay facility is located at the mine industrial area adjacent to the maintenance workshop and at the Ndunga Industrial Facility adjacent to the Rowell Highway. The inspection procedure involves checking the entire piece of equipment for noticeable traces of soil/seeds and plant material. This includes checking the deck area, wheel arches, belly plates, front grill and radiator. Plant or equipment that are observed to contain seeds or plant material will be refused access to the Southern Lease until it has been adequately cleaned.
- Personnel working on the Southern Lease will undertake a daily check for weed seeds on work clothes or boots prior to entering the Southern Lease.
- Contractors and suppliers will be required, as part of the proponent's standard supply contract, to ensure that all plant, vehicles and equipment have been adequately washed down prior to arrival on the island. Prior to arrival on the island, the proponent's nominated representative will be required to inspect all plant and equipment on the Australian mainland to ensure compliance with washdown requirements.

## Weed Control

Weed control will include the following measures:

- Prioritising weed control actions in newly established rehabilitation areas, high traffic areas and park up areas.
- The control methods used will depend on the weed species, and the location and extent of the weed infestation. An integrated weed management approach which considers appropriate land management practices and physical and chemical controls is currently in place at the existing mine and will be applied to the exploration program, where deemed appropriate. Control activities undertaken within the active mining areas include, but are not limited to, hand weeding and the use of helicopter and/or vehicle mounted spray units for the application of selective herbicides.
- The fire management regime can also be an effective tool in controlling and preventing the spread of weeds. The development of a fire management regime will be considered for the Southern Lease in consultation with the Traditional Owners, via the ALC as part of a broader program of works for the existing mine.

## Communication and Reporting

Reporting and consultation in relation to weeds will include the following:

- The proponent will continue to facilitate ongoing consultation with the ALC on matters relating to weed management.
- The proponent will report on weed management activities as part of the Mining Management Plan prepared under the *Mining Management Act 2001*.
- Site-wide Communication Briefs will be used to alert workers and the Groote Eylandt community of any new weed threats, and to provide weed identification information.

- As part of the site inductions and pre-start safety briefings, all exploration staff and contractors will be made aware of their responsibilities regarding weed management to ensure there is an ongoing and general awareness of the risks of weed incursions.

### Weed Management Responsibilities

The following outlines the current internal responsibilities regarding weed management, with a similar structure to be applied to the exploration program:

- The proponent's Rehabilitation Mine Services team has overall responsibility for weed management within the proponent's mining, exploration, township and special purpose leases.
- The proponent's Rehabilitation Mine Services team advises and consults on potential weed issues pertaining to rehabilitation. Rehabilitation Mine Services is responsible for updating and reviewing weed management procedures on an annual basis.
- The proponent's Exploration Team is responsible for implementation of the weed management strategy throughout the proponent's exploration areas in a manner that achieves the most effective result. The strategy is implemented in collaboration with the proponent's Rehabilitation Mine Services Team.
- The proponent's Supply Department is responsible for ensuring suppliers are made aware and comply with the proponent's requirements in relation to weed management.

## 6.3.6 Cane Toad Management

The proponent has a Cane Toad Management Plan and associated quarantine procedures in place, which would apply to the exploration program. The management plan includes monitoring, and, in the event of a Cane Toad being found, reporting and disposal procedures. Current Cane Toad management activities include:

- Cane Toad awareness programs conducted through:
  - Site inductions;
  - Inductions of airport and barge personnel;
  - Contractor inductions prior to arrival on Groote Eylandt;
  - 'Keep Groote Cane Toad Free' signage at the airport, the main road in Alyangula, throughout the accommodation facilities, mess facilities and at the mine site and port;
  - Community information posters in Alyangula which include the process to be adopted in the event of a Cane Toad being sighted;
  - Information cards on Cane Toads being provided in airplane seat pockets for all commercial flights to Groote Eylandt, and for the proponent's charter flights;
  - In-flight announcements by flight attendants for all commercial flights to Groote Eylandt, and for the proponent's charter flights; and
  - Sitewide Communication Briefs.
- Barge inspections of every barge coming to Milner Bay are undertaken by barge operators. The proponent's Environment Team, together with the ALC rangers, also undertake periodic inspections of the barges to ensure compliance with quarantine protocols.
- Lockers are provided to fly-in fly-out staff to store work boots and other luggage on the island, as a means of reducing the probability of accidentally transporting toads.

- Cane Toad-proof fencing designed to contain and prevent toad movement surrounds the perimeter of the shipping yards in Milner Bay and Darwin. The fences are inspected on a monthly basis, and repairs are undertaken as required, to ensure the integrity of the fencing. The perimeter fence was upgraded in 2018 and continues to serve as an effective barrier in the island wide defence and management of potential Cane Toad incursions.

Cane Toad acoustic monitoring devices (designed by the University of Queensland) and cage traps (designed by Frogwatch) are currently being used on the proponent's mineral leases and also in the Alyangula Township. The traps were constructed as a part of a community development program, which was a partnership between the proponent, the ALC, James Cook University and the University of Queensland. The acoustic monitoring devices involve broadcasting the distinctive male Cane Toad mate attraction call, and making use of real time Cane Toad recognition software to detect if there is a response. Should a Cane Toad be detected, a message is transmitted via email or text message to the proponent's Environment Department, which will respond and inspect the trap and surrounding area. The proponent is responsible for monitoring the Cane Toad traps within its mineral leases and within Alyangula, and the ALC Rangers are responsible for all other traps across the Groote Eylandt archipelago.

All Cane Toad incidents which occur within Alyangula or the proponent's mineral leases are recorded by the proponent. Cane Toad incidents include interceptions of Cane Toads during quarantine inspections, reported or suspected toad sightings and eradication of toads. Recording incidents in this way enables quantification of the risk by determining the frequency and type of incident so that future planning can be improved. The proponent also undertakes regular reviews of quarantine procedures to confirm their adequacy and make recommendations for their continuous improvement. These reviews are undertaken by trained and experienced quarantine officers.

### 6.3.7 Waste Management

The proponent has a waste management system in place for the existing mine. Waste generated by the exploration program will be managed in accordance with this system. The waste management system is based on the regulatory requirements, values and principles of the Northern Territory's *Waste Management and Pollution Control Act 1988* (NT)*, Waste Management and Pollution Control (Administration) Regulations 1998* (NT)*,* and the *Waste Management Strategy for the Northern Territory 2015-2022* (NT EPA 2015)*.*

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; 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 exploration program is not expected to create a significant volume of wastes. All wastes generated will be managed in accordance with the existing waste management system.

### 6.3.8 Hazardous Materials Management

The only significant hazardous material / substance required for the exploration program is diesel fuel, which will be stored at the fuel storage facilities located at the existing mine. Diesel will be required to refuel drill rigs, dozers, and other vehicles and equipment that remain within the exploration area, such as small diesel generators used for night-lighting.

Diesel will be transported and stored in 5000 L tanks on support trucks. The proponent has refuelling procedures in place to prevent and control any spills that may occur during vehicle refuelling. In addition, the proponent will ensure that:

- Spill cleanup kits are available on support trucks;
- Staff receive appropriate training in the use of spill cleanup kits;

- Any spillages which may result during refuelling activities are contained; and
- Contaminated are materials removed and disposed in accordance with the existing mine procedures.

Should other hazardous substances (or dangerous goods) be required during the exploration program, the transport, use and disposal issues will be planned and managed prior to use on site and appropriate measures implemented in accordance with existing mine procedures and relevant guidelines and legislation.

# 7

# Glossary

# 7 GLOSSARY

The following terms are commonly used throughout this Notice of Intent. Further explanation or description may be provided in the main report or appendices.

| TERM | DEFINITION |
|---|---|
| Aboriginal Freehold Land | Land declared under *Aboriginal Land Rights (Northern Territory) Act 1976* (NT) (ALRA) to be Aboriginal Land, held as freehold tenure. On Groote Eylandt, this land is held by a Land Trust as established under ALRA |
| Aquifer | Rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs |
| Archipelago | A group of many islands in a large body of water |
| Biodiversity | The diversity of different species of plants, animals and micro-organisms |
| Catchment | The surface drainage area from which a river, stream or reservoir receives its water |
| Clan | A group of people generally related by blood or marriage. It is an important unit in Aboriginal society, having its own name and territory, and is the land-owning unit |
| Cretaceous | Relating to or denoting the last period of the Mesozoic era, between the Jurassic and Tertiary periods |
| Diamond drilling | A method of drilling which uses a diamond impregnated (hollow) core bit to obtain core samples for detailed geological analysis |
| Ecosystem | An interacting system of animals, plants, other organisms with non-living parts of the environment |
| Ephemeral | Relating to a waterway with defined bed and banks, which flows only intermittently after rain |
| Erosion | The wearing away of land surface by wind or water |
| exploration program | The Stage 1 Exploration Program, including regional exploration drilling, infill drilling and diamond drilling. The indicative layout of the exploration program is shown on Figure 1-3 |
| GEMCO | Groote Eylandt Mining Company Pty Ltd, the proponent |
| Geochemical | Chemical compositions related to the geology of an area or sample |
| Geological | Relating to the earth, the rocks of which it is composed, and the changes which it has undergone or is undergoing |
| Groundwater | Water found beneath the surface of the ground |
| Habitat | The native environment where a given animal or plant lives or grows, often described in terms of geography, climate and vegetation |
| Indigenous | Defined as Aboriginal and Torres Strait Islander |
| Infill drilling | A form of drilling, commonly used in exploration programs to provide information on the manganese mineralisation (i.e. depth, thickness and quality). Infill drilling is to be undertaken using a Reverse Circulation (RC) drill rig. |
| Laterite | A soil type rich in iron and aluminium, formed in hot and wet tropical areas |

| TERM | DEFINITION |
|---|---|
| LiDAR | Light Detection and Ranging, is a remote sensing survey method |
| Microhabitat | Refers to very small, specialised habitats, such as a clump of grass or a space between rocks |
| Mitigation | The act of lessening in intensity, to prevent or make less severe |
| MNES | 'Matters of National Environmental Significance' that are listed under the EPBC Act |
| Moiety | A system in Australian Aboriginal culture that divides all the members of a tribe, such as the Anindilyakwa People, into two groups. A person is born into one or other group and this does not change throughout their life |
| Open cut mining | Process used to remove minerals found over a large area, close to the surface. The mine is dug downward in benches or steps |
| Outstation | Small remote Aboriginal settlement with varying levels of occupation |
| Perennial | Relating to a waterway with defined bed and banks, which flows all year |
| Potential exploration area | The maximum extent of future exploration within the Southern Lease, as shown on Figure 2- 7 |
| Potential mineralised area | Area in which manganese mineralisation is possible, as shown on Figure 2-7 |
| Proterozoic | Noting or pertaining to the latter half of the Precambrian Era, from about 2.5 billion to 570 million years ago, characterized by the appearance of bacteria and marine algae |
| Quaternary | The period of geological time beginning two to three million years ago and extending to the present |
| Regional exploration drilling | To be undertaken in the more remote areas of the Southern Lease using a low impact aircore drill rig. Small samples for preliminary analysis of the presence or absence of manganese will be collected |
| Rehabilitation | The process whereby the ground surface in a disturbed area is made safe and stable, enabling natural regeneration to then occur |
| Riparian | Pertaining to, or situated on, the bank of a body of water, such as a river |
| Runoff | The portion of rainfall that is not infiltrated or evaporated, and flows along the ground surface |
| Sacred sites | Places in the landscape that have a special significance under Aboriginal tradition |
| Sediment | Solid particles which tend to settle in a liquid |
| Socio-economic | Of, or relating to, both social and economic considerations |
| Southern Lease | Area within the Exploration Licence (EL2455) shown on Figure 1-1 |
| Strata | Layers of rock or soil with internally consistent characteristics that distinguish it from contiguous layers |
| Stratigraphy | The arrangement and succession of rock layers and layering (stratification) |
| Taxa | Categories in the biological classification system for all living organisms |
| Tertiary | The period of geological time from 63 million to 2 million years ago |
| Topography | The surface features of an area of land |

| TERM | DEFINITION |
|---|---|
| Topsoil | The upper most layer of soil where the highest concentration of organic matter and micro-organisms are found. Often referred to as the "A" horizon |
| Traditional Owners | People recognised as the Traditional Aboriginal Owners of the land based on their traditional and cultural associations with the land |
| Waste | An unwanted by-product or surplus product, including a gas, liquid, solid or energy, from an industrial, commercial, domestic or other activity |
| White rock | Areas of sandstone outcropping that may be considered to be culturally sensitive in places |

# 8

# Abbreviations

# 8 ABBREVIATIONS

The following abbreviations are commonly used throughout this Notice of Intent.

| ABBREVIATION / ACRONYM | DEFINITION |
|---|---|
| % | percentage |
| AAPA | Aboriginal Areas Protection Authority |
| ALC | Anindilyakwa Land Council |
| ALRA | *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) |
| ATSIHP Act | *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) |
| DENR | Department of Environment and Natural Resources |
| DoEE | Department of the Environment and Energy |
| DPIR | Department of Primary Industry and Resources |
| EA Act | *Environmental Assessment Act 1982* (NT) |
| EAA Procedures | *Environmental Assessment Administrative Procedures 1984* (NT) |
| EARC | East Arnhem Regional Council |
| EIS | Environmental Impact Statement |
| EL | Exploration License |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* (Cth) |
| the exploration program | The Stage 1 Exploration Program |
| FIFO | Fly-In Fly-Out |
| 4WD | Four Wheel Drive vehicle |
| GEMCO | Groote Eylandt Mining Company Pty Ltd |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| ha | Hectare |
| In-situ | In the original place |
| IPA | Indigenous Protected Area |
| km | Kilometre |
| $km^2$ | Square kilometres |
| KPIs | Key Performance Indicators |
| L | Litres |
| LiDAR | Light Detection and Ranging |
| LGA | Local Government Area |

| ABBREVIATION / ACRONYM | DEFINITION |
|---|---|
| m | metre |
| MMP | Mining Management Plan |
| MNES | Matters of National Environmental Significance |
| NOI | Notice of Intent |
| NT | Northern Territory |
| NT EPA | Northern Territory Environment Protection Authority |
| OHS | Occupational Health and Safety |
| PER | Public Environment Report |
| PMST | EPBC Act Protected Matter Search Tool |
| RC | Reverse Circulation |
| 6WD | Six wheel drive truck |
| Sacred Sites Act | *Northern Territory Aboriginal Sacred Sites Act 1989* (NT) |
| TEC | Threatened Ecological Community |
| TPWC Act | *Territory Parks and Wildlife Conservation Act 2006* (NT) |
| VMUs | Vegetation Management Units |
| WM Act | *Weeds Management Act 2001* (NT) |
| WMS | Weed Management System |

# 9

# References

# 9 REFERENCES

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# 10

# NOI Information Requirements

# 10 NOI INFORMATION REQUIREMENTS

Table 10-1 outlines the specific information requirements contained in the Northern Territory Environment Protection Authority Guideline *Referring a Proposal to the NT EPA, A guide for proponents and referral agencies* (NT EPA 2018b). A cross reference to where the information required by the guideline can be found in this Notice of Intent (NOI) is also provided.

**Table 10-1 NOI Information Requirements Cross Reference Table**

| INFORMATION REQUIREMENTS | CROSS REFERENCE |
|---|---|
| **Proposal title** | |
| **Contact details** | |
| ■ Proponent name, primary contact person, postal address, phone, email, organisational structure and responsibility; name of parent company/companies if applicable. | Section 1.4 – The Proponent |
| ■ Consultants (if acting on behalf of the proponent): business name, primary contact person, postal address, phone, email. | Section 1.4 – The Proponent |
| ■ Joint-venture partners (if applicable), name(s) and contact details. | Not applicable |
| **Location** | |
| A description of the proposal location, including: | |
| ■ Latitude and longitude. | Due to the irregular shape of the exploration areas, a latitude and longitude is not able to be provided. Figure 1-1 shows the location of the site and includes latitude and longitude. |
| ■ Street address, tenement details, lot/section numbers, town/hundred, other ancillary information as applicable. | Section 2.3 – Tenements |
| ■ Zoning/ land tenure and ownership of the location and surrounding areas. | Section 2.2.4 – Land Ownership and Land Tenure |
| ■ Location within a regional context | Section 2.2.1 – Regional Setting |
| ■ Planning context (e.g. any strategic planning, land use management plans and identified development corridors applying to the proposed site). | Section 2 – Project Description |
| **Other approvals and regulation** | |
| A brief outline of Northern Territory and Commonwealth legislation applicable to the proposal, and any approvals, licences or permits received and/or required for the project to proceed, for example: | Section 1.5 – Regulatory Approvals |

| INFORMATION REQUIREMENTS | CROSS REFERENCE |
|---|---|
| ■ Development permit required under the *Planning Act.* | Not applicable |
| ■ Environment protection approval or licence required under the *Waste Management and Pollution Control Act.* | Not applicable |
| ■ Approval of Mining Management Plan required under the *Mining Management Act* or approval of an Environment Plan under the *Petroleum Act*. | Section 1.5 – Regulatory Approvals |
| **Description of proposal** | |
| A description of the proposal addressing key physical components of the proposal and their purpose/function, including infrastructure and major equipment. Where applicable detail: | See below |
| ■ Transport requirements, such as transport mode, route(s); frequency; and use of public roads. | Section 2.2.2 – Location<br>Section 2.6.3 – Drilling |
| ■ Social and economic details relating to the project (e.g. expected economic benefits, workforce and workforce accommodation requirements, local service requirements). | Section 2.6.9 – Workforce and Accommodation<br>Section 2.7 – Significance of the Exploration Program |
| ■ Water and energy source(s). | Section 2.6.3 – Drilling<br>Section 2.6.5 – Environmental and Cultural Controls |
| ■ The handling (storage and transport) of hazardous substances. | Section 6.3.8 – Hazardous Materials Management<br>Section 2.6.6 – Utilities |
| ■ Waste water and solid waste stream requirements / infrastructure. | Section 2.6.6 – Utilities |
| ■ Decommissioning and rehabilitation measures. | Section 2.6.4 – Rehabilitation |
| **Alternatives** | |
| A description of any alternatives being considered, such as alternatives in:<br>■ Location<br>■ Timeframe<br>■ Activities | Section 2.6.10 – Alternatives |
| **Land use history** | |
| An outline of the land-use history of the proposed site(s), to the extent possible from available information, including the extent and nature of previous activities that may have caused soil, surface water and/or groundwater contamination or degradation. Where applicable: | Section 2.2.5 – Land Use |
| ■ Discuss the scope and extent of any previous or current investigations into or activities involving the remediation of soil, surface water or groundwater contamination on-site. | Not applicable – no remediation of soil, surface water or groundwater contamination has been or is being undertaken on the site. |

| INFORMATION REQUIREMENTS | CROSS REFERENCE |
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| ■ Advise if the site is or has been regulated as a contaminated site under the *Waste Management and Pollution Control Act* (WMPC Act). | Not applicable – the site is not nor has been regulated as a contaminated site. |
| **Existing environment** | |
| A description of the existing environment.<br>Information should focus on those aspects of the existing environment that are pertinent to the consideration of the potential environmental impacts from the proposal, including aspects of the environment:<br>■ Where the proposed action is to occur<br>■ That are likely to be impacted by the proposal, and<br>■ Are likely to influence the extent of environmental impacts. | Section 3 – Review of Environmental Factors<br>Section 4 – Terrestrial Flora and Fauna<br>Section 5 – Social, Economic and Cultural Surroundings |
| **Natural environment** | |
| A description of the general characteristics of the proposed site(s) and the surrounding area that may be impacted by the proposal.<br>Descriptions should provide information sufficient to allow for preliminary assessment of potential impacts and suitability of the land (or water body) to support the proposed development. | Section 2.2 – Setting<br>Section 4 – Terrestrial Flora and Fauna<br>Section 5 – Social, Economic and Cultural Surroundings |
| **Significant sites or features** | |
| A description of the proximity of the proposal to any significant sites or features such as significant landform, National Park or high conservation value waterways or land systems. | Section 2.2 – Setting |
| **Potential impacts** | |
| Description of the nature and extent of potential impacts (direct, indirect and cumulative) from the proposal on environmental factors and objectives. | See below |
| **Environmental factors** | |
| Terrestrial Flora and Fauna | Section 4 – Terrestrial Flora and Fauna |
| Terrestrial Environmental Quality | Section 3.3 – Review of Environmental Factors |
| Landforms | Section 3.3 – Review of Environmental Factors |
| Aquatic Ecosystems | Section 3.3 – Review of Environmental Factors |
| Inland Water Environmental Quality | Section 3.3 – Review of Environmental Factors |
| Hydrological Processes | Section 3.3 – Review of Environmental Factors |
| Marine Flora and Fauna | Section 3.3 – Review of Environmental Factors |
| Benthic Communities and Habitats | Section 3.3 – Review of Environmental Factors |
| Marine Environmental Quality | Section 3.3 – Review of Environmental Factors |

| INFORMATION REQUIREMENTS | CROSS REFERENCE |
|---|---|
| Coastal Processes | Section 3.3 – Review of Environmental Factors |
| Air Quality and Greenhouse Gases | Section 3.3 – Review of Environmental Factors |
| Social, Economic and Cultural Surroundings | Section 5 – Social, Economic and Cultural Surroundings |
| Human Health | Section 3.3 – Review of Environmental Factors |
| For each of the identified proposal specific factors address the following in a table or provide supporting information in report form:<br>■ NT EPA factor and associated objective<br>■ Receiving environment – describe current condition and values potentially impacted in relation to this factor and corresponding objective<br>■ Potential impacts – assess the potential impacts (direct and indirect) of the proposal and review the impacts against the NT EPA factor(s) and objective(s)<br>■ Mitigation – describe measures proposed to manage and mitigate the potential environmental impacts on the applicable objective(s). Describe the effectiveness of proposed measure(s) and the level of confidence that the measure will be implemented. Include any relevant National or Territory standards, codes of practice and guidelines applicable.<br>■ Assumptions – describe any assumptions critical to your assessment e.g. specific mitigation measures or regulatory conditions.<br>■ Relevant policy and guidance<br>■ Consultation – outline any outcomes of preliminary consultation (if undertaken). | As outlined in Section 3 – Review of Environmental Factors, the proposal specific factors identified for the exploration program were Terrestrial Flora and Fauna and Social, Economic and Cultural Surroundings. An assessment of these factors is included in Section 4 – Terrestrial Flora and Fauna and Section 5 – Social, Economic and Cultural Surroundings of this NOI. These sections include discussions on the current baseline conditions and values potentially impacted, an assessment of potential direct and indirect impacts, descriptions of the mitigation measures proposed to manage and mitigate potential environmental impacts, assumptions, relevant legislative requirements and guidelines and consultation with relevant government agencies and the Anindilyakwa Land Council. |

| INFORMATION REQUIREMENTS | CROSS REFERENCE |
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| Include a description of any potential cumulative impacts (successive, incremental and combined impacts of past, present and foreseeable actions). | The Southern Lease is remote and large parts of it have limited access. Accessible portions of the Southern Lease are periodically used by the Traditional Owners for collecting resources. There are also two recreation areas which are accessible to visitors under a permitting system that are used for fishing, camping and swimming. As such, there are no activities being undertaken within the Southern Lease that have the potential to give rise to cumulative impacts with the exploration program.<br>Previous disturbance for exploration drill pads in the Southern Lease has been rehabilitated and as such, previous exploration is not considered likely to have a potentially significant cumulative impact.<br>Due to the nature of exploration, geological data collected from the exploration program may require future exploration programs to be undertaken within the Southern Lease. Any potential for cumulative impacts with future exploration programs will be assessed as part of approvals for future exploration activities. |
| **Matters of National Environmental Significance (MNES)** | |
| State whether or not a referral has or will be submitted to the Australian Government responsible for administering the *Environment Protection and Biodiversity Conservation Act 1999*. | An assessment of potential impacts on MNES has been completed and is described in Section 4 – Terrestrial Flora and Fauna and is supported by specialist ecological reports provided in Appendix A – *Baseline Terrestrial Ecology*, Appendix B – *Southern Lease Small Mammal Research Project* and Appendix C – *Assessment of Impacts on Listed Species*. The assessment of potential impacts on MNES concludes the exploration program will not give rise to significant impacts on MNES. |
| **Proponent's statement of whether significant impacts are likely** | |
| State an opinion on whether the proposal is likely to have a significant impact on the environment and reasons why. | As outlined in Section 3 – Review of Environmental Factors, the proposal specific factors identified for the exploration program were Terrestrial Flora and Fauna and Social, Economic and Cultural Surroundings. Section 4 – Terrestrial Flora and Fauna concludes that no significant impacts on terrestrial flora and fauna, biological diversity and ecological integrity are predicted. Section 5 – Social, Economic and Cultural concludes that no significant adverse impacts on the social, economic, cultural and heritage values of the Northern Territory are predicted. The exploration program is therefore not predicted to have a significant impact on the environment. |

| INFORMATION REQUIREMENTS | CROSS REFERENCE |
|---|---|
| **References and data** | |
| All sources must be appropriately referenced with preference for the Harvard Standard. A reference list should include the address of any internet pages used as data sources. Referenced supporting documentation and data, or documents cited in the NOI must be available upon request. | Section 9 – References |
| Where spatial data is included in the NOI, then this should be provided in GIS format, geo-referenced and conform to the following parameters:<br>■ Data type: closed polygons that represent the proposal boundary (development envelope) and the activity areas for all physical elements of the proposal (footprint).<br>■ Attribution: Name the development envelope and each activity area in the attribute table of the spatial data.<br>■ Coordinate System: GDA94 (datum) and projected into the appropriate Map Grid of Australia (MGA) zone. | GIS data is able to be provided upon request |
| All maps and figures contained in the NOI should be clear and readable, of appropriate scale, in either jpeg or pdf format and of good resolution (> 300 ppi). 'Flatten' figures to reduce the size of the NOI. | Noted |
| Any raw data collected or generated to support development of the NOI should be provided in csv or excel file formats. Data columns should be clearly titled for variables with relevant units. | Raw data is able to be provided upon request. All raw data, including photographs, collected as part of the Small Mammal Research Project, has been provided previously to the Department of Environment and Natural Resources |