

# Wonarah Phosphate Project

## Draft Environmental Impact Statement

### Executive Summary

November 2009





# **DRAFT ENVIRONMENTAL IMPACT STATEMENT**

## **EXECUTIVE SUMMARY**

Wonarah Phosphate Project

November 2009

CR 9014\_7\_v3



**Coffey Natural Systems Pty Ltd** ABN 61 005 041 878  
Unit 8, 21 Parap Road Parap NT 0820 Australia  
T (+61) (8) 8901 1200 F (+61) (8) 8901 1299  
[coffey.com](http://coffey.com)

© Coffey Natural Systems Pty Ltd November 2009

|                  |                                |                  |              |
|------------------|--------------------------------|------------------|--------------|
| Project director | Daniel Moriarty, Tara Halliday |                  |              |
| Project manager  | Rebecca Powlett                |                  |              |
| <b>Version:</b>  | <b>Details:</b>                | <b>Approved:</b> | <b>Date:</b> |
| CR 9014_7_v3     | Final for exhibition           | Daniel Moriarty  | 13/11/2009   |

## **Guide to the Wonarah Phosphate Project Draft Environmental Impact Statement**

The EIS comprises four volumes:

- Executive Summary.
- Main Report.
- Appendices Volume 1.
- Appendices Volume 2.



## CONTENTS

|                                                    |          |
|----------------------------------------------------|----------|
| <b>EXECUTIVE SUMMARY</b>                           | <b>1</b> |
| 1 Introduction                                     | 1        |
| 2 Project Background                               | 1        |
| 3 Project Description                              | 4        |
| 4 Existing Environment                             | 9        |
| 5 Key Environmental and Social Impacts             | 20       |
| 6 Environmental Outcomes and Assessment Criteria   | 24       |
| 7 Mine Closure, Rehabilitation and Future Land Use | 31       |

### Figures

|                                                                                                           |    |
|-----------------------------------------------------------------------------------------------------------|----|
| ES1 Location of the Wonarah Phosphate Project                                                             | 2  |
| ES2 Mine layout                                                                                           | 5  |
| ES3 Main Zone mine layout                                                                                 | 6  |
| ES4 Ore transport route from Wonarah Phosphate Project to the multi-user hub                              | 10 |
| ES5 Soil classifications in the project area                                                              | 13 |
| ES6 Threatened flora in the project area and surrounds                                                    | 14 |
| ES7 Threatened fauna in the project area and surrounds                                                    | 16 |
| ES8 Location of third party bores surrounding the project area                                            | 17 |
| ES9 Regional catchments, major rivers, sampling sites, elevation and estimated flow paths (close up view) | 19 |

### Tables

|                                                          |    |
|----------------------------------------------------------|----|
| ES1 Key characteristics of the Wonarah Phosphate Project | 7  |
| ES2 Summary of residual impact assessments               | 21 |
| ES3 Environmental and social outcomes                    | 25 |

### Plates

|                                      |    |
|--------------------------------------|----|
| ES1 Typical landform at Wonarah      | 12 |
| ES2 Typical rocky outcrop at Wonarah | 12 |

Draft Environmental Impact Statement  
Wonarah Phosphate Project

# EXECUTIVE SUMMARY

## 1 Introduction

Minemakers Australia Pty Ltd (Minemakers) proposes to develop the Wonarah Phosphate Project, hereafter referred to as 'the project', in the Barkly Tableland of the Northern Territory (Figure ES1). The project involves the mining of two phosphate deposits, known as 'Arruwurra' and 'Main Zone'. The project has an Indicated Joint Ore Reserves Committee (JORC) compliant resource estimate of 399 Mt at 21% phosphorite ( $P_2O_5$ ) (15% cut-off grade) and will be developed over two discrete stages.

Stage 1 involves the mining of the deposits for direct shipping ore (DSO). DSO is of a quality that requires minimal processing to meet market requirements. Mining during Stage 1 is expected to occur for approximately ten years, although exploration currently underway may extend this period even further. Production will commence at a rate of 0.5 Mt/a and increase to 3 Mt/a after two and a half years. Mining of the DSO is scheduled to commence at the end of quarter 2, 2010, provided all necessary permits and approvals are in place.

Minemakers submitted a Notice of Intent (NOI) for Stage 1 of the Wonarah Phosphate Project to the Northern Territory Government Department of Regional Development, Primary Industry, Fisheries and Resources (DRDPPIFR) on 10 March 2009 and the project was then referred to the Minister for Natural Resources, Environment and Heritage for consideration. The minister determined that the project required the preparation of an Environmental Impact Statement (EIS) under the Northern Territory *Environment Assessment Act* on 5 May 2009.

Guidelines for the preparation of the EIS were issued on 11 July 2009; this EIS document addresses these guidelines and provides the basis upon which assessment and approval by the Northern Territory Government will be made.

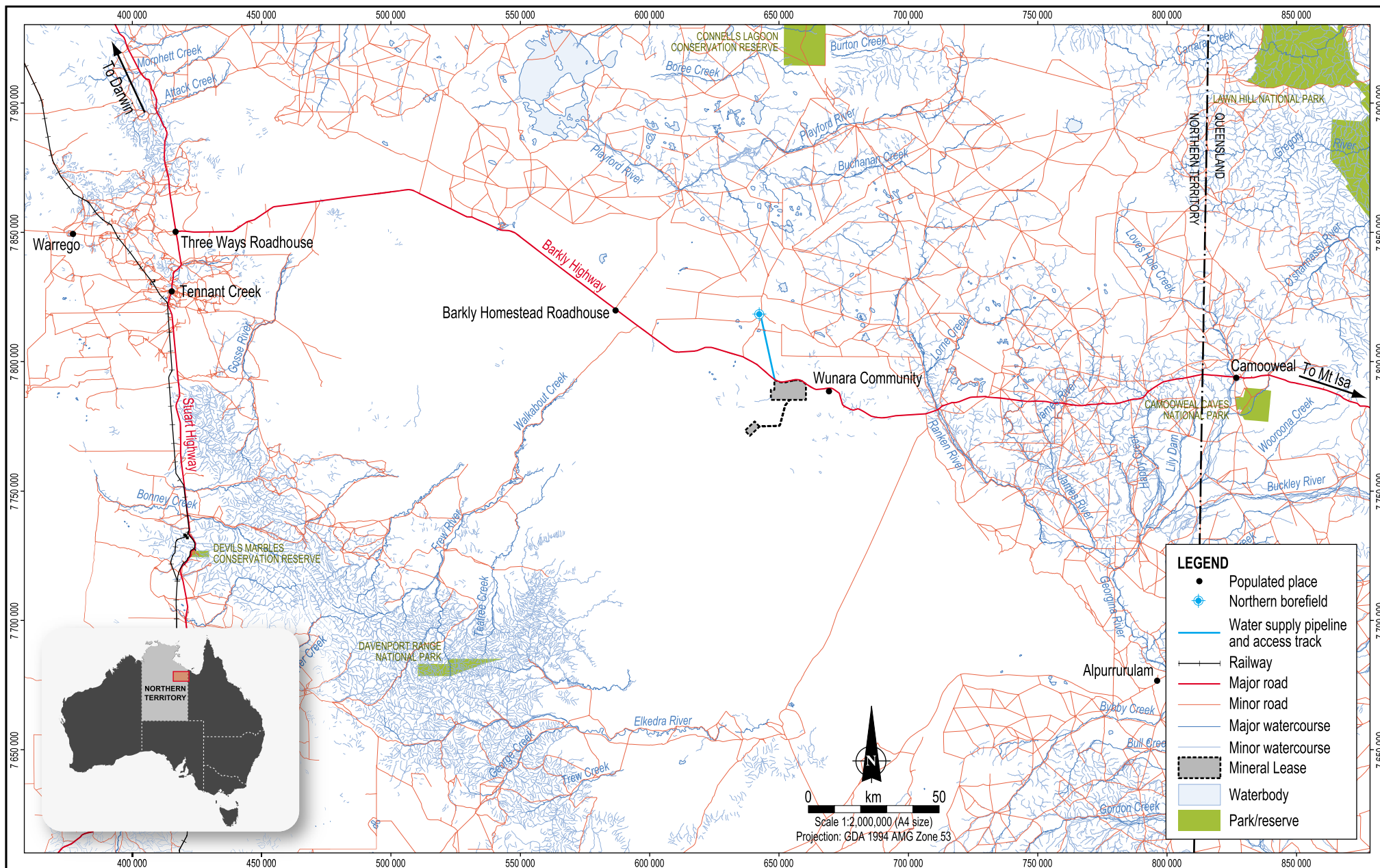
Stage 2, if pursued, will involve an expansion of the mining and processing operations to develop the lower grade ore, i.e., the non-DSO material, and possibly extend operations beyond the current Mineral Lease. Stage 2 will be permitted separately if and when a decision is made by Minemakers to proceed with this development.

## 2 Project Background

### Location

The project is located in the Barkly Tableland of the Northern Territory directly south of the Barkly Highway, approximately 240 km east of Tenant Creek and approximately 960 km southeast of Darwin (see Figure ES1). The Wunara Community is the closest populated area to the project. It is located adjacent to the Barkly Highway and is approximately 10 km to the east of the Mineral Lease boundary.

The project area includes the Mineral Lease area, which is located south of the Barkly Highway, the borefield which is on the northern side of the highway on the Dalmore Downs pastoral lease and the water supply pipeline corridor that connects these two areas.



## Proponent

Minemakers is an Australian company and has been listed on the Australian Stock Exchange (ASX) since October 2006 (ASX code: MAK). Along with the Wonarah Phosphate Project, the company owns, or has options over, mineral projects and prospects located in the Northern Territory, Tasmania, Western Australia and Namibia.

## Legislative Context

This EIS provides the basis upon which the project's assessment and approval by the Northern Territory Government under the Environmental Assessment Act will be made. Following this, approval under the *Mining Act* and *Mining Management Act* is required. This will involve the preparation of an application for an authorisation to carry out mining activities and preparation of a mining management plan (MMP). The MMP will be based upon the information contained in the EIS and any EIS approval conditions and will be the operational document by which the mine will be managed.

The Central Land Council (CLC) is the statutory body through which Minemakers deals with the Traditional Owners of the project area and surrounds.

## Project Rationale

The primary objective of the project is to effectively, efficiently and profitably mine and process ore from the Wonarah deposits in accordance with the project's environmental and social objectives. Minemakers will continue exploration activity at Wonarah so as to further identify mineral resources that may extend the life of the project.

The development of the project will contribute to employment and business opportunities within the region. The project will also bring other benefits to the regional, territory and national economies in the form of royalties and taxes (both direct and indirect). Total annual (unescalated) revenue generated by the project is estimated to be \$500 million, while estimated annual operating expenses and royalties (excluding capital costs) will be about \$457 million.

Minemakers will work with local Indigenous training providers to ensure programs are focused on maximising skill development and employment opportunities for members of the Indigenous community.

## Stakeholder Consultation

Minemakers has consulted with key stakeholders throughout the project's planning process.

Consultation activities during the initial planning or scoping stage of the project (up to February 2009) were focused on introducing the project concept, facilitating land access for exploration activities, establishing and initiating the assessment and approvals process for the project, and providing information on the exploration activities being undertaken. Stakeholders involved in consultation activities during this phase were the Traditional Owners, CLC, Northern Territory and Australian government agencies and local pastoralists.

Since the project progressed from the scoping study to the preparation of the EIS phase, consultation has expanded to include a broader range of organisations and individuals, including residents of Tennant Creek and Alice Springs, local training providers, local businesses, the Northern Territory Mineral Resources Council (formally NT Resources Council), the Northern Territory Industry Capability Network (NTICN) and the Environment Centre Northern Territory (ECNT).

Along with listening to stakeholders interests and concerns, and providing general updates on the project and its progress, topics that have been discussed as part of consultation activities include issues specific to the Wunara community, the project approvals process, training, land access, employment and business opportunities, the source of water for the project and land access.

The broad outcomes of consultation activities to date have included:

- Increased government and community awareness and understanding of the project.
- Liaison with regulatory authorities regarding the assessment and permitting route.
- Relationship building with Traditional Owners and the CLC.
- Identification of areas of concern to key stakeholders.
- Identification of potential employment opportunities for local Indigenous people.

A database is being, and will continue to be, kept to record all stakeholder contact. A stakeholder consultation plan has been developed to continue consultation during the operation and rehabilitation phases of the project.

### **3 Project Description**

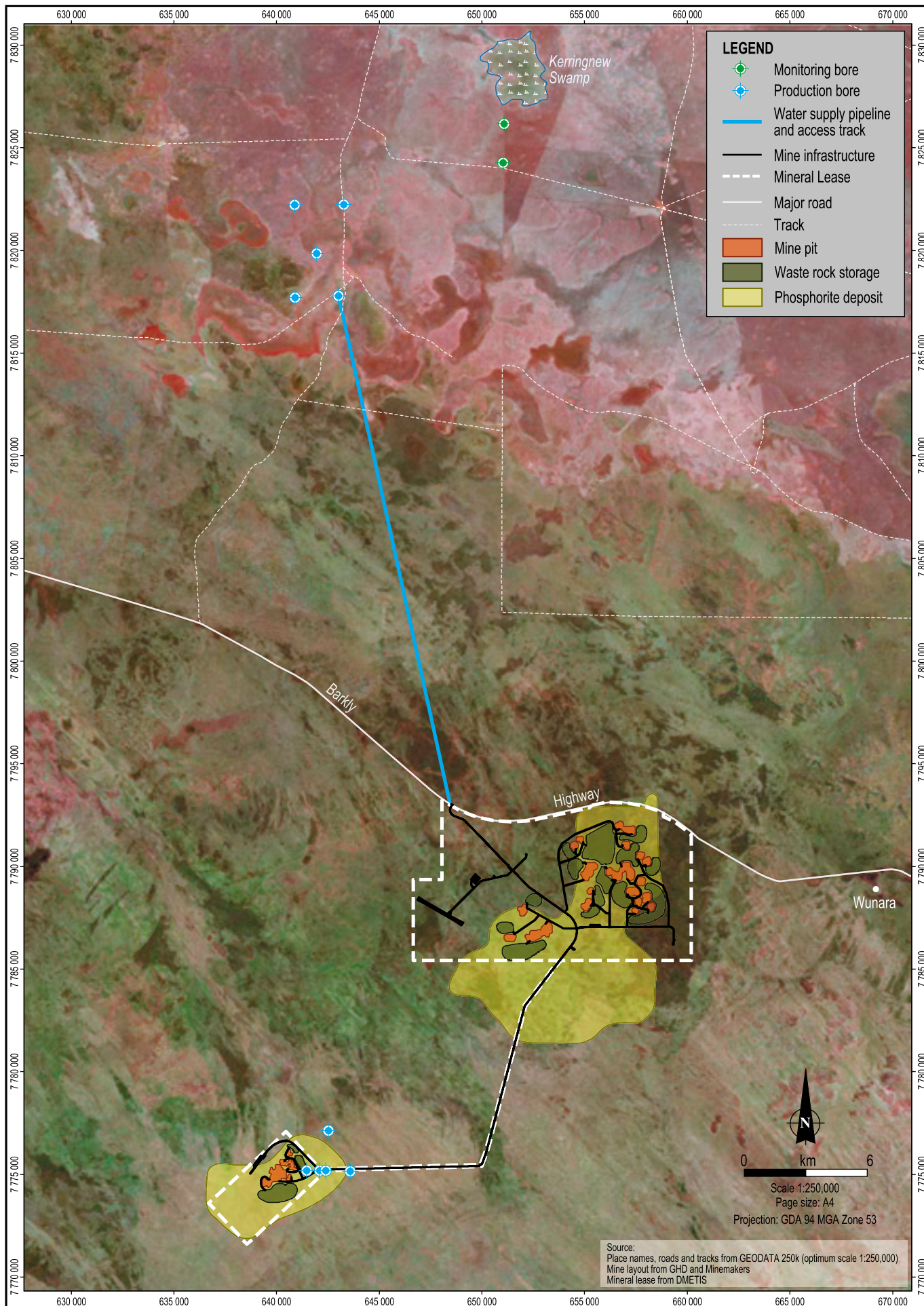
#### **Overview**

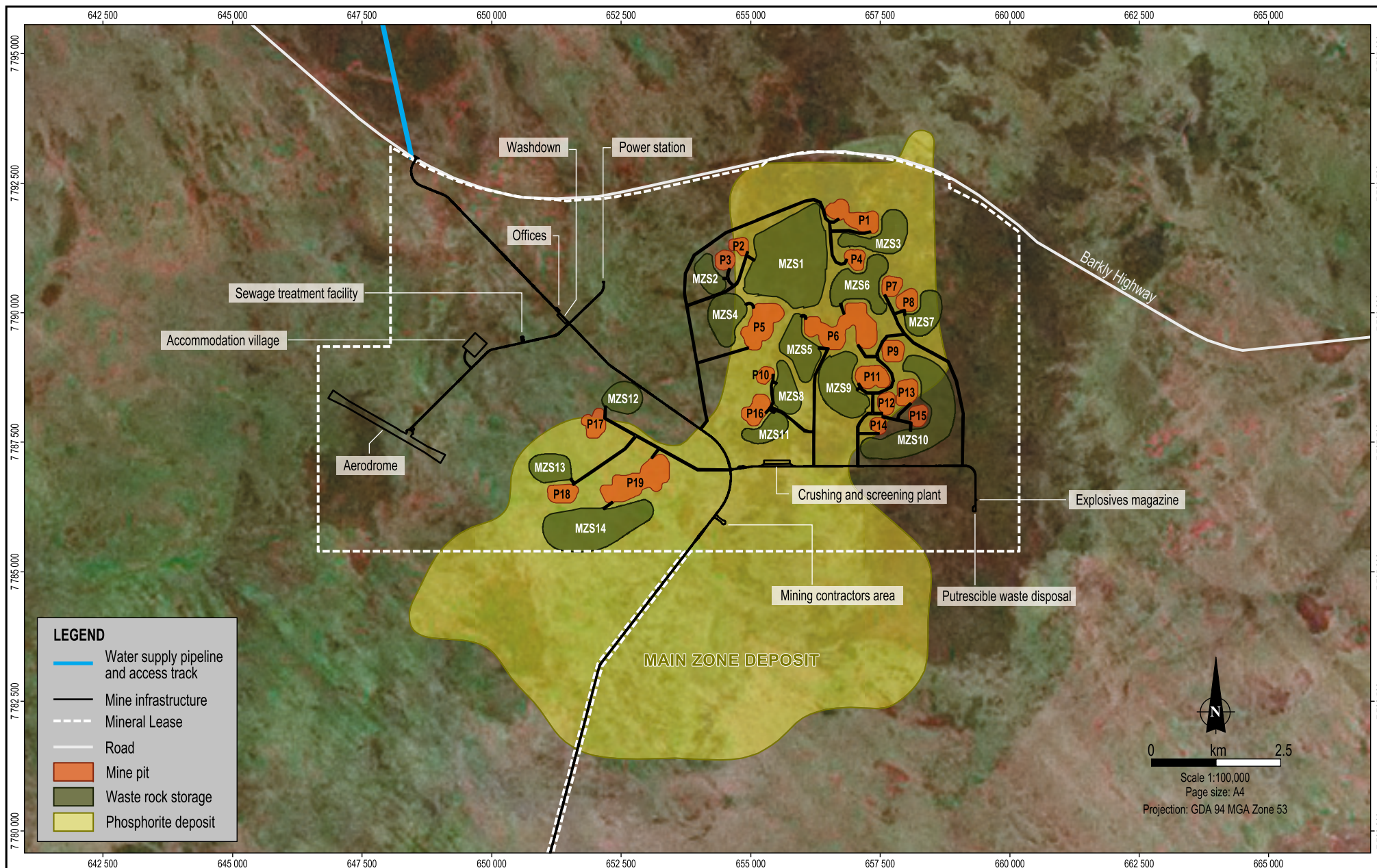
Stage 1 of the project will involve the mining of DSO from up to 23 open pits (4 in the Arruwurra deposit and up to 19 in the Main Zone, Figure ES2), two mobile crushing and screening plants and associated mine infrastructure (Figure ES3). The cut-off grade for DSO is at least 30%  $P_2O_5$  and the location of the open pits reflects the areas of the deposit containing the highest proportion of DSO.

Based on currently defined resources Stage 1 has a mine life of around ten years and will produce approximately 19.9 Mt of DSO; however, exploration currently underway may extend the mine life even further. The ore will initially be mined at a rate of 0.5 Mt/a, increasing to 3 Mt/a after about two and a half years.

The Arruwurra and Main Zone deposits will be developed using conventional shallow open pit and strip mining methods, which will allow, to varying extents, for progressive rehabilitation of some disturbed areas to occur. A number of pits will be operated concurrently to allow blending of ore types to achieve optimum blends for market requirements. Pits will be between 10 and 30 m deep in the Arruwurra deposit and between 20 and 60 m deep in the Main Zone deposit.

The phosphate produced at the mine will be transported by road to Global Port Solutions' multi-user hub north of Tennant Creek, and then transported by rail to the Port of Darwin, where it will be stored in a shed and then loaded onto ship for export. The construction and operation of these two purpose-built facilities will be permitted separately to the mine development and are outside the scope of this EIS.





Source:  
Place names, roads and tracks from GEODATA 250k (optimum scale 1:250,000)  
Mine layout from GHD and Minemakers  
Proposed mineral lease from DMETIS

**coffey**  
natural systems

Date:  
11.11.2009  
MXD:  
Minemakers\_Wonarah\_GIS.mxd  
File Name:  
9014\_07\_ES03\_GIS\_HB

**Minemakers Australia Pty Ltd**  
**Wonarah Phosphate Project**

**MINEMAKERS**  
AUSTRALIA PTY LTD

**Main Zone mine layout**

Figure No:  
**ES3**

The key characteristics of the project are summarised in Table ES1.

**Table ES1 Key characteristics of the Wonarah Phosphate Project**

| Item                                                                                                                    |                   | Description                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project location                                                                                                        |                   | 240 km east of Tennant Creek, Northern Territory                                                                                                                                                                                                        |
| Mineral Lease                                                                                                           |                   | ML27244, 10,846 ha in size                                                                                                                                                                                                                              |
| Project footprint (excluding support infrastructure, i.e., road haulage worker accommodation village at multi-user hub) |                   | 2,325.6 ha                                                                                                                                                                                                                                              |
| Mining method                                                                                                           |                   | Shallow open pit and strip mining methods                                                                                                                                                                                                               |
| Mining inventory                                                                                                        | Arruwurra deposit | 2.6 Mt                                                                                                                                                                                                                                                  |
|                                                                                                                         | Main Zone deposit | 17.3 Mt                                                                                                                                                                                                                                                 |
|                                                                                                                         | Total             | 19.9 Mt                                                                                                                                                                                                                                                 |
| Mine life                                                                                                               |                   | 10 years, commencing in Q2 2010                                                                                                                                                                                                                         |
| Mining rate                                                                                                             |                   | 0.5 Mt/a initially, building to 3 Mt/a after 2.5 years                                                                                                                                                                                                  |
| Processing method                                                                                                       |                   | Conventional crushing and screening                                                                                                                                                                                                                     |
| Crushing and screening throughput                                                                                       |                   | Initial capacity of each crushing and screening plant will be 0.5 Mt/a, will be expanded over mine life to meet marketing and mining requirements                                                                                                       |
| Operating hours                                                                                                         |                   | Continuous operation, 24 hours per day, 7 days per week                                                                                                                                                                                                 |
| Power source                                                                                                            |                   | Dual fuel power station on site                                                                                                                                                                                                                         |
| Power requirement                                                                                                       |                   | 4 MW                                                                                                                                                                                                                                                    |
| Raw water source                                                                                                        |                   | Groundwater (northern borefield)                                                                                                                                                                                                                        |
| Raw water requirement                                                                                                   |                   | Average 7.7 ML/d, peak 9.6 ML/d                                                                                                                                                                                                                         |
| Accommodation on site                                                                                                   |                   | 120 persons                                                                                                                                                                                                                                             |
| Employees at 3 Mt/a production                                                                                          | Mining            | Construction: 50 to 100 people<br>Operations: approximately 120 positions (Minemakers and contractors)<br>Nominal two weeks on, one week off fly-in, fly-out (FIFO) roster. FIFO will be from the aerodrome at the mine site to respective home cities. |
|                                                                                                                         | Road Haulage      | Operations: 180 positions<br>Nominal two weeks on, one week off fly-in, fly-out (FIFO) roster. FIFO will be from the Tennant Creek Airport to respective home cities.                                                                                   |
| Capital expenditure                                                                                                     |                   | \$107 million                                                                                                                                                                                                                                           |

## Mining and Treatment of Ore

Mined ore will be transported via haul trucks to the ROM stockpile adjacent to each of the mobile crushing and screening plants located at Arruwurra and Main Zone. Non-DSO stockpiles will store lower-grade material adjacent to each pit for later treatment as part of Stage 2. If Stage 2 does not proceed, these stockpiles will be rehabilitated as part of the waste rock stockpiles.

Treatment of ore for the project will be a simple process and no chemicals will be involved. A primary crusher will reduce the size of the ore to 75 mm; the crushed product will be screened and then fed into a secondary crusher to reduce the size of the ore to less than 2 mm. Once ore

has passed through the crushing and screening process, it will be stockpiled ready to be transported to market.

Geochemical characterisation testwork has shown that waste rock and ore material will not generate acid rock drainage. No special waste rock management measures are therefore required for the waste rock storages or non-DSO stockpiles.

Elevated radiation levels are sometimes associated with phosphate rock deposits. Results of testwork demonstrate that uranium is present at background levels only, usually less than 20 ppm. This is typical for normal weathered and leached sedimentary rocks.

## **Water Management**

The project area is located in a semi-arid environment where evaporation far exceeds rainfall. Project design and ongoing water management methods have been based on the principals of minimising water consumption and maximising water recycling. Site water management will include a combination of flood protection berms, sediment basins, drains and oily water separators to protect the downstream fauna and habitats from impacts from mining activities and to protect mine infrastructure and operations from flooding, particularly at Arruwurra.

## **Infrastructure**

The main features of infrastructure to be developed for the project can be summarised as:

- A 4 MW per day power station fuelled by both diesel and natural gas.
- A borefield to the north of the Mineral Lease will provide the long-term raw water supply to the project via a 30 km pipeline. While the northern borefield is being constructed (approximately three months), raw water will be sourced from a borefield located at Arruwurra.
- A reverse osmosis plant for potable water treatment at a rate of approximately 27 kL/d.
- A sewage treatment plant located northeast of the accommodation village for domestic wastewater treatment.
- An office complex comprising site reception, administration, technical services, meeting and training rooms will be located adjacent to the site access road.
- A permanent accommodation village will be constructed to accommodate approximately 120 workers.
- An aerodrome will be constructed southwest of the accommodation village.
- A designated waste landfill for disposal of putrescible and domestic waste.

## **Road Access and Transport**

Mineral Lease road access and transport will be by:

- A new all-weather, heavy-vehicle road from the Barkly Highway.
- Site roads to provide access to project infrastructure components within the Mineral Lease.
- Haul roads to connect each pit to the nearest ROM stockpile and workshop and office areas.

Ore will be transported by road trains from the Mineral Lease via the Barkly and Stuart highways to the multi-user hub located outside and north of Tennant Creek (Figure ES4). Transport of ore will be carried out 24-hours per day, 365-days per year. Truck movements will gradually increase from 32 round trips per day at 1 Mt/a to 91 round trips per day at 3 Mt/a; this equates to approximately one truck every 46 minutes increasing to one truck every 16 minutes.

## **Workforce and Accommodation**

Minemakers will preferentially employ local people during the construction and operation of the project. The construction workforce will peak at about 100 people, who will be initially housed in the existing exploration camp. The operations workforce will peak at approximately 120 people, who will be housed in the accommodation village on site. Most contractors and employees will travel to site by charter aircraft.

The road haulage workforce will peak at approximately 180 people. An accommodation village will be constructed by the haulage contractor close to the multi-user hub outside and north of Tennant Creek to accommodate the road haulage workforce; this infrastructure component is outside the scope of this EIS.

## **4 Existing Environment**

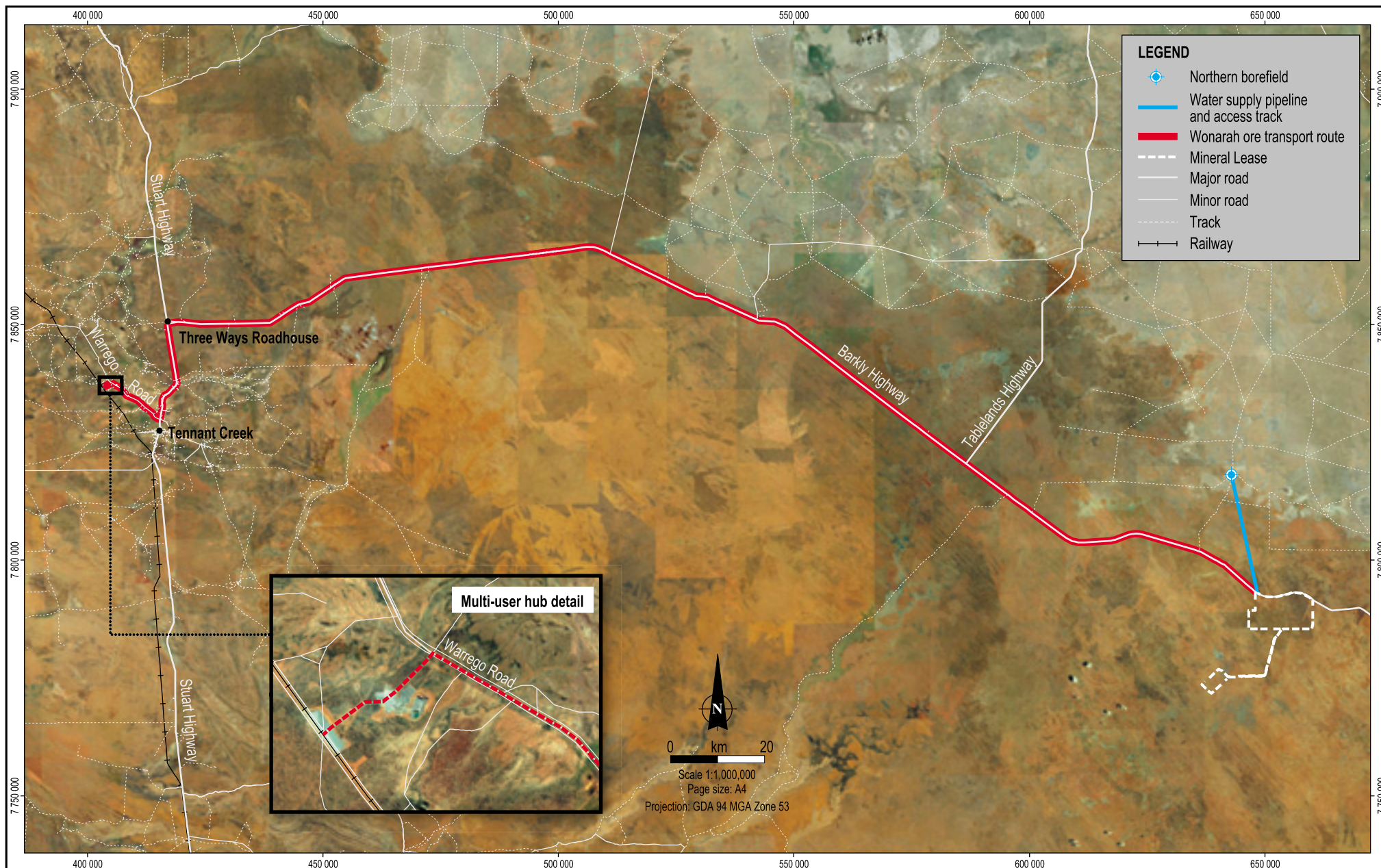
The physical setting of the project can be characterised as semi-arid, relatively flat, open grasslands/open woodland which are common across the Barkly Tableland; while the socio-economic setting of the region can be characterised as being sparsely populated, remote and heavily dependant on Tennant Creek and Mount Isa for services and employment. Within the project area there are no residents or existing infrastructure, apart from an exploration camp. A brief description of the existing physical and socio-economic environment follows.

### **Air Quality**

The existing air quality in the vicinity of the project is relatively pollutant free and is typical of a remote, semi-arid rural environment. Dust generated by wind erosion of exposed surfaces is the main air pollutant present. Other pollutants sources are combustion emissions from bushfires and minor emissions from vehicles travelling along the Barkly Highway.

### **Noise**

No significant, permanent man-made noise sources are located at or near the project, other than passing vehicles travelling on the Barkly Highway and noise when exploration activities are underway. The only ongoing noise present is caused by wind blowing over vegetation and noises from insects and birds.



Source:  
Place names, roads, tracks and railways from GEODATA 250k (optimum scale 1:250,000).  
Cadastral from NT DPL. Proposed mineral lease tenure from DMETIS.  
Mine infrastructure from GHD.  
Wonarah ore transport route from CNS.  
Imagery from Google Earth (15/07/2009) approximate georeferencing only

**coffey**  
natural systems

Date:  
09.11.2009  
MXD:  
Minemakers\_Wonarah\_GIS.mxd  
File Name:  
9014\_07\_ES04\_GIS\_HB

**Minemakers Australia Pty Ltd**

**Wonarah Phosphate Project**

**MINEMAKERS**  
AUSTRALIA PTY LTD

**Wonarah Phosphate Project  
ore transport route to multi-user hub**

Figure No:

**ES4**

## Landform and Soils

The landform of the project area has a general low relief, although small rocky outcrops are locally common (Plates ES1 and ES2). Across the Barkly Tableland there is generally only a very gentle relief, which varies less than 50 m in elevation from the highest to lowest point.

Soils within the project area have been classified into four major soil classifications: Kandosols, Vertosols, Calcarosols and Rudosols (Figure ES5). Kandosols and Rudosols dominate the sand plains within the project area, while Vertosols and Calcarosols are restricted to areas subject to inundation such as ephemeral lakes and calcareous plains, respectively.

## Land Uses

Traditional Owners use the Mineral Lease and surrounds for hunting and gathering and for accessing culturally significant sites. While the Mineral Lease area is suitable for grazing beef cattle, no pastoral activities currently occur on the land. The borefield area to the north of the Barkly Highway is used for grazing beef cattle.

## Flora

The distribution and composition of vegetation within the project area is influenced by soil types. Field surveys identified five vegetation communities within the project area:

1. Sand plains supporting *Eucalyptus* and *Acacia* open woodland over hummock grassland.
2. Black soil and clay pans supporting coolibah low open woodland over grassland.
3. Calcareous plains supporting supplejack low open woodland over open grassland.
4. Ephemeral lakes supporting coolibah low open woodland over grassland.
5. Rocky rises supporting *Acacia* and mallee shrubland over hummock grassland.

The project lies within the Davenport Murchinson Ranges bioregion; the vegetation communities listed above are widespread and common across this bioregion.

None of the vegetation communities present in the project area are listed under the EPBC Act or the *Territory Parks and Wildlife Conservation Act* (TPWC Act). Of the 144 flora species recorded in the project area none are listed under the EPBC Act. However, 13 flora species listed under the TPWC Act have been recorded in the region, with 4 of these being recorded in the project area (Figure ES6): two near threatened species, *Bergia barklyana* and *Hibiscus brachychlaenus*; and two data deficient species, *Distichostem barklyanus* and *Heliotropium pulvinum*. Forty-four flora species of Indigenous utilitarian, cultural or mythical significance were recorded during the field surveys.

One record of *Sporobolus latzii* is listed in the NT Parks and Wildlife Flora Atlas within an Indigenous cultural exclusion zone adjoining the Mineral Lease. This is the only known collection site of this species in Australia. Although targeted searches for this species were performed as part of the field surveys no specimens were identified.

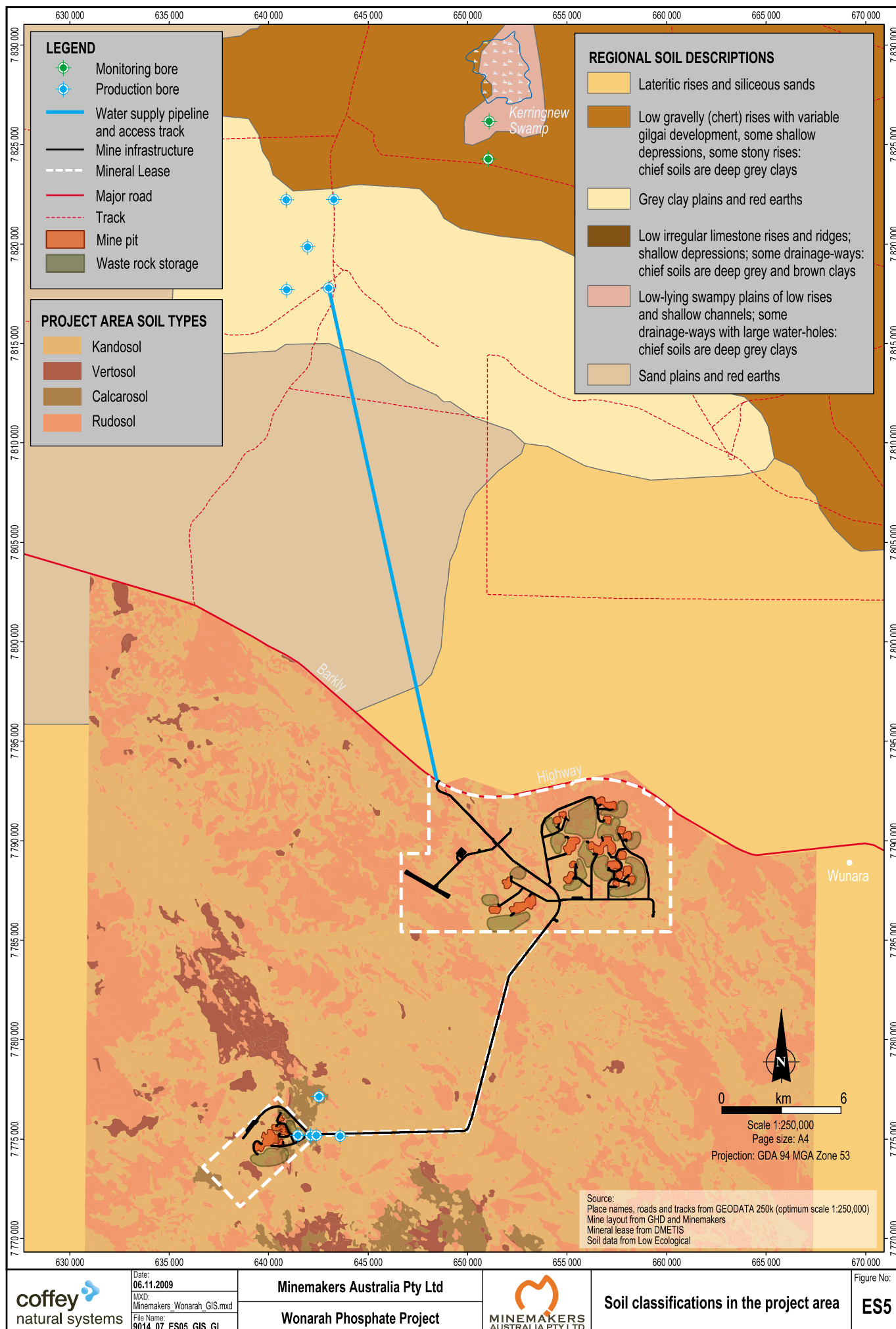
No weed species listed under the Northern Territory *Weeds Management Act* have been identified in the Mineral Lease. However, two environmental weed species, *Cenchrus ciliaris* (buffel grass) and *Aerva javanica* (kapok bush) were recorded during the field surveys.

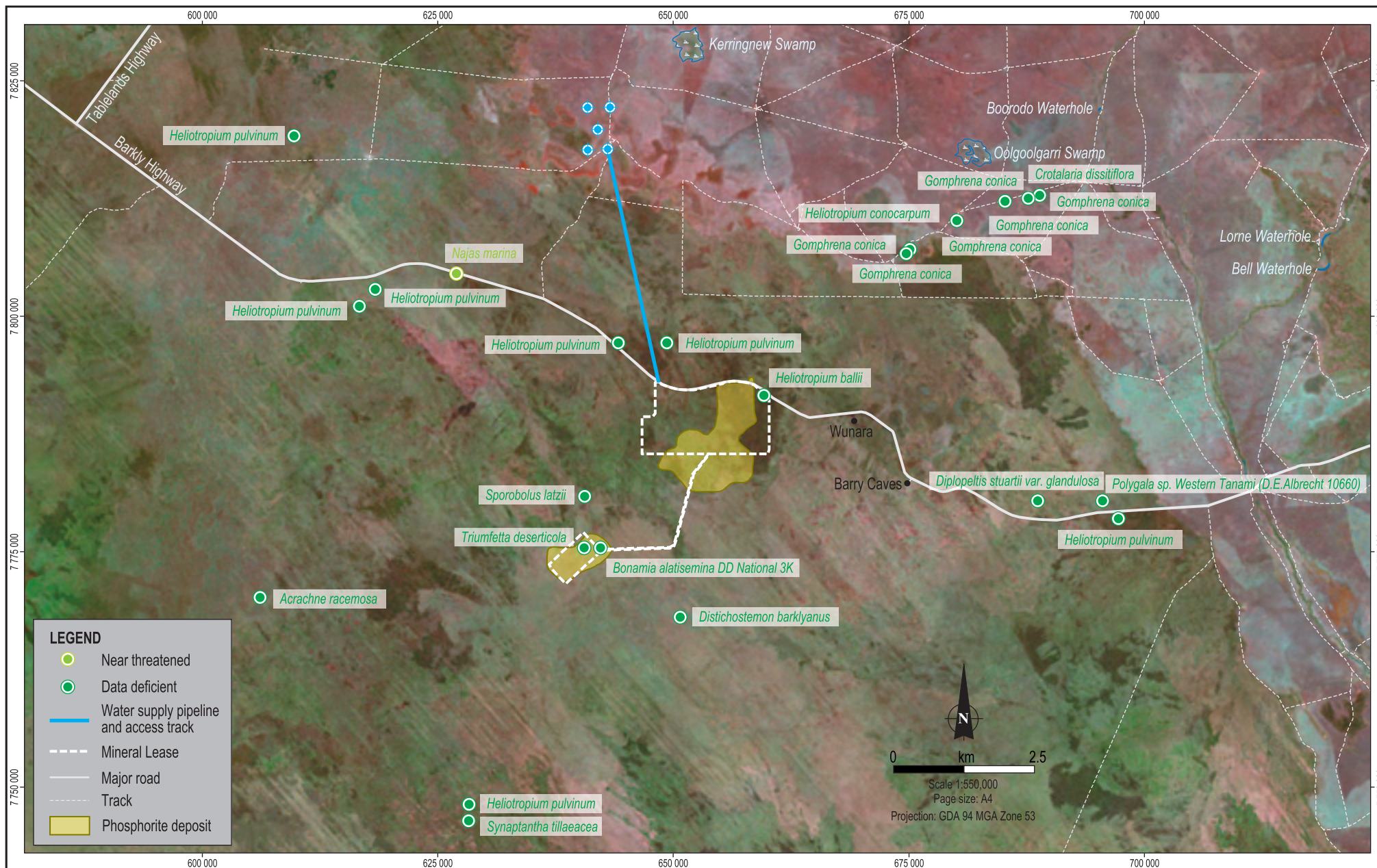


**Plate 1**  
Typical landform at Wonarah



**Plate 2**  
Typical rocky outcrop at Wonarah





Source:  
Place names, roads and tracks from GEODATA 250k (optimum scale 1:250,000)  
Bore locations from GMP  
Flora data from Low Ecological  
Mine layout from GHD and Minemakers  
Mineral lease from DMETIS

**coffey**  
natural systems

Date:  
11.11.2009  
MXD:  
Minemakers\_Wonarah\_GIS.mxd  
File Name:  
9014\_07\_ES06\_GIS\_HB

**Minemakers Australia Pty Ltd**  
**Wonarah Phosphate Project**

**MINEMAKERS**  
AUSTRALIA PTY LTD

**Threatened flora in the project area  
and surrounds**

Figure No:  
**ES6**

## Fauna

The NT Parks and Wildlife Fauna Atlas identifies 163 species within the project area and surrounds. Twelve of these species are listed under the EPBC Act and eight are listed under the TPWC Act (Figure ES7). Two species (both listed under TPWC Act as near threatened) have been recorded in the project area, *Rattus villosissimus* (long haired rat) and *Aspidites ramsayi* (woma python). Two species of conservation significance were recorded as during the field surveys, *Ardeotis Australia* (Australian bustard) (listed as vulnerable under the TPWC Act) and *Onychogalea unguifera* (northern nail-tailed wallaby) (listed as near threatened under the TPWC Act). The field surveys identified no habitats of listed ecological importance.

No species listed under the EPBC Act were recorded during the field surveys, despite targeted searches for such species. An ephemeral lake is located approximately 15 km to the northwest of the Arruwurra deposit within an Indigenous cultural exclusion zone, and may offer suitable habitat for EPBC Act-listed migratory birds during periods of high rainfall. The lack of suitable ephemeral waterbodies within the project area makes the ongoing presence of these species unlikely.

Traditional Owners identified local fauna of cultural significance for their utilitarian values. Larger fauna species such as kangaroo, Australian bustard, sand goanna and other large dragons are still hunted by the Traditional Owners. Ephemeral lakes within cultural exclusion zones are considered an important hunting ground as they provide seasonal refuge to larger species. Traditional Owners consulted during field surveys identified no species of mythical significance.

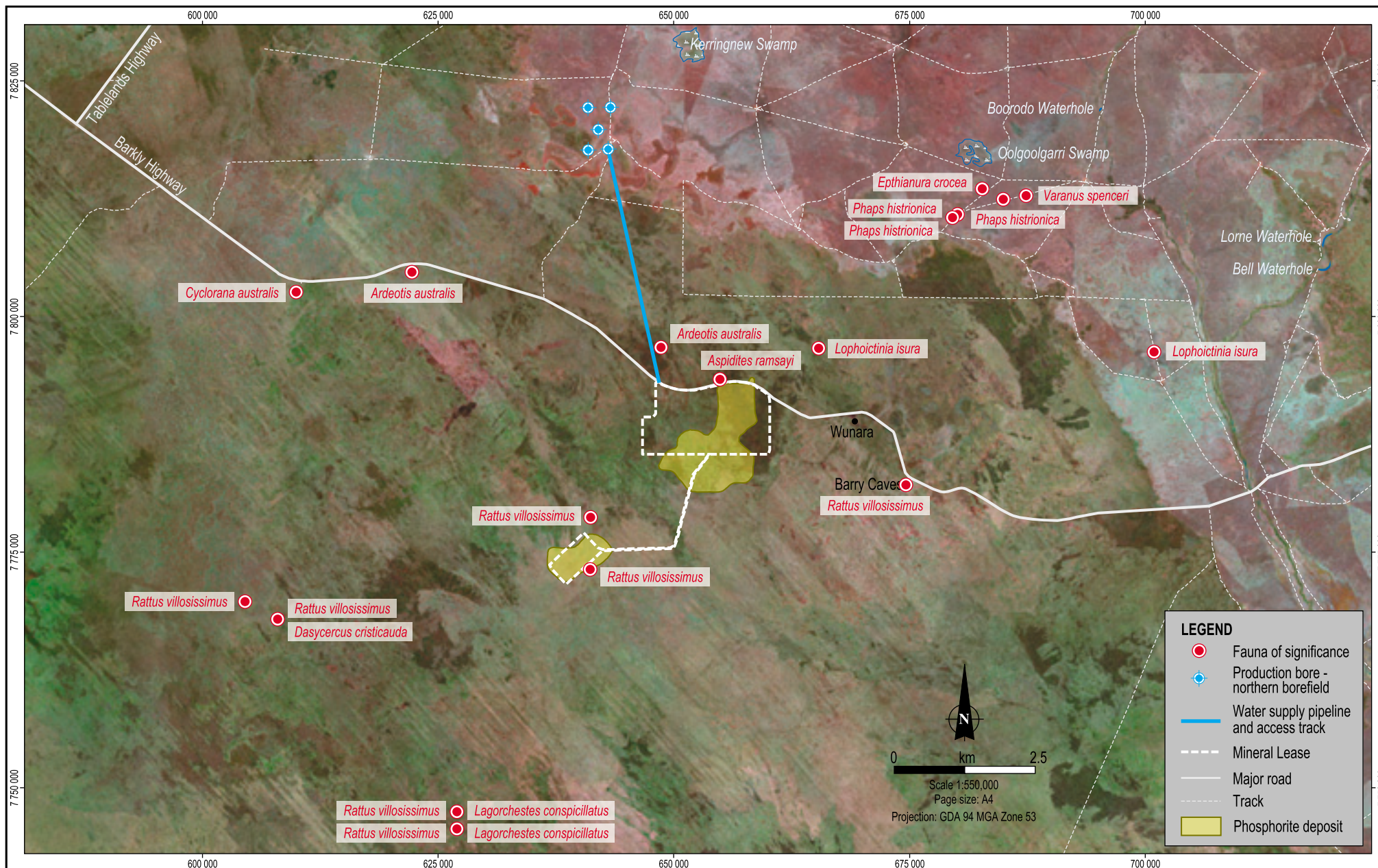
Five introduced fauna were recorded within the project area during field surveys: camels, cows, donkeys, cats and foxes. Cats and foxes are likely to be in low abundance in the area.

## Groundwater

Groundwater offers the only source of reliable water within the region, with the main aquifers on the Barkly Tableland comprising cavernous zones that are commonly weathered and fractured, within calcareous units of the Wonarah Formation and Camooweal Dolomite. Groundwater recharge is predominantly from rainfall infiltration.

Groundwater quality over the tableland is generally fresh to brackish and groundwater levels in the region are extremely variable, ranging from about 25 to over 100 m below ground level. The groundwater level to the north of Mineral Lease is reasonably consistent, lying between 49 and 65 m below ground level in the vicinity of the proposed borefield. This reasonably flat lying groundwater level is in keeping with the presence of a well-connected aquifer system within the cavernous and weathered dolomite. Groundwater levels at the Mineral Lease are more variable, varying from 3 to 63 m below ground level.

Ten existing boreholes lie within the vicinity of the Mineral Lease, all located along the Barkly Highway. The Northern Territory Government installed seven of these for construction and maintenance of the Barkly Highway. Six pre-existing boreholes for stock watering lie within a 10 km radius of the northern borefield (Figure ES8).



Source:  
Place names, roads and tracks from GEODATA 250k (optimum scale 1:250,000)  
Bore locations from GMP  
Fauna data from Low Ecological  
Mine layout from GHD and Minemakers  
Mineral lease from DMETIS

**coffey**  
natural systems

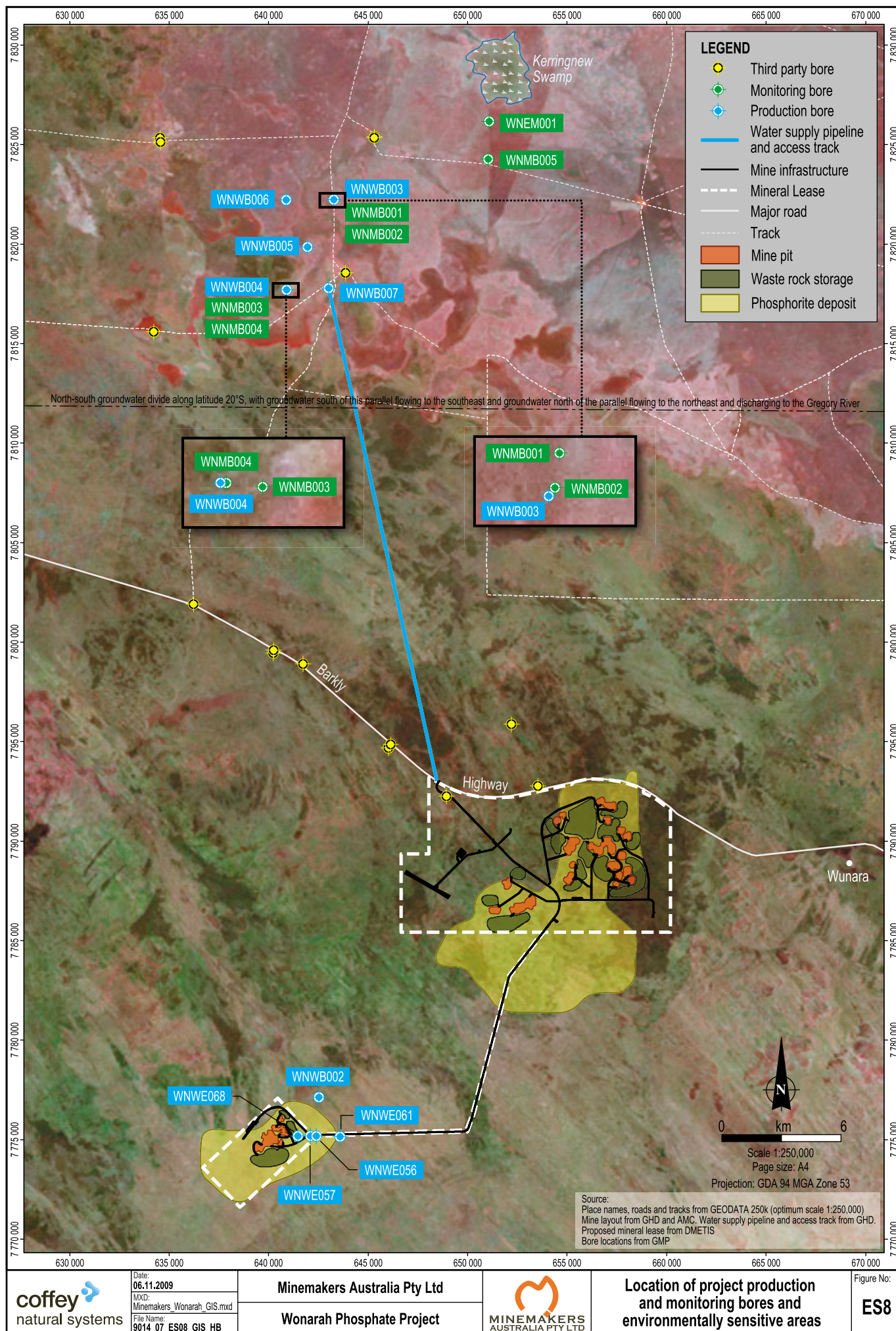
Date:  
11.11.2009  
MXD:  
Minemakers\_Wonarah\_GIS.mxd  
File Name:  
9014\_07\_ES07\_GIS\_HB

**Minemakers Australia Pty Ltd**  
**Wonarah Phosphate Project**

**MINEMAKERS**  
AUSTRALIA PTY LTD

**Threatened fauna in the project area  
and surrounds**

Figure No:  
**ES7**



## Surface Water

The Barkly Tableland region has a semi-arid climate with three distinct seasons – dry (April to July), build up to the wet (September to November) and wet (December to March). Nearly all rain falls between November and March and the greatest incidence is in January and February. A local Bureau of Meteorology rainfall station located at the Ranken River receives a mean annual rainfall of 361 mm. Tropical cyclones can bring heavy rains to the Barkly region; however they are erratic in nature and occur relatively infrequently.

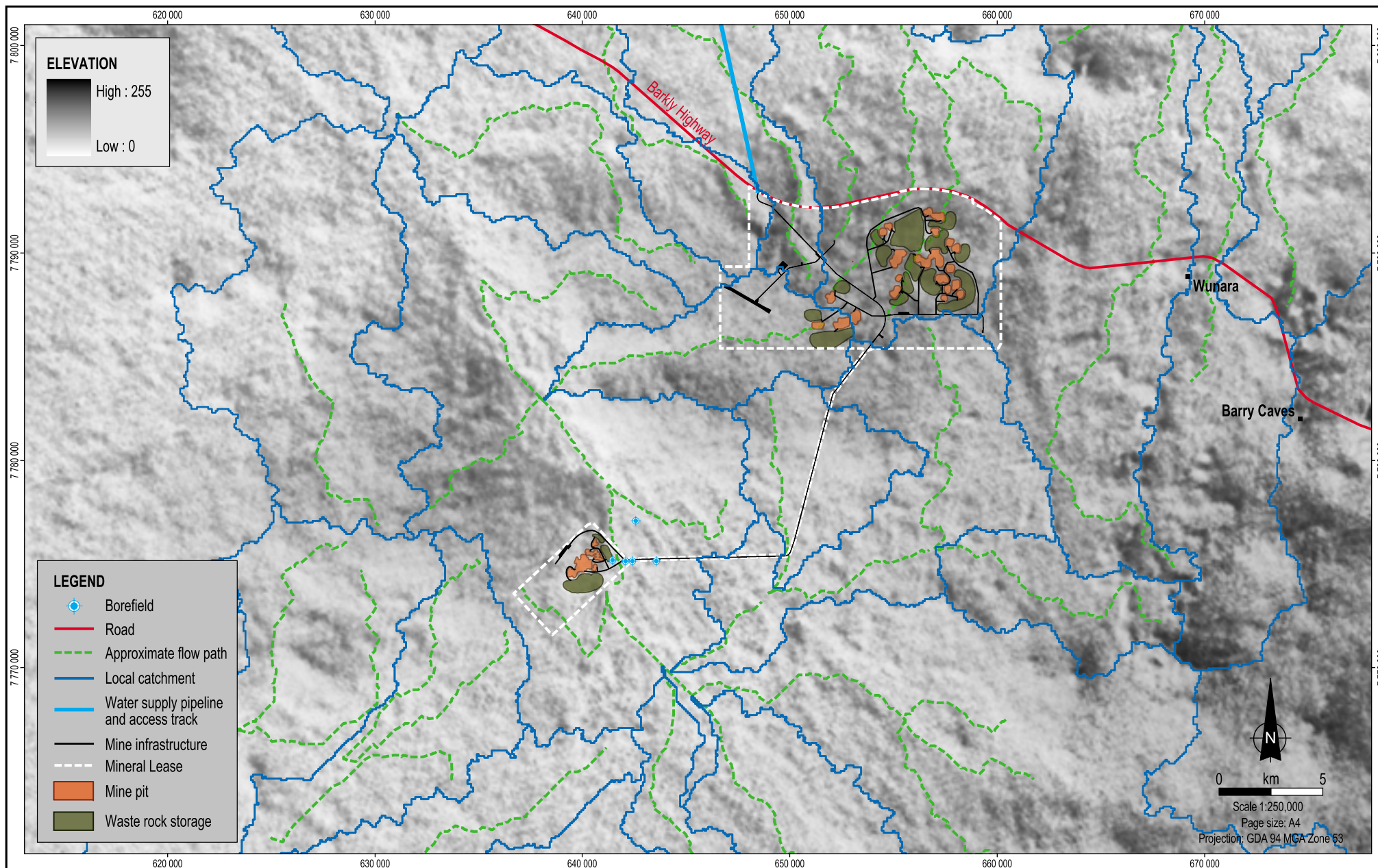
No significant watercourses traverse the project area, with the closest watercourse being the ephemeral Ranken River approximately 60 km to the east and ephemeral Playford River 87 km to the north. The project area incorporates four catchment areas (Figure ES9). However, all of the on site creeks and drainage lines are relatively minor and ephemeral in nature and are likely to only carry runoff following significant rainfall events. The drainage in the project area flows to several large shallow lakes, very few of which are permanent; however, some lakes are known to retain water for extended periods after rain. Seasonally flooded swamps occur in the southwest of the project site, around Arruwurra.

The project is located in the Barkly Surface Water Management Area (SWMA). Under the SWMA management framework, there are no water quality objectives to meet environmental and other public benefit outcomes. There is no major water storage, diversion or supply infrastructure within the Barkly SWMA and the volume of surface water used is less than 0.1% of the mean annual runoff. There are no current surface water licences within the Barkly SWMA and any surface water use is for stock watering.

## Socio-economics

The project area is on the Barkly Tableland, a remote region of the Northern Territory. The Barkly Tableland covers a large area of the central-eastern Northern Territory. The major service centre for the region is the town of Tennant Creek (approximately 240 km west of the project). The region is sparsely populated with the major sources of income for the region generated from grazing, mining and tourism.

The closest populated community to the project is Wunara, a small Aboriginal settlement located approximately 10 km from the Mineral Lease boundary, adjacent to the Barkly Highway. The population residing in the community fluctuates from 2 to 30 people according to the season. Members of the Wunara Community are Traditional Owners of the land subject to the Mineral Lease. The project is also surrounded by a number of pastoral properties.



Source:  
Place names, roads and tracks from GEODATA 250k (optimum scale 1:250,000)  
Mine plan from AMC & GHD.  
Catchments and flow paths from Carrick Consulting.  
DEM from Northern Territory Geological Survey.

**coffey**  
natural systems

Date:  
13.11.2009  
MXD:  
Minemakers\_Wonarah\_GIS.mxd  
File Name:  
9014\_07\_ES09\_GIS\_GL

**Minemakers Australia Pty Ltd**  
**Wonarah Phosphate Project**

**MINEMAKERS**  
AUSTRALIA PTY LTD

**Catchments and estimated flow paths  
in the project area**

Figure No:  
**ES9**

## Indigenous and Non-Indigenous Cultural Heritage

The project area is located within the region associated with the Arruwurra people. The project area and surrounds is known to contain sites of mythological and archaeological significance. Through the Central Land Council (CLC), in consultation with Traditional Owners, six sacred sites were identified close to the Mineral Lease. These sites have consequently been incorporated into the Indigenous cultural exclusion zones and are located outside of the Mineral Lease; no infrastructure or activities related to the project will occur in these areas. A search of the Aboriginal Areas Protection Authority (AAPA) Heritage Database identified two registered sites to the north of the Barkly Highway.

An archaeological survey identified six low density silcrete knapping areas across the Mineral Lease. Of these, one (lying outside of the Mineral Lease) is of moderate scientific significance and the remaining five (four of which are inside the Mineral Lease) are of low scientific significance.

A search of the Australian Heritage Database and the NT Heritage Register identified no sites of non-Indigenous cultural heritage within the project area.

## 5 Key Environmental and Social Impacts

An assessment of the potential, credible environmental and social impacts that may be associated with the project has been carried out. This assessment was based on knowledge of the existing environment, experience with similar operations elsewhere and issues of concern to key stakeholders. Measures to avoid, mitigate and/or manage each potential negative impact have been developed. These reflect Minemakers' commitment to good practice mining and environmental management, and are technically and economically feasible within the context of the project's setting.

The residual risk associated with the impacts, assuming the effective implementation of the proposed avoidance, mitigation and management measures is provided in Table ES2.

Development of the project will also bring positive environmental and social impacts. The main benefits of the project are predicted to be:

- Annual total sales revenue estimated to be \$500 million.
- Estimated annual operating expenditure will be of approximately \$450 million and annual government royalties of approximately \$7 million.
- Capital expenditure (e.g., project expenditure and investment in additional infrastructure) of about \$107 million.
- Annual salaries for Minemakers employees of approximately \$3.5 million per annum (excluding on-costs) and for contractors, approximately \$24.3 million.
- Increased incomes for people elsewhere in the region, including local and peripheral communities, of approximately \$11.9 million per annum (using the industry multiplier of 0.428).
- Direct employment of up to about 100 people during construction and up to 300 people during operations.

**Table ES2 Summary of residual impact assessments**

| ID                                    | Impact                                                                                                                                                                         | Likelihood     | Consequence   | Residual Risk |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------|---------------|
| <i>Air quality</i>                    |                                                                                                                                                                                |                |               |               |
| I01                                   | Decrease in air quality at the Wunara community due to dust emissions generated within the Mineral Lease.                                                                      | Rare           | Moderate      | Moderate      |
| I02                                   | Decrease in air quality for motorists travelling along the section of the Barkly Highway adjoining the Mineral Lease due to dust emissions generated within the Mineral Lease. | Possible       | Moderate      | High          |
| I03                                   | Decrease in air quality due to dust emissions from project related heavy vehicles along the ore transport route.                                                               | Unlikely       | Moderate      | Moderate      |
| I04                                   | Significant increase in the amount of combustion emissions.                                                                                                                    | Unlikely       | Insignificant | Low           |
| I05                                   | Decrease in air quality due to odour.                                                                                                                                          | Rare           | Insignificant | Low           |
| <i>Greenhouse gas emissions</i>       |                                                                                                                                                                                |                |               |               |
| I06                                   | Significant increase in greenhouse gas emissions                                                                                                                               | Unlikely       | Insignificant | Low           |
| <i>Noise and vibration</i>            |                                                                                                                                                                                |                |               |               |
| I07                                   | Disturbance to sensitive receptors from noise and vibration generated within the Mineral Lease.                                                                                | Rare           | Minor         | Low           |
| I08                                   | Disturbance to sensitive receptors from project related heavy vehicle noise along the ore transport route.                                                                     | Unlikely       | Minor         | Low           |
| <i>Landform, geology and soils</i>    |                                                                                                                                                                                |                |               |               |
| I09                                   | Unstable landforms                                                                                                                                                             | Unlikely       | Minor         | Low           |
| Significant reduction in soil quality |                                                                                                                                                                                |                |               |               |
| I10                                   | Due to altered profile                                                                                                                                                         | Unlikely       | Minor         | Low           |
| I11                                   | Due to compaction                                                                                                                                                              | Unlikely       | Minor         | Low           |
| I12                                   | Due to contamination                                                                                                                                                           | Unlikely       | Minor         | Low           |
| I13                                   | Due to erosion                                                                                                                                                                 | Possible       | Moderate      | High          |
| <i>Land use</i>                       |                                                                                                                                                                                |                |               |               |
| I14                                   | Reduced availability of land for traditional hunting and gathering.                                                                                                            | Almost Certain | Insignificant | Low           |
| I15                                   | Restriction of Traditional Owner access to sites of cultural significance.                                                                                                     | Rare           | Minor         | Low           |
| I16                                   | Significant reduction in land for potential pastoral use.                                                                                                                      | Unlikely       | Insignificant | Low           |

**Table ES2 Summary of residual impact assessments**

| ID                   | Impact                                                                                                     | Likelihood | Consequence   | Residual Risk |
|----------------------|------------------------------------------------------------------------------------------------------------|------------|---------------|---------------|
| <i>Flora</i>         |                                                                                                            |            |               |               |
| I17                  | Reduced species abundance.                                                                                 | Unlikely   | Insignificant | Low           |
| I18                  | Significant impacts to threatened species.                                                                 | Unlikely   | Moderate      | Moderate      |
| I19                  | Reduced conditions favourable for plant growth due to dust.                                                | Likely     | Insignificant | Moderate      |
| I20                  | Reduced conditions favourable for plant growth due to disturbance.                                         | Unlikely   | Insignificant | Low           |
| I21                  | Increased weed density and distribution.                                                                   | Unlikely   | Moderate      | Moderate      |
| I22                  | Introduction of new weed species.                                                                          | Unlikely   | Moderate      | Moderate      |
| <i>Fauna</i>         |                                                                                                            |            |               |               |
| I23                  | Reduced species abundance in the long term.                                                                | Unlikely   | Minor         | Low           |
| I24                  | Significant impacts to threatened species.                                                                 | Unlikely   | Minor         | Low           |
| I25                  | Increased abundance of introduced species.                                                                 | Unlikely   | Moderate      | Moderate      |
| <i>Groundwater</i>   |                                                                                                            |            |               |               |
| I26                  | Decrease in the availability of groundwater for third party users.                                         | Unlikely   | Minor         | Low           |
| I27                  | Unacceptable reduction in groundwater quality.                                                             | Unlikely   | Minor         | Low           |
| <i>Surface water</i> |                                                                                                            |            |               |               |
| I28                  | Adverse effects on downstream ecosystems due to fugitive sediment.                                         | Possible   | Minor         | Moderate      |
| I29                  | Adverse effects on downstream fauna and riparian vegetation due to altered flow regimes.                   | Unlikely   | Insignificant | Low           |
| I30                  | Adverse effects on fauna and riparian vegetation and groundwater users due to surface water contamination. | Unlikely   | Insignificant | Low           |

**Table ES2 Summary of residual impact assessments**

| ID                                  | Impact                                                                                                           | Likelihood | Consequence   | Residual Risk |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------|------------|---------------|---------------|
| <i>Socio-economic</i>               |                                                                                                                  |            |               |               |
| I31                                 | Social disruption caused by population and demographics                                                          | Unlikely   | Moderate      | Moderate      |
| I32                                 | Increased competition for skilled labour, particularly for highly skilled people with previous mining experience | Possible   | Minor         | Moderate      |
| I33                                 | Significant pressure placed on existing emergency services                                                       | Unlikely   | Minor         | Low           |
| I34                                 | Inadequate existing infrastructure and community services                                                        | Unlikely   | Moderate      | Moderate      |
| I35                                 | Reduced availability and affordability of housing and accommodation in Tennant Creek                             | Unlikely   | Moderate      | Moderate      |
| I36                                 | Lack of accommodation for Traditional Owners in Wunara community                                                 | Possible   | Minor         | Moderate      |
| I37                                 | Social problems due to drugs and alcohol                                                                         | Unlikely   | Moderate      | Moderate      |
| <i>Indigenous cultural heritage</i> |                                                                                                                  |            |               |               |
| I38                                 | Disturbance to cultural exclusion zones                                                                          | Rare       | Major         | High          |
| I39                                 | Disturbance to identified archaeological site of moderate significance                                           | Rare       | Moderate      | Moderate      |
| I40                                 | Disturbance to identified archaeological sites of low significance                                               | Likely     | Insignificant | Moderate      |
| I41                                 | Disturbance to unidentified archaeological sites of significance                                                 | Possible   | Insignificant | Low           |
| <i>Traffic</i>                      |                                                                                                                  |            |               |               |
| I42                                 | Increased risk of accident due to reduced headway                                                                | Possible   | Moderate      | High          |
| I43                                 | Increased risk of accident due to increased rate of road degradation                                             | Possible   | Minor         | Low           |

- Indirect employment of around 480 people during operations.
- Increased support to local communities through mechanisms such as sponsorships and donations, employment opportunities, and training and education opportunities.
- Acquisition of new baseline environmental data.

Minemakers will work with local Indigenous training providers and other mining projects in the Barkly Tableland region to ensure training programs are focused on maximising skill development and employment opportunities for members of the Indigenous community and contribute to the suitably trained Indigenous workforce in the region.

As with all mining projects, some adverse impacts will be unavoidable. However, based on the risk assessment, the majority of environmental and social risks associated with the project will be low or moderate, following implementation of mitigation and management measures.

## **6 Environmental Outcomes and Assessment Criteria**

Minemakers has set specific outcomes for each environmental and social aspect during the construction, operation, rehabilitation and closure of the project. These outcomes are based on the potential environmental or social impacts and residual risks identified for the project, as summarised in Table ES3. Each environmental and social outcome is accompanied by measurable assessment criteria that can be used by Minemakers and others (such as regulators or external environmental auditors) to assess progress towards, or compliance with, the outcome. Where possible, the assessment criteria have been based on standards, guidelines, monitoring results or similar that will allow for numerical comparison.

A monitoring program has been developed for each of the environmental and social outcomes to allow assessment against the assessment criteria. The monitoring program and assessment criteria will allow for early warning that mitigation and management measures are failing and the outcome is potentially at risk of not being achieved.

**Table ES3 Environmental and social outcomes**

| ID                         | Impact                                                                                                                                                                         | Outcome                                                                                                             | Assessment Criteria                                                                                                                                                                                                                                                |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Air quality</i>         |                                                                                                                                                                                |                                                                                                                     |                                                                                                                                                                                                                                                                    |
| I01                        | Decrease in air quality at the Wunara community due to dust emissions generated within the Mineral Lease.                                                                      | No decrease in air quality or visual amenity due to dust emissions outside of the Mineral Lease.                    | Compliance with annual average dust deposition rate does not exceed 2 g/m <sup>2</sup> /month above baseline dust deposition rate of 2.6 g/m <sup>2</sup> /month outside of the Mineral Lease.<br>Complaints register to show no reasonable complaint unaddressed. |
| I02                        | Decrease in air quality for motorists travelling along the section of the Barkly Highway adjoining the Mineral Lease due to dust emissions generated within the Mineral Lease. | No decrease in air quality or visual amenity due to dust emissions outside of the Mineral Lease.                    | Measurements of fugitive dust do not exceed levels that may affect visibility (5 g/m <sup>2</sup> /month). To be recorded by real time dust monitoring gauges) across the Barkly Highway.<br>Complaints register to show no reasonable complaint unaddressed.      |
| I03                        | Decrease in air quality due to dust emissions from project related heavy vehicles along the ore transport route.                                                               | No decrease in air quality due to dust emissions from project related heavy vehicles along the ore transport route. | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                   |
| I04                        | Significant increase in the amount of combustion emissions.                                                                                                                    | No decrease in air quality due to combustion emissions outside of the Mineral Lease                                 | Maintenance records show regular servicing of vehicles and plant.                                                                                                                                                                                                  |
| I05                        | Decrease in air quality due to odour.                                                                                                                                          | No decrease in air quality due to odour outside of the Mineral Lease.                                               | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                   |
| <i>Noise and vibration</i> |                                                                                                                                                                                |                                                                                                                     |                                                                                                                                                                                                                                                                    |
| I07                        | Disturbance to sensitive receptors from noise and vibration generated within the Mineral Lease.                                                                                | No disturbance to sensitive receptors from noise and vibration at the mine                                          | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                   |
| I08                        | Disturbance to sensitive receptors from project related heavy vehicle noise along the ore transport route.                                                                     | No significant increase in traffic related noise at sensitive receptors along the ore transport route.              | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                   |

**Table ES3 Environmental and social outcomes**

| ID                                 | Impact                                                                                                  | Outcome                                                                                                     | Assessment Criteria                                                                                                                                                                                                                                                                                            |
|------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Landform, geology and soils</i> |                                                                                                         |                                                                                                             |                                                                                                                                                                                                                                                                                                                |
| I09                                | Unstable landforms.                                                                                     | Landform is stable.                                                                                         | Slopes within the Mineral Lease are stable with drainage patterns consistent with the pre-mine landform.<br>Slopes of waste rock storages and stockpiles do not exceed 18°.                                                                                                                                    |
| I10,<br>I11,<br>I12,<br>I13        | Significant reduction in soil quality due to altered profile, compaction, contamination and/or erosion. | No reduction in soil quality.                                                                               | Verification testing of soils contaminated as a result of mining activities show remediation has been successful.<br>Compacted areas no longer required for mining activities have been ripped and revegetated.<br>No visible gully erosion.                                                                   |
| <i>Land use</i>                    |                                                                                                         |                                                                                                             |                                                                                                                                                                                                                                                                                                                |
| I14                                | Reduced availability of land for traditional hunting and gathering.                                     | Minimal reduction in Arruwurra Aboriginal Corporation land available for traditional hunting and gathering. | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                                                               |
| I15                                | Restriction of Traditional Owner access to sites of cultural significance.                              | Alternative access routes to be agreed in consultation with Traditional Owners.                             | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                                                               |
| I16                                | Significant reduction in land for potential pastoral use.                                               | No significant reduction in land for potential and actual pastoral use.                                     | Complaints register to show no reasonable complaint unaddressed.                                                                                                                                                                                                                                               |
| <i>Flora</i>                       |                                                                                                         |                                                                                                             |                                                                                                                                                                                                                                                                                                                |
| I17,<br>I18                        | Reduced species abundance or significant impacts to threatened species.                                 | Disturbance to vegetation is restricted to areas permitted within the Mineral Lease conditions.             | Annual audit of records show native vegetation clearance is in accordance with the Mineral Lease conditions.<br>Annual flora surveys (including photo monitoring) at all flora monitoring sites to show no unexpected change in abundance, composition or condition of flora species from baseline conditions. |

**Table ES3 Environmental and social outcomes**

| ID                    | Impact                                                                       | Outcome                                                                                                       | Assessment Criteria                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Flora (cont'd)</i> |                                                                              |                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                               |
| I19                   | Reduced conditions favourable for plant growth due to dust                   | The health of remaining vegetation does not alter significantly over the life of the project.                 | Annual flora surveys (including photo monitoring) at all flora monitoring sites in to show no unexpected change in abundance, composition or condition of flora species from baseline conditions.<br><br>Compliance with annual average dust deposition rate does not exceed 2 g/m2/month above baseline dust deposition rate of 2.6 g/m2/month outside of the Mineral Lease. |
| I20                   | Reduced conditions favourable for plant growth due to disturbance            | The health of remaining vegetation does not alter significantly over the life of the project.                 | Annual flora surveys (including photo monitoring) at all flora monitoring sites in to show no unexpected change in abundance, composition or condition of flora species from baseline conditions.                                                                                                                                                                             |
| I21, I22              | Increased weed density and distribution or introduction of new weed species. | No weed species are encouraged or introduced due to the project construction and operations.                  | No increase in weed density/distribution and no new establishment of declared weeds, compared with control sites or baseline data.                                                                                                                                                                                                                                            |
| <i>Fauna</i>          |                                                                              |                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                               |
| I23, I24              | Reduced species abundance and significant impacts to threatened species.     | Disturbance to vegetation is restricted to areas permitted within the Mineral Lease conditions.               | Annual audit of records show native vegetation clearance is in accordance with the Mineral Lease conditions.<br>Regular surveying (as per the monitoring program for fauna) indicates no changes in abundance, composition or condition of fauna species from baseline conditions.                                                                                            |
| I25                   | Increased abundance of introduced species.                                   | No introduced fauna species are encouraged or introduced due to the project construction and operations.      | A reduction in abundance of pest (feral) species from baseline monitoring records.                                                                                                                                                                                                                                                                                            |
| <i>Groundwater</i>    |                                                                              |                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                               |
| I26                   | Decrease in the availability of groundwater for third party users.           | Groundwater supply from third party bores does not decrease due to the project's construction and operations. | Monitoring of nearby third party bores shows no decrease in groundwater level depth directly attributable to groundwater extraction for the project.                                                                                                                                                                                                                          |
| I27                   | Unacceptable reduction in groundwater quality.                               | Groundwater quality is not reduced due to the project construction or operations.                             | Monitoring of production bores reveal no change to groundwater quality.                                                                                                                                                                                                                                                                                                       |

**Table ES3 Environmental and social outcomes**

| ID                    | Impact                                                                                                           | Outcome                                                                                                                                     | Assessment Criteria                                                                                                                                                                                                                                                                                                           |
|-----------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Surface water</i>  |                                                                                                                  |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                               |
| I28                   | Adverse effects on downstream ecosystems due to fugitive sediment.                                               | No adverse effects on downstream fauna and habitats due to the generation of fugitive sediment as a result of mining activities.            | Annual flora surveys (including photo monitoring) at all flora monitoring sites to show no unexpected change in abundance, composition or condition of flora species from baseline conditions.                                                                                                                                |
| I29                   | Adverse effects on downstream fauna and riparian vegetation due to altered flow regimes.                         | No adverse effects on downstream fauna and riparian vegetation due to altered flow regimes as a result of mining activities.                | Annual flora surveys (including photo monitoring) at all flora monitoring sites to show no unexpected change in abundance, composition or condition of flora species from baseline conditions.<br><br>Fauna monitoring indicates no changes in abundance, composition or condition of fauna species from baseline conditions. |
| I30                   | Adverse effects on fauna and riparian vegetation and groundwater users due to surface water contamination.       | No adverse effects on fauna, riparian vegetation and groundwater users due to surface water contamination as a result of mining activities. | Following rainfall events where there is runoff of water from the site, upstream and downstream monitoring to show no statistically significant impact of the project on surface water quality (including major anions and cations, total and dissolved metals and pH, TDS, EC and total petroleum hydrocarbons).             |
| <i>Socio-economic</i> |                                                                                                                  |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                               |
| I31                   | Social disruption caused by population and demographics                                                          | No negative change in social cohesion in Wunara or Tennant Creek as a result of the project.                                                | Annual audit of complaints register indicates no incidence of community complaint regarding changes in social cohesion due to project.                                                                                                                                                                                        |
| I32                   | Increased competition for skilled labour, particularly for highly skilled people with previous mining experience | Minimise adverse social impact due to increase in competition for skilled labour.                                                           | Consultation register shows liaison with existing training providers and local communities regarding training and employment.                                                                                                                                                                                                 |
| I33                   | Significant pressure placed on existing emergency services                                                       | Project does not place additional pressure on existing emergency services.                                                                  | Consultation register shows liaison with existing emergency services.                                                                                                                                                                                                                                                         |
| I34                   | Inadequate existing infrastructure and community services                                                        | No unexpected demand placed on infrastructure or services as a result of the project.                                                       | Consultation register shows liaison with relevant stakeholders.                                                                                                                                                                                                                                                               |

**Table ES3 Environmental and social outcomes**

| ID                                  | Impact                                                                                              | Outcome                                                                                                                           | Assessment Criteria                                                                                                                                                                                                                                    |
|-------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Socio-economic (cont'd)</i>      |                                                                                                     |                                                                                                                                   |                                                                                                                                                                                                                                                        |
| I35,<br>I36                         | Decrease in availability and affordability of housing and accommodation in Tennant Creek and Wunara | Community awareness of project and its progress is maintained so potential impacts are taken into consideration for any planning. | Consultation register shows liaison with government, shire council and Traditional Owners.                                                                                                                                                             |
| I37                                 | Social problems due to drugs and alcohol                                                            | Successful management of drugs and alcohol on mine site.                                                                          | Annual audit of complaints register indicates no incidence of community complaint regarding drug or alcohol issues associated with the workforce.<br><br>Audit of drug and alcohol testing records demonstrate testing conducted and results acted on. |
| —                                   | Positive benefits are realised                                                                      | Positive socio-economic benefits are maximised.                                                                                   | Annual audit of procurement records show supply of goods and services have been sourced locally.<br><br>Workforce statistics indicate workforce composition includes local and Northern Territory people are employed at the project.                  |
| <i>Indigenous cultural heritage</i> |                                                                                                     |                                                                                                                                   |                                                                                                                                                                                                                                                        |
| I38                                 | Disturbance to Indigenous cultural exclusion zones                                                  | No disturbance to Indigenous cultural exclusion zones.                                                                            | Audits show that all staff are inducted, and as such have been made aware of exclusion zones, commitments under relevant legislation and cultural heritage management plan.<br><br>Audits show no disturbance to Indigenous cultural exclusion zones.  |
| I39                                 | Disturbance to identified archaeological site of moderate significance                              | No disturbance to identified archaeological site of significance.                                                                 | Audits show that all staff are inducted, and as such have been made aware of site locations, commitments under relevant legislation and cultural heritage management plan.<br><br>Audits show no disturbance to site.                                  |

**Table ES3 Environmental and social outcomes**

| ID                                           | Impact                                                             | Outcome                                                                                                                                                                                                                                 | Assessment Criteria                                                                                                                                                                                                 |
|----------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Indigenous cultural heritage (cont'd)</i> |                                                                    |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                     |
| I40                                          | Disturbance to identified archaeological sites of low significance | Disturbance to identified sites of low significance is restricted to that permitted by granted consent to disturb under the Heritage Conservation Act, i.e., within Mineral Lease.                                                      | Audits show that all staff are inducted, and as such have been made aware of commitments under relevant legislation and cultural heritage management plan.<br><br>Audits show no unauthorised disturbance to sites. |
| I41                                          | Disturbance to unidentified archaeological sites of significance   | Disturbance to identified sites of archaeological significance is restricted to that permitted by granted consent to disturb under the Heritage Conservation Act, i.e., within Mineral Lease, and within 30 m of silcrete outcroppings. |                                                                                                                                                                                                                     |
| <b>Traffic</b>                               |                                                                    |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                     |
| I42,<br>I43                                  | Increased risk of accident                                         | No adverse effects on safety due to increased road traffic.                                                                                                                                                                             | Complaints register shows all reasonable complaints are investigated.<br><br>Vehicular incident register shows no project-related incidents/near misses.                                                            |

## **7 Mine Closure, Rehabilitation and Future Land Use**

A mine closure and rehabilitation plan has been prepared for the project that includes specific closure objectives and assessment criteria that will apply to progressive and final rehabilitation and actual closure works. This plan demonstrates that it is technically and economically feasible to successfully close and rehabilitate the project and to develop a closure and rehabilitation process that can be built on during the life of the project.

The objectives of the closure and rehabilitation process are to ensure the:

- Protection of human health and safety.
- Progressive rehabilitation of the site during operations.
- Ecosystem and landscape function after closure is resilient, self-sustaining and comparable to the surrounding areas.
- Project does not compromise the quality and quantity of surface water or groundwater to existing users and water dependent ecosystems.
- Need for long term monitoring and maintenance is reduced through design and construction of mine waste landforms that are physically and chemically stable.
- Landforms are consistent with the surrounding landscape.
- Residual risks and liabilities are identified and can be readily controlled.
- Mine closure process and lease relinquishment occurs in a cost-effective and efficient manner.
- Full cost of decommissioning and rehabilitation is understood and that a mechanism for funding exists.
- Development of an environmental monitoring and reporting program which is focused towards demonstrating the achievement of closure outcomes.

Rehabilitation will be undertaken progressively when areas are no longer required for mining. This will include backfilling of pits where economically feasible, stabilisation of land, and ripping and revegetating of disturbed areas. All infrastructure, excluding any requested by Traditional Owners to remain on-site, will be removed and the areas will be regenerated as per mined areas.

The final pit voids will remain as a permanent feature in the landscape. Abandonment bunds will be constructed to prevent inadvertent public access to the pit voids.

The mine closure and rehabilitation plan will be regularly reviewed and revised as necessary during the life of the project. A final decommissioning plan will be developed in consultation with regulatory authorities and Traditional Owners during operations and as part of the closure process. This plan will further detail completion criteria and refine the timeline for decommissioning and determination of compliance with regulatory authority requirements.

