



NOTICE OF INTENT

HNC (Australia) Resources Pty Ltd

Area 55 Oxide Project

December 2009

CR 9029_1_v3



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Notice of Intent
Area 55 Oxide Project

1. INTRODUCTION

1.1 Overview

HNC (Australia) Resources Pty Ltd, hereafter referred to as HAR, proposes to develop the Area 55 Oxide Project ('the project'), located approximately 65 km south from Darwin and 3.5 km southwest of the Browns Oxide Project, in the Northern Territory (Figure 1.1).

The project comprises:

- Open pit mine.
- Waste rock stockpile(s).
- Tailing storage facility.
- Haul road and light vehicle road.
- Temporary ore stockpile.
- Ancillary infrastructure (workshop, administration office).

The project has a nominal resource of 4.7 Mt of polymetallic oxide ore and a mine life of approximately 4 years; ore will be mined at a rate of 1.3 Mt/a. Over the life of the project approximately 9.7 Mt of waste material will be produced. The project will process the ore from the Area 55 open pit at HAR's existing Browns Oxide Project processing plant and will extract copper, cobalt and nickel metals. A new tailing storage facility (known as 'TSF South') will be constructed to store the tails from processing.

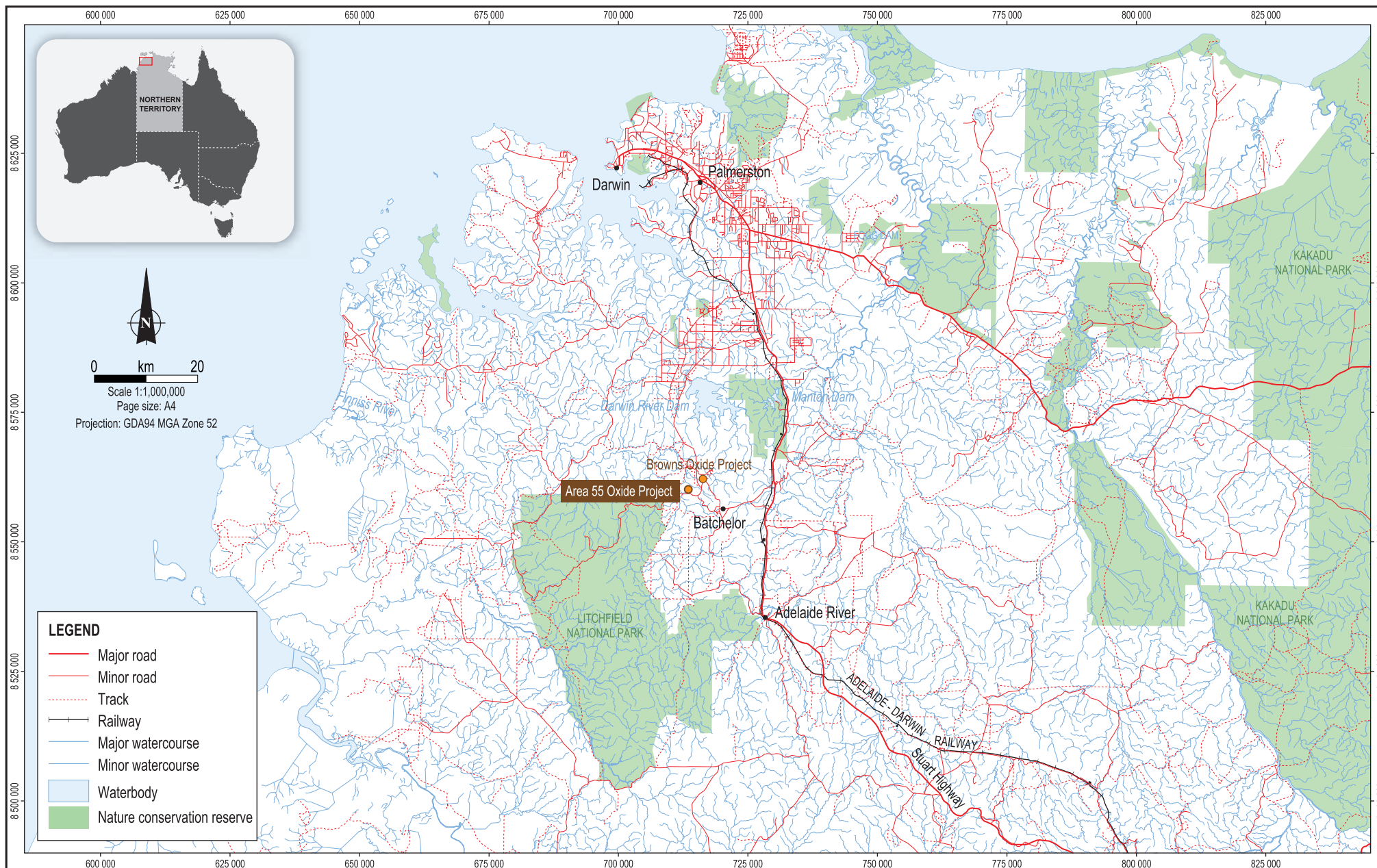
The Browns Oxide Project is currently under care and maintenance and it is planned that it will restart in mid 2010.

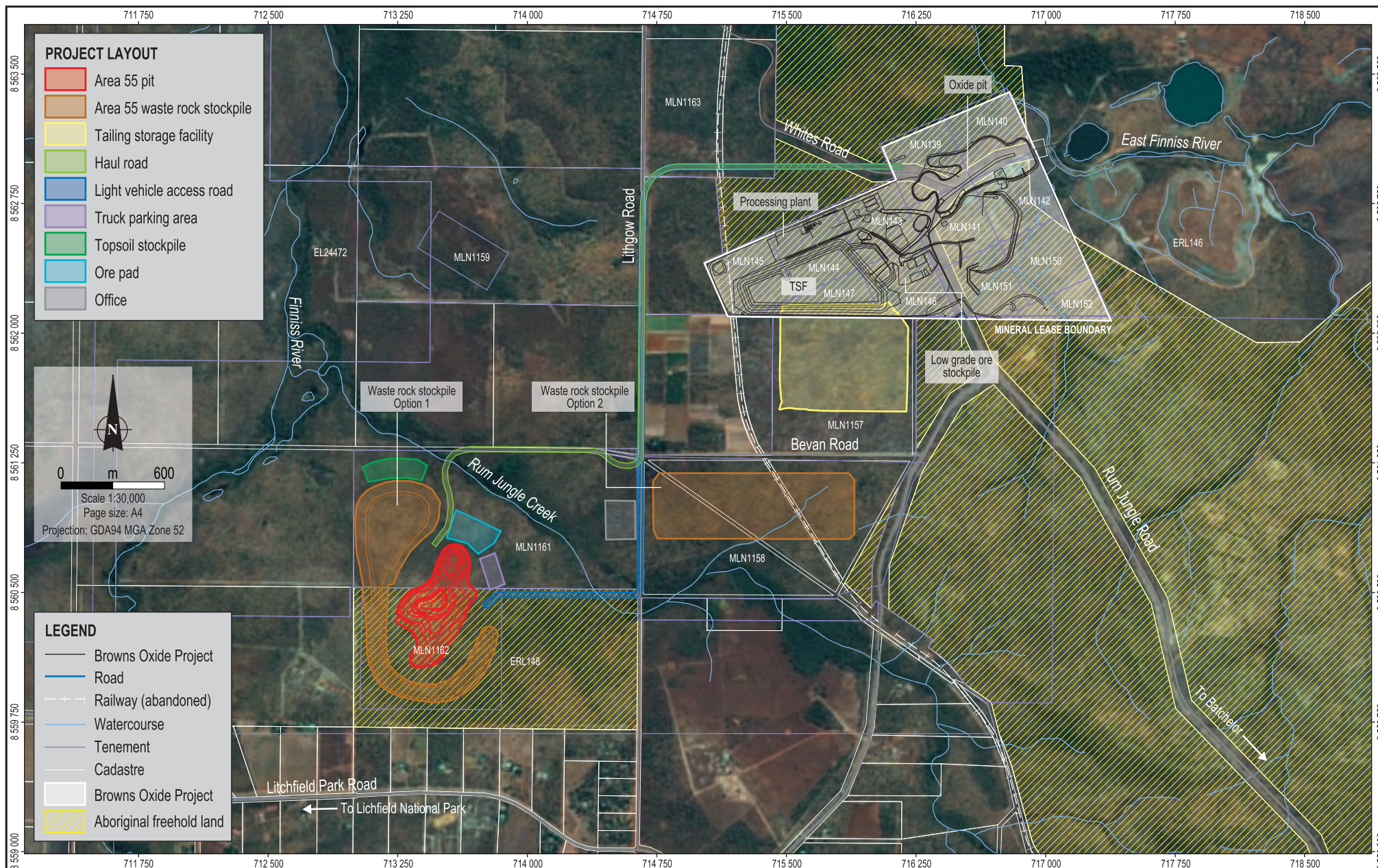
HAR commenced a community consultation in September 2009 and will continue and expand on this community consultation program throughout the approvals process. The Area 55 Oxide Project is located close to residents of the Rum Jungle community; the southern boundary of the Area 55 lease boundary is within a few hundred metres of the nearest residents. Due to the proximity of the project to residents, HAR proposes to mine ore from Area 55 only during daylight hours (nominally 7 am to 6 pm).

This Notice of Intent provides formal notification to the Northern Territory Government and other interested parties of HAR's intent to commence the process of applying for environmental approvals for the development of the project.

1.2 Project Area and Land Tenure

The project will be primarily located on Northern Territory and Aboriginal freehold land in the Hundred of Goyder, within mining lease areas MLN 1157, MLN 1161 and MLNA 1162 (this is in the process of being granted); one of the waste rock stockpile layouts being considered involves a stockpile on another mining lease area, MLN 1158 (Figure 1.2). TSF South will be located on MLN 1157, immediately south (and abutting) the existing TSF for the Browns Oxide Project.





Source:
Project layout from HNC (Australia) Resources Pty Ltd
Railways, roads and drainage from NTLIS (optimum scale 1:10,000)
Imagery from Google Earth, 2009.
Cadastre and Aboriginal freehold land from NTDP1

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Area 55 Oxide Project

HAR

Area 55 and Browns Oxide Project
layout and land tenure

Figure No:

1.2

The haul road used to transport ore to the Browns Oxide Project processing plant and, potentially, waste rock to the stockpile on MLN 1158 will be located along the western section of Bevan Road (currently a gazetted road reserve, but with no road constructed) and Lithgow Road.

The Browns Oxide Project processing plant is located within the mining lease areas MLN 139 to MLN 147 and MLN 150 to MLN 152. This area is referred to in this NOI as the 'Browns site'.

Compass Resources Limited holds the tenements in which the project will be located; further detail about this is provided in Section 1.4.

1.3 Details of the Proponent

HAR is a wholly owned Australian subsidiary of Hunan Nonferrous Metals Corporation (HNC). HNC is a large corporation under the administration of Hunan Province in China, majoring in the production and sale of nonferrous metals. HNC is partially state owned, with approximately 48% of its shares publicly listed on the Hong Kong Stock Exchange.

HNC has rights to mine and process major minerals such as lead, zinc, tungsten, antimony, bismuth and fluorite in Hunan Province. HNC carries out exploration, mining, processing and smelting of these metals in the Hunan Province, which are sold in China. HNC also provides consulting mining and processing services in China to other non-ferrous minerals companies.

HNC has two other joint ventures in Australia; one in Tasmania that involves the reopening of a scheelite mine, and one in Western Australia, which involves exploration of a large polymetallic orebody.

The contact details for HAR are provided in Table 1.1.

Table 1.1 HAR contact details

Mine Site Office HNC (Australia) Resources Pty Ltd Old Rum Jungle Rd Batchelor NT 0845 Phone: (08) 8939 7501 Fax: (08) 8939 7515	Darwin Office HNC (Australia) Resources Pty Ltd Level 3, 5 Bishop Street Woolner NT 0800 Phone: (08) 8981 1716 Fax: (08) 8981 1725
Contacts: Bob Lloyd - General Manager	Contacts: Steven Ludwig - Projects Manager

The lead environmental consultant for the project is Coffey Environments Pty Ltd. Contact details are provided in Table 1.2.

Table 1.2 Lead environmental consultant contact details

Darwin Office

Coffey Environments Pty Ltd
8/21 Parap Road
Parap NT 0820
Phone: (08) 8901 1200
Fax: (08) 8901 1299

Contacts:

Tara Halliday – Project Director
Daniel Moriarty – Project Manager

1.4 History of the Project and Proponent

In 2006, Compass Resources Limited (Compass Resources) and HNC formed a joint venture (JV) and signed a Memorandum of Understanding to form three JVs in the Batchelor region, being the:

- Oxide JV to develop and mine polymetallic oxide ore resources at Browns, Area 55 and Mt Fitch.
- Sulphide JV to develop and mine polymetallic sulphide ore resources at Browns and Browns East.
- Regional Exploration JV to explore for additional oxide and/or sulphide resources to be developed and mined by the Oxide JV or Sulphide JV.

The JV agreements do not cover uranium deposits owned by Compass Resources.

In 2007 the three joint ventures were formed, and Compass Mining Pty Ltd (Compass Mining), a wholly owned subsidiary of Compass Resources, was appointed as the operator of the Oxide JV and Sulphide JV and Compass Resources was appointed the operator of the Regional Exploration JV. The first project to be developed was the Browns Oxide Project, which was commissioned in 2008.

In January 2009, Compass Resources went into voluntary administration along with Compass Mining, the previous operator of the Browns Oxide Project and HNC became the sole funder of all the joint ventures. In May 2009, a decision was made to liquidate Compass Mining and place Compass Resources under a Deed of Company Arrangement.

In May 2009, the joint venture partners appointed HAR to be the operator of the Oxide JV, the Sulphide JV and the Regional Exploration JV.

HAR placed the Browns Oxide Project under care and maintenance in May 2009 and commissioned a review of the Browns Oxide metallurgy. The review, which is nearing completion, recommends building a new nickel/cobalt recovery circuit to replace the current resin-in-pulp circuit. Subject to engineering and financial feasibility, modifications to the plant will begin in early 2010 and production will resume in mid 2010.

HAR is continuing with the Oxide, Sulphide (Browns Project Stage 2) and Exploration joint venture projects. Oxide ore from Area 55 is required to provide feed to the Browns Oxide Project processing plant, at a nominal rate of 1.3 Mtpa.

1.5 Purpose of this Notice of Intent

This Notice of Intent (NOI) has been prepared in accordance with the Northern Territory Department of Natural Resources, Environment, the Arts and Sport Information Guidelines for a Notice of Intent (DNRETA, 2007) and the Department of Resources¹ Environmental Assessment of Mining Proposals Advisory Note (DPIFM, 2006). The NOI presents an overview of the environmental aspects of the project to assist the Northern Territory Government Department of Resources and the Environmental Assessment Branch of the Environment, Heritage and the Arts Division of the Department of Natural Resources, Environment, the Arts and Sport (DNRETAS) in the determination of the level of environmental assessment for the project.

The objectives of this NOI are to:

- Provide formal notification to the Northern Territory Government and other interested parties of HAR's intention to develop the project.
- Present an outline of the proposed project, including the potential economic, social and environmental benefits that may be associated with it.
- Provide an initial environmental characterisation of the project area based on recent and historic investigations.
- Identify and describe the potential environmental and social issues associated with the project.
- Describe high-level management and mitigation measures with the potential to minimise adverse environmental impacts as a result of the project.
- Outline the proposed baseline and impact assessment studies proposed to inform the environmental and social impact assessment (ESIA) for the project.

Table 1.3 provides a cross-reference for the NOI against the DNRETAS Information Guidelines for a Notice of Intent (DNRETA, 2007a).

Table 1.3 NOI requirements as addressed by this document

NOI Requirement	Report Section
Name of proponent and consultant	1.3
Address and contact details of proponent	1.3.1
Location of proposal	1.1
Description of proposal	Chapter 2
Outline of legislative and licensing requirements	Chapter 3
Description of site and related details of existing environment	Chapter 5

¹ Formerly the Department of Regional Development, Primary Industry, Fisheries and Resources (DRDPIFR).

Table 1.3 NOI requirements as addressed by this document

NOI Requirement	Report Section
Description of marine and land uses in and adjacent to the proposal	Chapter 5
Description of waste management and pollution control on and off site	2.3.3 and 2.9
Description of existing environment and related environmental aspects	Chapter 5
Aboriginal and sacred sites clearance	5.14
Description of project timing, staging and decommissioning	2.6
Description of environmental commitments, safeguards and monitoring	Chapter 6
Description of rehabilitation and decommissioning	2.12

1.6 Proposed Environmental Assessment of Project

The project will require the preparation of an EIS under the Northern Territory Environmental Assessment Act.

In addition to the EIS, under the provisions of the *Native Title Act 1993* and *Aboriginal Land Rights (Northern Territory) Act 1976*, HAR will be required to prepare a document that meets the requirements of section 46 of the Aboriginal Land Rights (Northern Territory) Act. Appendix A outlines how this NOI and the subsequent EIS will address section 46 requirements.

In parallel with the submission of this NOI, HAR has lodged a referral to the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) for the project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Previous mining proposals associated with the project (e.g., Browns Oxide Project, Browns Oxide Project – second tailing storage facility) were declared controlled actions under section 18 of the EPBC Act due to the potential for significant impacts to EPBC Act-listed threatened fauna species (the northern quoll, red goshawk, northern masked owl and partridge pigeon). Given this precedent, HAR proposes that the project be deemed a ‘controlled action’ under the provisions of the EPBC Act for the same reasons. Further detail about this is provided in Section 3.1.1.

Given this, it is anticipated that the project will be assessed by a joint Northern Territory and Australian government approvals process under the Northern Territory *Environmental Assessment Act* and Commonwealth EPBC Act, respectively. A bilateral agreement between the Northern Territory and Australian governments facilitates this process.

1.7 Report Structure

The NOI comprises eight chapters and a table of contents that outlines figures, tables and plates in relevant chapters. The format of the main report is:

Chapter 1 (this chapter) – introduction, proponent details, project details, project summary, and purpose of the NOI.

Chapter 2 – detailed description of the project.

Chapter 3 – legislative framework (including Commonwealth and Northern Territory legislation, international conventions and national policies and strategies).

Chapter 4 – public involvement and stakeholder consultation.

Chapter 5 – description of existing environment, identification of potential environmental and social issues, management and mitigation measures to address these issues, and scope of investigations to inform the EIS.

Chapter 6 – environmental management.

Chapter 7 – conclusion.

Chapter 8 – references.

Appendices – documents supporting the information presented in this NOI.

2. PROJECT DESCRIPTION

2.1 Project Overview

First identified in 1954, the Area 55 oxide deposit has a nominal resource of 4.7 Mt of ore containing potentially economic amounts of copper, cobalt and nickel with a mine life of four years. The project is in the pre-feasibility study stage.

The development of the Area 55 Oxide Project will consist of an open pit, waste rock stockpile(s), a tailing storage facility (TSF), ancillary infrastructure (e.g., workshops, power and water) and a haul road to the existing processing facilities at the Browns site.

Two locations are being considered for the waste rock stockpile:

- Immediately south and northwest of the open pit on MLN 1161 and MLN 1162.
- At the junction of Bevan and Lithgow roads on MLN 1158.

Further detail about this is provided in [Section 2.2.3](#).

HAR proposes to conduct mining and haulage operations only during daylight hours (nominally 7 am to 6 pm) and to conduct in-pit mining only during the dry season (nominally April to December). Ancillary mining and haulage operations (geological investigations, surveying, equipment maintenance and road maintenance) may occur outside of these times. Processing of ore and operation of the TSF will be on a continuous basis 24 hours per day, 365 days per year.

The construction and operation of the project will involve the local community, in particular the Indigenous community. Initiatives involving the Indigenous community will build on those started for the Browns Oxide Project and involve:

- Training programs for metallurgical process technicians, mining open pit operators, maintenance and other mine-related occupations.
- Indigenous-owned small businesses/partnerships.

The project will produce copper, cobalt and nickel. Concentrations of uranium in the ore are low (see [Section 2.2.3](#) for more detail) and no uranium will be produced by the project.

2.2 Project Components

The project will be located within mining leases MLN 1161, MLNA 1162, MLN 1157 and potentially MLN 1158; additional areas will incorporate haul roads and other infrastructure associated with the project (Figure 1.2). The major components of the project and their proposed footprints are identified in [Table 2.1](#) and described in detail in the following sections ([Section 2.2.1 to 2.2.7](#)). The proposed project layout and location of related infrastructure is shown in [Figure 1.2](#).

Table 2.1 Project components and approximate footprints

Component	Approximate Total Disturbance Area (ha)
Open pit	19
Temporary ore stockpile	5
Waste rock storage – Option 1	38
Waste rock storage – Option 2	48
Haul road	9
Tailing storage facility	48
Light vehicle access road	3
Ancillary infrastructure	3
Total	173

2.2.1 Open Pit

The average depth of the pit will be 35 m, with a deepest point of 120 m, and the overall length and width will be 800 m and 450 m, respectively. The pit will produce about 9.7 Mt of waste and 4.7 Mt of ore resulting in a total of 14.4 Mt of material being mined, at a rate of about 4 Mt/a (1.3 Mt of ore and 2.7 Mt of waste) over 4 years at a strip ratio of 2 to 1. The pit has been designed with the following parameters, based on overall slopes from previous work and observations from the Browns Oxide Project:

- Ramp width: 25 m.
- Ramp grade: 1 in 10.
- Berm width: 5 m.
- Bench height: 10 m.
- Bench stack height: 20 m.
- Bench slope angles: 70 degrees.

2.2.2 Temporary Ore Stockpile

Ore mined from the pit will be transferred by mine haul trucks to a temporary stockpile on the Area 55 site, prior to transport to the ROM stockpile on the Browns site. This temporary stockpile will have a nominal capacity of 400,000 t, and will act as an exchange point between the mine haul trucks and the triple road trains used to haul ore. Front-end loaders will be used to load the triple road trains.

A direct haulage option is also being considered where ore will be hauled directly to the Browns site, eliminating the need for a temporary stockpile and eliminating the double handling involved with transferring ore from the mine haul trucks to triple road trains.

2.2.3 Waste Rock Storage

There are currently two options for waste rock storage for the project:

- **Option 1.** This option ([Figure 2.1](#)) involves the use of a waste rock storage design that wraps around the south and northwest of the open pit and will provide some screening of dust, noise and visual impacts from surrounding properties. This design also limits the haulage distance of waste rock from the pit to the waste rock stockpile. However, construction of this option may sterilise a zone of potentially economic mineralisation to the northwest of the pit.



Source:
 Project layout from HNC (Australia) Resources Pty Ltd
 Railways, roads and drainage from NTLIS (optimum scale 1:10,000)
 Imagery from Google Earth, 2009.
 Cadastre from NT DPI.

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HAR

**Waste rock stockpile
 Option 1**

Figure No:
2.1

- **Option 2.** This option (Figure 2.2) involves the use of two stockpiles: one smaller stockpile directly to the south of the pit, constructed to act as a bund to provide a screen for dust, noise and visual impacts; and a second larger stockpile on MLN 1158. This design increases the waste haulage distance, and creates a more widespread disturbance area for the project; however, it still provides some screening of the operation and means that any future potential mineralisation to the northeast is not sterilised. If this option is chosen potentially acid forming (PAF) waste rock will be stored in the stockpile on MLN1158 ensuring that the small 'bund' stockpile on MLNA 1162 will comprise all non-acid forming waste rock.

Waste rock will be hauled from the pit to the waste rock stockpile by the mine haul trucks directly.

The preferred option for the location and design of the waste rock stockpile(s) will be determined based on economic, environmental and social considerations.

Preliminary geochemical testwork by Environmental Geochemistry International (Appendix B) indicates that some material mined at Area 55 will be PAF. This preliminary work analysed 55 samples from five waste rock units:

- **Sand** – all 14 samples representing sand were classified as NAF. The sand samples were essentially devoid of both sulphur and acid neutralising capacity (ANC). As such, the sand samples could be described as 'barren' in both acid potential and neutralisation potential.
- **Weathered dolomite** – out of 20 weathered dolomite samples, 19 were classified as NAF. In most cases the sulphur contents were negligible and ANCs were also generally low. This confirms the weathered nature of the dolomite in the sense that there was almost no carbonate content remaining. One weathered dolomite sample was classified as uncertain, because it acidified to pH 4.1 with virtually no sulphur content. This may have been due to reaction of organics and not related to sulphide oxidation.
- **Dolomite** – all dolomite samples were classified as NAF, with the majority having very high ANCs.
- **Weathered shale** – a total of nine weathered shale samples were tested, eight of which were classified as NAF and were essentially barren with respect to acid potential and neutralisation potential. One was classified as PAF but had low sulphur content and therefore a relatively low capacity for acid generation.
- **Shale** – shale is the major unit of concern for acid generating potential. Potentially acid forming samples constituted 10 of the 12 shale samples; 1 was NAF, while the last could not be definitively classified. High sulphur content occurred in 9 of 12 shale samples; 5 of the PAF shale samples had little or no ANC and it is expected that these materials would generate ARD within a short time if exposed to atmospheric conditions (i.e., a short lag only). The other five PAF shale samples had moderate ANCs. This type of PAF materials often exhibit a lag period of at least a year and possibly a few years before ARD is produced; however, the lag period also depends on the relative reactivities of the sulphide and carbonate mineralogies. Additional testing of shale samples is underway to assess such activities and better define the acid generating potential of the waste rock and handling requirements for it.



Source:
Project layout from HNC (Australia) Resources Pty Ltd
Railways, roads and drainage from NTLIS (optimum scale 1:10,000)
Imagery from Google Earth, 2009.
Cadastrate from NT DPI.

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Waste rock stockpile
Option 2

Figure No:

2.2

Given that other mineralisation in the region is recognised as having elevated uranium levels a number of uranium assays, a baseline gamma radiation survey and a preliminary radiation assessment of the area has been undertaken. All indicate that uranium levels in Area 55 ore body are well within normal limits and as such waste will not need any special management; the uranium content of the material is low, averaging approximately 30 ppm, with less than 3% of samples being above 100 ppm. Section 5.13 provides more detail about this.

2.2.4 Haul Road

A haul road from the mine site to the processing plant has been designed as part of the conceptual mine site layout study (Figure 1.2). The mine haul road will occur outside the existing HAR mineral leases and will proceed east from the north of the Area 55 pit 1.5 km down the unconstructed Bevan Road easement to Lithgow Road; from this point there are three options:

- To proceed up Lithgow Road to Whites Road then follow Whites Road to enter the Browns Oxide Project from the north.
- To proceed up Lithgow Road then construct a new road east to enter the Browns Oxide Project from the east.
- To proceed along Bevan Road to the western boundary of MLN 1157, then construct a new road north on the western boundary of MLN 1157 to enter the Browns Oxide Project from the south.

2.2.5 Run-of-Mine Stockpile

The existing run-of-mine (ROM) stockpile at the Browns Oxide Project will be used for the project. Ore will be hauled here and stockpiled to provide the Browns Oxide Project processing plant with continuity of supply. The Browns Oxide Project will run 24 hours per day 365 days per year. As such, the amount of ore stockpiled at the ROM will be in the order of 600,000 t, and will likely peak toward the end of the dry season to ensure sufficient supply to the Browns Oxide Project processing plant over the wet season, when mining will not be undertaken at Area 55.

2.2.6 Tailing Storage Facility

The project will produce approximately 4.5 Mt of process residue (tailing). HAR intends to construct and operate a new tailing storage facility (TSF) to store tailing produced during the processing of oxide ore from the Area 55 oxide deposit; this new TSF (referred to as 'TSF South') will be located immediately south of the current TSF, within MLN 1157. It will share a common wall with the existing Browns Oxide Project TSF.

The new TSF has been designed by Australian Tailings Consultants. The 'paddock' style embankment (i.e., one comprising an embankment around all sides) will have a final maximum footprint of approximately 48 ha, and a capacity of 6 Mt; the additional 1.3 Mt capacity is to account for any potential increase in reserves from Area 55. If the additional capacity is not required any additional lifts will not be constructed and the TSF will be closed at its final capacity as described in Section 2.11.3. Tailing will be transported from the Browns Oxide Project processing plant to TSF South by pipe.

TSF South will be fenced after construction to prevent access by people, stock and large ground-dwelling mammals.

2.2.7 Access Roads

Access to the project will be along currently gazetted roads, most likely Litchfield Park Road to Bevan Road and Lithgow Road, a light vehicle access track that will proceed down the currently unsealed Lithgow Road alignment to enter the Area 55 site from the east (Figure 1.2).

There will be minimal traffic associated with the project, because the majority of consumables will be stored at the Browns Oxide Project site and hence the majority of traffic will go directly there. There will be no project related increase in traffic past the Litchfield Park Road and Bevan Road junction.

2.2.8 Ancillary Infrastructure

Little in the way of ancillary infrastructure will be required at the Area 55 site other than some workshops and offices for the mining contractor. These will be located on the site of the previous construction camp for the Browns Oxide Project, located immediately northeast of Area 55 (see Figure 2.1). Amenities such as water are already provided to this site, limiting construction and disturbance. Other administrative and management staff will be provided with office space at the existing Browns Oxide Project offices. In addition, refuelling will be via a fuel truck using fuel stored at the Browns Oxide Project site; therefore, no hydrocarbons other than lubricating oils for the machinery will be stored on site.

2.3 Mining Process

Open cut mining will be undertaken as a conventional truck and shovel operation. Much of the oxidised material is relatively weak and will be mined without blasting, but the occurrence of harder bands in the orebody means that some drilling and blasting is likely to be required throughout the mine life. Detailed blasting requirements will be established as mining progresses but the initial assumption is that half the material will require light blasting, at a frequency of approximately one blast per week; with between 80 and 270 holes being fired at any one time. Gravel stemming, inter-hole delays and low-impact blast-hole connections, such as Nonel tubing, will be used to minimise ground vibration, air blast and fly rock.

As an alternative that will not require blasting a continuous miner is being considered; this equipment gradually excavates/grinds material and lays a windrow behind which can be collected and loaded into haul trucks.

At this stage the mining fleet for this operation will comprise:

- Load and haul:
 - Two hydraulic excavators (a third may be required in the first 12 months of operation).
 - Eight to ten dump trucks.
 - Two D9 dozers.
 - One haul truck water cart.
 - One grader.
 - Service truck.
 - A number of light vehicles.
- Drill and blast:
 - One drill rig.

- One explosive truck.
- One skid steer loader.
- Ore haulage:
 - Four triple road trains.
 - One front-end loader.

In addition, other small ancillary items such as pit pumps and mobile lighting units may be required.

2.4 Mining Schedule

A summary of the proposed mining schedule is shown in Table 2.2.

Table 2.2 Mining schedule

Type of material (Mt)	Year					Total (Mt)
	2011	2012	2013	2014	2015	
Ore	-	1.3	1.3	1.3	0.8	4.7
Waste rock	1.6	3.8	2.4	1.3	0.6	9.7
Total	1.6	5.1	3.7	2.6	1.4	14.4

2.5 Treatment Process

Ore from the Area 55 oxide deposit will be processed at the existing Browns Oxide Project processing plant. The plant will operate 24-hours per day, 7-days per week, 365-days per year. The Browns Oxide Project processing plant extracts copper and nickel/cobalt concentrate from the ore; it does not extract uranium.

Some modifications to the plant may be required to optimise the recovery of minerals from the Area 55 ore. However, these are not likely to have any material environmental impact to the currently approved (although not operating) processing plant.

As background for the reader, an overview of the Browns Oxide Project processing plant is described below.

2.5.1 Crushing

Primary crushing will be undertaken at a rate of 150 to 300 wet tonnes per hour, 24 hours per day seven days per week to reduce the product to less than 200 mm, which will then be fed directly to the grinding circuit.

2.5.2 Grinding

Crushed ore will be fed to the ball mill at a rate of 160 dry tonnes per hour, 24 hours per day seven days per week. The ore will be ground to a particle size of 80% less than 200 µm. This pulp will be thickened prior to forwarding to the acid leach tank.

2.5.3 Acid Leach

Feed from the grinding circuit will be diluted to approximately 40% solids. Sulphuric acid, recycled from other components of the plant, will be added to the slurry to leach the minerals at 60 to 80°C, heat being provided by steam. Design leaching time is five hours, after which the slurry will be sent to the counter-current decantation circuit for solid/liquid separation.

2.5.4 Counter Current Decantation (CCD)

The counter-current decantation circuit will separate soluble minerals from solid residues. In the process the solids will be washed free of acid. The clear liquor will then be sent to the solvent extraction circuit to increase its tenor suitable for copper electrowinning.

2.5.5 Resin In Pulp (RIP)

The current resin in pulp circuit will be replaced with another circuit to extract cobalt and nickel. Engineering for this is underway and details will be presented in the EIS.

2.5.6 Solvent Extraction (SX)

The solvent extraction circuit will purify and concentrate the copper from the solution. This high-copper pregnant liquor solution will then be sent to the electrowinning circuit.

2.5.7 Electrowinning

Copper will be removed from the loaded electrolyte solution onto stainless steel starter cathodes. The remaining solution will be sent to the precipitation stage. The plated copper cathodes will then be washed and the copper will be stripped off the steel plates as Grade A copper cathode sheets. The copper sheets will then be weighed, sampled and bound in pallets for transport from site for sale.

2.5.8 Iron and Manganese/Magnesium Removal

The pH of the liquor stream will be raised via the addition of limestone pulp to neutralise any remaining acid and precipitate the solubilised iron. The precipitate will be pumped to the TSF. The pulp will then be pumped to the tails hopper where additional lime will be added and the final tails product will be pumped to the TSF. The clarified liquor stream will report to the nickel/cobalt precipitation circuit.

2.5.9 Nickel/Cobalt Precipitation

The copper-free solution will be neutralised in preparation for nickel and cobalt precipitation. This will result in the precipitation of a mixed metal carbonate. This resulting slurry will be thickened and the filtered to produce a moist solid product. This will be bagged in 1 m³ lined bulker bags and shipped in containers for sale for further downstream refining.

2.5.10 Process Residue

Tailing from the processing circuit will be discharged to the TSF at a slurry density of 32 to 36% solids.

2.5.11 Reagents

The reagents required for the operation of the process plant include steam, sulphuric acid, extractant, diluent (high flash point aliphatic kerosene), limestone, flocculent, diesel and other various small usage reagents. The forecast annualised usage is given in Table 2.3; this is not likely to change significantly for the treatment of Area 55 oxide ore.

Table 2.3 Estimated annual reagent use

Reagent	Annual Usage [^]
Anthracite (t)	9
Anti-scalant (m ³)	35
Clay (t)	15
Celite (t)	10
Cobalt Sulphate (t)	2
Diluent (m ³)	186
Diesel (m ³)	10,500
Extractant (m ³)	33
Ferrous Sulphate (t)	9
Flocculant (t)	200
Garnet (t)	12
Guar (t)	4
Grinding balls (t)	700
Limestone (t)	63,600
Resin (m ³)	20
Sodium Carbonate (t)	5,300
Sodium Metabisulphite (t)	2,500
Steam (t)	124,500
Sulphuric Acid (t)	62,500

[^] Estimates based on operation of Browns Oxide Project..

2.6 Water Management

The climate of the Top End of the Northern Territory shows both strong seasonality and extremes of precipitation ranging from extreme cyclonic rainfall to virtually nothing during the dry season. The water management system must accommodate both the normally variable rainfall, and the occasionally more severe shortages and surpluses of water that may occur over the life of the operation. The following principles will apply to the design and operation of the water management system:

- Minimise water consumption.
- Maximise water recycling.
- Establish a preferential hierarchy of uses based on water quality.
- Water may be discharged from the Area 55 site; this will only be surface run-off that has been treated in sedimentation or polishing ponds prior to release. Contaminated water, such as that

with low pH, will be returned to the Browns site before reuse or discharge in accordance with the Browns Oxide Project waste discharge license.

- Control potential contaminants used on site.
- Minimise the disturbance of land.

2.7 Other Mine Infrastructure

Infrastructure that will be required for the operation of the project includes:

- Water management system, including sediment dams and traps.
- Water reticulation pipeline connecting Area 55 to the Browns site.
- Infrastructure related to mine maintenance.
- A utilities corridor running from the Browns site to Area 55 to supply water and to return any contaminated water.
- Power supplied by two on-site 56 kVa generators.

The project will use the existing explosives magazine at the Browns site to store explosives and detonators for the project.

2.8 Waste Management

Waste generated during construction and operation of the project will be disposed with waste generated for the Browns Oxide Project. Anticipated wastes to be generated during site preparation and operations, and their respective disposal methods are listed in Table 2.4. This list is preliminary and will be refined once detailed engineering is completed. National pollution inventory requirements will be determined upon completion of detailed engineering. Contractors will be instructed, and appropriately supervised, to ensure that they apply the waste management principles of reduce, reuse and recycle, and comply with the Browns Oxide Project waste management plans and procedures.

Table 2.4 Anticipated project waste

Waste Materials	Approximate Quantities	Disposal Method
Scrap steel	50 t	Collection by steel recycling contractor
Wooden pallets	500	Majority returned to supplier for reuse, damaged/excess buried in on-site landfill
Diesel drums	20	Collection by supplier
Domestic waste	1,200 kg	Burial at Batchelor or on-site landfill
Waste oil and grease	200 kg	Removed from site for recycling
Sewage effluent	100 kL	Utilise an existing septic facility from a previous camp at the location of the offices.

2.9 Workforce

The existing workforce at the Browns Oxide Project is approximately 25, which is expected to increase to approximately 100 in 2010 when the project resumes mining. The majority of this workforce will be employed by HAR and sourced primarily from the local area and Darwin.

It is not envisaged that the project will result in any major increase in employment, as most of the workforce will already be employed at the Browns Oxide Project. However, the development of the project will provide for the ongoing operation of the Browns Oxide Project processing plant and the employment and training associated with this.

HAR is committed to providing employment opportunities for Indigenous Australians; the Browns Oxide Project workforce was 29% Indigenous prior to going into care and maintenance. HAR's current workforce is currently 17% Indigenous and the aim is to return it to at least previous levels. HAR also offers training programs for process technicians, mining pit operators and maintenance personnel. HAR considers that the project will continue to offer training and employment opportunities to local people.

In addition, the project offers excellent opportunities for local businesses to provide some of the infrastructure and services that will be required in Batchelor to support the project, as was the case during the operation of the Browns Oxide Project.

2.10 Timing

Mining at Area 55 will commence once the Browns oxide deposit has been depleted to ensure continuity of supply for the Browns Oxide Project processing plant. As such, mining at Area 55 will represent a rollover of mining operations from the Browns Oxide Project to Area 55, as opposed to duplication.

Subject to the receipt of all necessary regulatory approvals, this means that development is planned to commence in 2011.

2.11 Rehabilitation and Mine Closure

Mine closure planning is a continuous process that commences prior to project development. Closure plans will be progressively refined and adapted throughout the life of the mine. This ensures that the planning adapts to information that becomes available during construction and operations, and to changes in regulations, stakeholder expectations, technology, knowledge and mine planning.

Mine closure planning will be conducted in consultation with stakeholders to ensure that the final rehabilitation and mine closure objectives incorporate their requirements (e.g., retention of certain infrastructure) and keep them informed of achievement of mine closure criteria.

The mine closure plan will be developed in line with the following objectives, developed from the Department of Resources mine close out objectives (DRPIFR, 2006):

- Ensure compatibility with post closure land use.
- Ensure physical safety to protect human health and safety.

- Ensure low risk to biota.
- Reduce the need for long term monitoring and maintenance through design of and construction of landforms that are geotechnically and geochemically stable.
- Develop landforms that are consistent with the surrounding landscape.
- Develop an environmental monitoring and reporting program that is focused towards demonstrating the achievement of closure outcomes.
- Undertake progressive rehabilitation of the site during operations.
- Ensure that the full cost of decommissioning and rehabilitation is understood and that a mechanism for funding exists.
- Ensure that residual risks and liabilities are identified and controlled to an acceptable level.

While rehabilitation and mine closure planning will continue to be refined during the life of the mine, generally the Mineral Lease will be rehabilitated as outlined in the following sections.

2.11.1 Open Pit

The open pit will not be backfilled and will remain as an open void after closure. Around the void an abandonment bund will be constructed to restrict public access. The final void will fill with water over time and will remain as a lake, similar to Rum Jungle Lake to the south of the project that is used for recreation purposes.

2.11.2 Waste Rock Storages

Design of waste rock stockpiles will be based on lessons learned at Rum Jungle and other mine sites around the world, and comprehensive geochemical sampling and testing of the waste materials, so as to minimise the risk of generating acid rock and metalliferous drainage.

HAR will discuss end use objectives for the waste rock storages with interested parties during the detailed design phase. This may have implications for waste stockpile shape, final surface materials and revegetation methods, within the limitations imposed by the need to control acid rock drainage.

2.11.3 Tailing Storage Facility

Decommissioning

The objectives of decommissioning TSF South will be to:

- Leave the site in a physically and geochemically stable condition with no or low maintenance requirements.
- Leave the site in a safe condition, so as to minimise risks to public safety.
- Prevent excessive erosion and ensure that the site does not become a significant source of water or wind-borne material.
- Revegetate the TSF to the point where a self-sustaining community comprised largely of native species characteristic of the surrounding country is established (i.e., a modified natural habitat).

- Minimise the visual impact of the TSF.

Rehabilitation

General rehabilitation procedures will include:

- Progressive revegetation of disturbed areas of TSF South throughout the operation, where practicable.
- Replacing of topsoil stockpiled during the construction process as the final landform of the TSF South is achieved. Ideally, the topsoil stockpiles will retain their seed resources allowing revegetation to occur naturally. If this does not occur to a sufficient degree, then TSF South area will be seeded and fertilised, with the application of seeds and fertilisers being timed to take best advantage of moisture and seasonal conditions.

Following mine closure, surface water and groundwater monitoring will be undertaken until it can be demonstrated that the agreed closure criteria have been met.

3. ENVIRONMENTAL PERMITTING

3.1 Commonwealth Legislation

3.1.1 Environment Protection and Biodiversity Conservation Act

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), actions that are likely to have a significant impact on a matter of national environmental significance are assessed. The Australian Government Department of Environment, Water, Heritage and the Arts (DEWHA) is responsible for administering the act. Matters that are considered to be of national environmental significance include:

- World Heritage properties.
- National Heritage places.
- Ramsar wetlands of international significance.
- Threatened species and ecological communities.
- Migratory species.
- Nuclear actions.
- Commonwealth marine areas.
- Additional matters of national environmental significance ('prescribed actions').

A referral and assessment process has been established to determine the application of the EPBC Act. The first step in this process is referral of the project to the DEWHA. The project is then assessed for the potential for impacts upon matters of national significance, and if this is applicable, to establish the significance of these impacts. If it is determined that there will be, or there is likely to be, a significant impact to a matter of national significance the project is declared to be a controlled action.

An EPBC Act referral will be lodged in parallel with this NOI. Previous mining proposals by Compass Resources Limited (e.g., Browns Oxide Project, Browns Oxide Project – second tailing storage facility) were declared controlled actions under section 18 of the EPBC Act due to the potential for significant impacts to EPBC Act-listed threatened fauna species (the northern quoll, red goshawk, northern masked owl and partridge pigeon). Given this precedent, HAR proposes that the project be deemed a 'controlled action' under the provisions of the EPBC Act for the same reasons. As a result, it is anticipated that the project will be assessed under the EPBC Act by the process agreed to under the bilateral agreement between the Northern Territory and the Australian governments.

3.1.2 Native Title Act

The *Native Title Act 1993* provides legal recognition of the rights and interests of the Aboriginal people over land and water possessed under their traditional laws and customs. The act sets out basic principals regarding native title in Australia and establishes a regulating and governing body, the National Native Title Tribunal.

The act also sets out processes by which native title rights are established, protected and compensation determined. Another important function of the act is through facilitating Indigenous Land Use Agreements (ILUA's) between native title parties and other interest holders.

For many years Compass Resources Limited (the previous proprietors) had worked closely with the Traditional Owners of the land, the Kungarakany and Warai people, through the Northern Land Council (NLC), in order to ensure the wishes of Traditional Owners are respected.

3.1.3 Aboriginal Land Rights (Northern Territory) Act

This act provides for the granting of inalienable freehold title to traditional Aboriginal owners of land in the Northern Territory, the establishment of Land Councils, and the establishment and management of Land Trusts to hold the Aboriginal land for the benefit of traditional owners of the land. The act also regulates exploration and mining on Aboriginal land and sets out the processes to be followed when negotiating with Traditional Owners for access to and leases over Aboriginal land. An exploration license cannot be granted in relation to Aboriginal land without the consent of the relevant Land Council (for the traditional owners) and the minister. A mineral lease cannot be granted unless an agreement has been entered into under the act.

The project will require the use of a significant amount of Northern Territory Aboriginal freehold land (see Figure 1.2).

HAR already holds an exploration agreement under section 42 of the act; an application for a mining agreement under section 46 of the act will be lodged in early 2010. This application will cover the:

- Commercial aspects of the proposed development (e.g., royalties, employment).
- Predicted environmental and social impacts of the proposed development.

The application submitted to the NLC will then be used as a basis for the NLC and HAR to come to an agreement upon terms and conditions for the grant of a mining interest. The statutory time period for both parties to reach an agreement is 12 months. Should the NLC and HAR fail to come to an agreement in within 12 months, or a longer period should it be agreed between HAR and the NLC, then the minister will appoint a mining commissioner to mediate the process and assist both parties to reach an agreement.

HAR has commenced discussions about the section 46 agreement with the NLC.

3.2 Northern Territory Legislation

The initial environmental permitting of mining activities is regulated in the Northern Territory by both the *Mining Management Act* and the *Environmental Assessment Act*.

A decision on the appropriate permitting route for new mining proposals in the Northern Territory is initiated by the proponent's submission of a NOI (i.e., this document) to the Northern Territory Government through the Minerals and Energy Referral Assessment branch of the Department of Resources. If assessment under the Environmental Assessment Act is thought to be required, the NOI is referred to the Minister for Natural Resources, Environment and Heritage through DNRETAS for determination of the appropriate level of assessment.

If, as expected, DNRETAS agrees that the project requires assessment at the level of EIS, draft guidelines for the preparation of the EIS will be developed by DNRETAS based on this NOI. These guidelines will be made available for public review for a period of 14 days, during which time the public may submit comments to be considered in the development of the final guidelines.

Once these guidelines are issued, HAR will be required to develop a Draft EIS that addresses the guidelines; once this is submitted the Draft EIS will be placed on public display for 28 days to allow for public review and comment. After this period is complete all comments will be provided to HAR and HAR will be required to address these comments in the EIS Supplement.

Following completion of the assessment and approval process under the Environmental Assessment Act by the Northern Territory Minister for Natural Resources, Environment and Heritage (assisted by the NRETAS Environment, Heritage and the Arts Division (EHA)), the Department of Resources proceeds with the approval process under the *Mining Act* and *Mining Management Act*.

3.2.1 Mining Act and Mining Management Act

The principal legislation for the regulation of mining proposals in the Northern Territory are the Mining Act and the Mining Management Act, both of which are administered by the Department of Resources.

Mining Act

The Mining Act establishes the framework within which activities to explore for and mine mineral resources can occur. The act sets out the administrative processes for authorising these activities through the grant of a title.

Compass Resources has an extensive tenement holding in the project area, under which HAR is the operator for activities within these tenements. The project lies within the mineral leases MLN 1161, MLNA 1162, MLN 1157 and MLN 1158 issued under the Mining Act. MLNA 1162 is currently under application.

Compass Resources and HAR will operate these tenements under a JV agreement.

Mining Management Act

The objectives of the Mining Management Act are to ensure that the development of mineral resources is in accordance with the best practice health, safety and environmental standards and to protect the environment and health and safety of all persons on mining sites.

Under the Mining Management Act, an application for an authorisation to carry out mining activities must be accompanied by a mining management plan. A mining management plan includes information relating to the description of mining activities, the management system to be implemented for the management of health, safety and environmental aspects, costing of closure activities and particulars of organisational structure. Plans of any existing or proposed mine workings and infrastructure must also be included. The mining management plan is required to be reviewed at intervals specified in the authorisation to carry out mining activities.

3.2.2 Environmental Assessment Act

The Environmental Assessment Act and the Environmental Assessment Administrative Procedures establish the framework for the assessment of potential or anticipated environmental impacts of development, and provide for protection of the environment. The Northern Territory Minister for Natural Resources, Environment and Heritage is responsible for administering the act. The minister also determines the appropriate level of assessment for new developments or

material changes to existing operations, based on the sensitivity of the local environment, the scale of the proposal and its potential impact upon the environment.

3.2.3 Water Act

The *Water Act* provides for the investigation, allocation, use, control, protection and management of surface water and groundwater resources, as well as the administrative process for licensing these activities. The act also considers the protection and use of water resources for purposes such as recreational, social and cultural.

Under this act, mining activities (as defined by the Mining Management Act) or another activity for a purpose ancillary to that mining activity, including the use of water as drinking water, are exempt from a number of provisions in the Water Act. This includes, but is not limited to, the use of surface water and groundwater as well as the construction of works to allow for the use of water.

While this project is not proposed to discharge of waste off the Mineral Lease, if off-lease discharge is required a waste discharge licence will be sought. Waste is defined in the Water Act as any solids, liquids or gas, which, if added to the water, may pollute the water.

3.2.4 Other Relevant Legislation

Other Northern Territory legislation relevant to the project includes the following acts and their associated amendments and regulations:

- *Aboriginal Land Act.*
- *Bushfires Act.*
- *Control of Roads Act.*
- *Dangerous Goods Act.*
- *Dangerous Goods (Road and Rail Transport) Act.*
- *Environmental Offences and Penalties Act.*
- *Heritage Conservation Act.*
- *Miscellaneous Acts Amendment (Aboriginal Community Living Areas) Act.*
- *Northern Territory Aboriginal Sacred Sites Act.*
- *Planning Act.*
- *Soil Conservation and Land Utilisation Act.*
- *Territory Parks and Wildlife Conservation Act.*
- *Traffic Act.*
- *Waste Management and Pollution Control Act.*
- *Weeds Management Act.*
- *Workplace Health and Safety Act.*

4. PUBLIC INVOLVEMENT AND CONSULTATION

An effective, ongoing, consultation program involving HAR, government, local residents, communities, Indigenous groups and other stakeholders will be essential to the successful development of the project. Consultation has begun with key stakeholder groups and will continue throughout the project planning, construction, operations, and mine closure phases. The stakeholder consultation will ensure that the process is open and transparent for all stakeholders throughout all stages of mine development.

HAR recognises that members of the public and government were not satisfied with the level of public involvement and consultation by the previous operators of the Browns Oxide Project. HAR has taken several significant steps to address this, with further detail provided in Section 4.4. Michels Warren Munday is guiding public involvement and consultation for the project.

4.1 Consultation Objectives

The goal of HAR's stakeholder consultation program is to:

- Ensure all stakeholders are given accurate and timely information so they are able to make informed decisions on the project.
- Ensure all community concerns are well understood and responded to.
- Give the community a chance to tell its story.
- Inform quality decision-making, ensure regulatory requirements are met and enhance project management.
- Ensure a comprehensive identification of issues that HAR will report against to ensure all issues are mitigated, managed or explained and ensure all concerns are properly recorded.
- Build good relations with the community.
- Meet HAR's corporate social responsibility objectives.

4.2 Stakeholders

Stakeholders are parties with an interest in the project who can potentially influence, or are influenced by, its development. Stakeholder groups and their level of interest and influence will vary throughout the life of the mine. Stakeholders associated with the project can be grouped into broad categories that reflect their interest in the project. Table 4.1 provides a summary of the key external stakeholders.

Table 4.1 Project stakeholders

Interest Group	Stakeholder
Northern Territory Government	Department of the Chief Minister Department of Resources Department of Natural Resources, Environment, the Arts and Sport (DNRETAS) – Environment, Heritage and the Arts (EHS) Division DNRETAS – including Heritage Advisory Council (HAC) and Parks and Wildlife Department of Lands and Planning (formerly Department of Planning and Infrastructure) Department of Construction and Infrastructure (formerly Department of Planning and Infrastructure) Minister for Primary Industry, Fisheries and Resources Member for Daly Minister for Natural Resources, Environment and Heritage Darwin Port Corporation (DPC) Power and Water Corporation (PWC) Aboriginal Areas Protection Authority (AAPA)
Australian Government	Department of the Environment, Water, Heritage and the Arts (DEWHA) Member for Lingiari Minister for Innovation, Industry, Science and Research Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA)
Indigenous groups	Northern Land Council (NLC) Traditional Owners, including Finnis River Land Trust
Local community	Landholders, residents and local community groups Coomalie Community Government Council Coomalie Landcare Group Batchelor Institute of Indigenous Tertiary Education Emergency services Local businesses
Non-government organisations	Environment Centre Northern Territory
Media	Local, regional, Northern Territory and national
Industry	AusIndustry The Australasian Institute of Mining and Metallurgy (AusIMM) Minerals Council of Australia (MCA) Northern Territory Industry Capability Network (NTICN) NT Chamber of Commerce

Other stakeholders include HAR, Compass Resources, consultants and suppliers to the project and potential purchasers.

4.3 Consultation Plan

Effective community consultation starts with listening to community views to develop a deep and empathetic understanding of community attitudes and concerns. Effective consultation will help shape subsequent communication strategies to ensure that issues of concern are either addressed or explained appropriately, including culturally appropriate communications strategies.

The process of community consultation for the project will cover:

- A stakeholder analysis to determine all key stakeholders and their likely attitudes.
- Briefings of all key government and community stakeholders to get initial feedback on the project.
- Materials to provide information on the project and answer key questions.
- Establishing a mechanism for stakeholder issues to be raised and resolved in a timely manner.
- Analysing all issues raised during initial consultation and developing an issues matrix that shows how issues can be either mitigated or managed.
- Providing feedback to all stakeholders on studies conducted during preparation of the EIS, outlining what alternatives were considered and any amendments made as a result of stakeholder consultation, and providing feedback on all issues raised.
- Circulating the EIS and seeking feedback.
- Providing regular updates in community newsletters (e.g., Batchelor 'Stop Press').

The ongoing consultation program will involve both formal and informal mechanisms, where the environmental assessment process will provide formal mechanisms for consultation, and informal mechanisms may include:

- Project information bulletins or brochures.
- Information on the HAR web site.
- Direct access to nominated senior HAR staff.
- An information display.
- Presentations, meetings and liaison:
 - Presentations by project personnel to community and other groups.
 - Media releases.
 - Northern Territory Government briefings.
 - Liaison and site inspections with government agencies and regulators.
 - Interviews and articles in 'local' media.
 - Open days at the site during both construction and operations.
 - Stakeholder information sessions.

4.4 Consultation to Date

4.4.1 Consultation with Local Residents

Stakeholder consultation to date has focused on immediate neighbours of the project. HAR engaged Michels Warren Munday to lead consultation with Litchfield Park Road residents in September and November 2009. The objective of this community consultation was to listen to the

views of residents and use the results to inform decision-making, to ensure concerns of the local residents are taken into account during the planning of the project and to build relationships between local residents and HAR.

Residents' reactions varied broadly. Many had long experience of mining and welcomed the economic benefits of the mine, while others were concerned about potential impacts on their lifestyle and properties.

Many participants do not see a distinction between the activities and responsibilities of the previous project owner, Compass Resources, and the new operator HAR. They expressed a desire to have the outstanding (namely financial) issues from Compass Resources addressed by HAR before developing the project. However, participants are generally prepared to give HAR the benefit of the doubt because of the potential benefits of the project.

Other key issues identified by participants include:

- Groundwater Bores. Impacts to the quality and quantity of groundwater resources will potentially impact the livelihoods of surrounding residents.
- Noise from construction and operation of the project. Residents identified general noise such as blasting and reversing alarms on machinery as a concern, particularly from night-time operations. Night-time operations have since been ruled out.
- The potential for dust to impact on nearby land use, including market gardens and houses.
- Fumes from the Browns Oxide Project processing plant have been an issue in the past for neighbours of the plant, when operated by Compass Mining. While the results of previous monitoring demonstrated that all levels meet air quality standards, a small number of residents are skeptical and are concerned about the potential health affects from the operation of the processing plant.
- Local road conditions. Residents expressed concern as to the potential risk to tourism and residential traffic from road trains and mining traffic.

Other impacts raised included social impacts, disturbance to flora and fauna, disturbance of heritage sites and the potential for devaluation of property prices.

Many residents also acknowledged the significant training, employment, property prices and economic benefits to the Batchelor region when the Browns Oxide Project was operating, and commented on the negative change in the area since this project was put in care and maintenance.

4.4.2 Consultation with Government

HAR provided the Northern Territory Government environmental assessment forum with a presentation about the project in November 2009. This presentation focused on:

- Who HAR is, and how it differs to the previous operators of the Browns Oxide Project.
- Why HAR wants to develop Area 55, and how it proposes to do this.
- The stakeholder consultation program underway for the project.
- The environmental studies planned or underway.
- Feedback on the scope of environmental investigations for the project.

Staff from DNRETAS, the Department of Resources, the Department of Chief Minister, Department of Lands and Planning, Health and Families and Aboriginal Areas Protection Authority attended the presentation.

4.4.3 Consultation with Northern Land Council

HAR provided the NLC with a presentation about the project in November 2009 to provide information to the NLC about HAR and the project. There was particular discussion about the section 46 application process and how this could best be negotiated between HAR and the NLC.

4.4.4 Consultation with Coomalie Community Government Council

HAR provided the Coomalie Community Government Council with a presentation about the project in October 2009. There was particular discussion about community consultation for the project and concerns about bore water supplies for residents.

4.5 Consultation for the EIS

As the project progresses through detailed project planning and development assessment (i.e., the EIS), stakeholder consultation will be expanded to cover the stakeholder groups identified in Table 4.1. This will:

- Increase information provision on the project.
- Identify areas of concern to Traditional Owners and other stakeholders.
- Build relationships with local communities.
- Identify potential employment opportunities for local people.
- Give all stakeholders a chance to raise issues.

4.6 Ongoing Consultation Plan

The community consultation and engagement program will continue throughout the project, in order to:

- Ensure open and transparent communication between HAR, the local community, the Traditional Owners and the NLC and Northern Territory and Australian government.
- Identify and talk to key stakeholders as new issues arise.
- Disseminate information to all stakeholders on key issues identified during the EIS assessment.
- Prepare relevant documents for review by government agencies and other stakeholders.
- Explain how impacts will be mitigated or managed.
- Report on all activities.

Notice of Intent
Area 55 Oxide Project

5. EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MANAGEMENT

5.1 Climate

Batchelor has a monsoonal climate with distinct wet and dry seasons. HAR maintains a weather station located at the Browns Oxide Project. The Australian Bureau of Meteorology maintains several weather stations in the vicinity of Batchelor, including one at Batchelor aerodrome. Data from this weather station has been obtained for the most recent complete twelve months (October 2008 to October 2009) from the Bureau of Meteorology (BOM, 2009a).

Over the last 12 months the total rainfall in Batchelor was 1,307 mm, with the most (430 mm) falling in February. The maximum temperature was 39.5°C in October 2008 and the lowest temperature was 7.4°C in June 2009.

The closest weather station with the longest data record (69 years) has been collected from Darwin Airport. Average annual rainfall is approximately 1,703 mm, with an average monthly rainfall ranging from 420 mm in January during the wet season to 1 mm in July during the dry season (BOM, 2009b). The mean monthly maximum temperature ranges from 30.5 °C in July to 33.3 °C in November (BOM, 2009b).

5.2 Greenhouse Gas

5.2.1 Existing Environment

According to information presented in the State and Territories Greenhouse Gas Inventories 2007 (DCC, 2009) greenhouse gas emissions for Northern Territory (excluding emissions and removals from land use, land use change and forestry) were 15.0 Mt. When emissions and removals from land use, land use change and forestry are included the total becomes 17.2 Mt. The principal source of emissions in the Northern Territory is the burning of savanna woodlands.

5.2.2 Potential Impacts

The construction and operation of the project will increase the greenhouse gas emissions for the region. Of the main greenhouse gases, carbon dioxide (CO₂) and nitrous oxide (NO₂) are the most significant in relation to the project since they are the main products that result from the combustion of diesel when powering earthmoving equipment. Vegetation clearing during construction will also cause emissions.

5.2.3 Management and Mitigation

Best practice environmental measures for reducing greenhouse gas emissions will be employed during the construction and operations phases and include:

- Developing and applying policies and procedures for energy efficient mine operation.
- Minimising haul distances to minimise diesel consumption.

- Monitoring energy consumption (e.g., diesel and electricity) and calculating greenhouse gas emissions.
- Where practicable, establishing measurable improvement targets (e.g., participation in revegetation programs) for greenhouse gas emissions.
- Reporting greenhouse gas emissions in accordance with the Territory Greenhouse Gas Inventory.

5.2.4 Specialist Study

Objectives

An assessment of the greenhouse gas impacts has been commissioned for the EIS, the objectives of which are to:

- Determine sources and quantities of greenhouse gas from equipment during construction (i.e., land clearing) and operations, as well as for emissions associated with transportation of the ore.
- Calculate the energy consumption and greenhouse gas emissions (in tonnes per annum CO₂-equivalent) resulting from the project, including electricity consumption and transport of resources to the Browns Oxide Project by road for each year of the project, and including emissions that arise as a result of clearing of vegetation for construction of the project.
- Assess the direct and indirect implications of the project for greenhouse gas emissions and energy consumption.
- Outline the requirements and/or measures to be implemented for minimisation and management of greenhouse gas emissions and energy consumption.
- Assess the overall greenhouse gas impacts of the project during operation after assuming the implementation of mitigation measures.

Greenhouse gas emissions will be considered in the context of the continued operation of the Browns Oxide processing plant.

Status

Collection of data and a review of emissions from the construction and operation of the Browns Oxide Project is underway. Predictions of emissions from the Area 55 Oxide Project will be calculated once the design of the project is confirmed; these will be reported in the EIS.

5.3 Air Quality

5.3.1 Existing Environment

An air quality characterisation and impact assessment for the Browns Oxide Project, nearby to the project area, was undertaken by Holmes Air Sciences in 2005 (Enesar, 2005). The findings of this can be used to provide an understanding of the air quality of the project area and surrounds. The project area is remote from pollution sources and the only air pollutant that is likely to be present at significant concentrations is particulate matter from wind-blown dust and bushfire smoke during the dry season. With the operation of the nearby Browns Oxide Project, it is expected that

particulate matter in the project area may increase in some months of the year depending on precipitation and wind direction.

Results from the monitoring of air quality during the operation of the Browns Oxide Project will be presented in the EIS.

5.3.2 Potential Impacts

The main potential air quality issue that will result from construction and operation of the project is the increase in dust levels with consequent adverse impacts on human health, vegetation and amenity. The main sources of dust will include:

- Drilling and blasting of ore and waste rock, when required.
- Loading and unloading of ore and waste rock.
- Hauling of waste rock and ore.
- General vehicle movements over unsealed roads.
- Wind erosion from exposed surfaces (e.g., topsoil stockpiles and waste rock storage).

The potential impacts of dust to flora are discussed in Section 5.8.2 below.

Emissions of combustion products such as carbon monoxide (CO), sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and particulate matter from fuel combustion of fixed on-site sources (i.e., plant equipment and machinery) and vehicles will occur and also have the potential for minor adverse impacts to local air quality.

5.3.3 Management and Mitigation

Given potential air quality impacts from the project to surrounding sensitive receptors, a bund will be constructed to the south of the Area 55 pit (Figures 2.1 and 2.2); in addition, the following mitigation strategies will be adopted:

- Using water or dust suppressants on trafficked areas (i.e., internal haul road and light vehicle access road), exposed surfaces and similar to reduce emissions.
- Maintaining and enhancing a vegetative buffer on project tenements between Area 55 and local residents.
- Maintaining roads to minimise the build up of fine particles that are susceptible to wind erosion.
- Using speed limits on roads used by mine traffic.
- Using signage and markings to ensure traffic is kept to designated roadways.
- Designing and scheduling blasting to minimise dust emissions (i.e., scheduling blasting when conditions are suitable).
- Minimising the extent of exposed areas susceptible to wind erosion.
- Where practical, limiting high dust-generating activities during adverse wind conditions or instead increasing the frequency of road watering.
- Establishing a complaints register that records the frequency of occurrence, intensity, duration, offensiveness and location of public complaints regarding dust.
- Establishing a dust monitoring program.

5.3.4 Specialist Study

Objectives

An assessment of the air quality impacts from the project has been commissioned for the EIS, the objectives of which are to:

- Use available information to describe the existing ambient air quality conditions and climatic features of the study area.
- Identify and describe all potential sources of air emissions in relation to construction and operation of the project.
- Locate and provide the distance to the nearest residences and other sensitive receptors.
- Provide recommendations regarding mitigation and management measures for reducing/controlling air quality impacts.
- Develop a quantitative model of dust emissions from the project.
- Assess the overall dust emission impacts of the project during construction and mining phases, assuming the implementation of mitigation measures.
- Assess the impact of air emissions of the project (both for construction and operations) in relation to ambient air quality, compliance with DNRETAS requirements and/or other Australian standards, effects on environment including flora and fauna, human health and amenity.
- Outline a monitoring and reporting program to enable sound air quality management.

Status

Existing air quality has been determined, and sensitive receptors have been identified based on fieldwork. The quantitative model has been established and will be run once the layout of the project is confirmed; the results of this will be reported in the EIS.

5.4 Noise and Vibration

5.4.1 Existing Environment

The expected noise and vibration impacts of the project are anticipated to be similar to those experienced already at the Browns Oxide Project. Other than the noise and vibrations generated by Browns Oxide Project and the associated infrastructure there are few other sources of noise and vibration in the area.

Residents in the vicinity of Area 55, i.e., along Litchfield Park Road, have reported being able to hear mining operations at Browns at night and during the day under particular weather conditions.

5.4.2 Potential Impacts

Noise and vibration from construction and operation of the project will disrupt surrounding residents. In general terms, noise nuisance is determined by the increment above background noise, with attenuation by distance, weather conditions, and local topography. Conversely,

nuisance caused by vibration is determined by the increment above human comfort and personal amenity limits with attenuation by distance, depth and ground type.

The main sources of noise and/or vibration emissions will be activities at the mine site during construction and operations and project-related noise from traffic on local roads. Specific noise or vibration sources include:

- Vehicles, including reversing alarms.
- Machinery, e.g., drills, loaders, haul trucks, excavators and other ancillary equipment.
- Blasting operations, when required.

Disturbance due to noise generated during the construction period may be higher than during operations, when the depth of mining in the pit will increase with time.

5.4.3 Management and Mitigation

Given potential noise impacts from the project to surrounding sensitive receptors, a bund will be constructed to the south of the Area 55 pit (Figures 2.1 and 2.2); in addition, the following mitigation strategies will be adopted:

- Construction and mining activities will be limited to daylight hours (nominally 6 am until 7 pm).
- Maintaining and enhancing a vegetative buffer on project tenements between Area 55 and local residents.
- Servicing all plant, machinery and vehicles regularly.
- Selecting and positioning site buildings, access roads, equipment and plant in a way that minimises acoustic disturbance in the locality.
- Installing standard and, where necessary, additional noise abatement devices (e.g., mufflers) on machinery and vehicles.
- Undertaking noise monitoring to ensure compliance with relevant noise criteria.
- Establishing a complaints register and responding to complaints as appropriate, e.g., undertaking monitoring of noise levels if complaints received.

5.4.4 Specialist Study

Objectives

An assessment of the noise impacts from the project has been commissioned for the EIS, the objectives of which are to:

- Describe the existing ambient noise conditions of the study area, nearest residences and other sensitive receptors.
- Identify and describe potential sources of noise emissions in relation to construction and operation of the project (including those associated with project infrastructure and transportation of ore).
- Assess impacts of noise generated during construction and operations, against current typical background levels.

- Identify and describe mitigation and management measures for reducing/controlling noise impacts.
- Identify appropriate day, evening and night-time noise limits for the various components of the project in the context of relevant standards and guidelines.
- Outline an appropriate monitoring and reporting program based on the impact assessment.

Status

Existing noise levels have been determined, and sensitive receptors identified, based on fieldwork. The quantitative model has been established and will be run once the layout of the project is confirmed; the results of this will be reported in the EIS.

5.5 Groundwater

5.5.1 Existing Environment

Groundwater in the region occurs at depths ranging from 2 to 12 m below surface, with an average depth of about 4 m. The groundwater levels fluctuate seasonally, with an average range of five metres. Groundwater hydrographs coincide with the monsoonal climate, with rainfall recharging aquifers during the wet season. Groundwater levels commence rising in the early wet season, around December, and peak in February. The peak is followed by recession that continues until the annual rise starts again in the following wet season.

The rapid cyclic groundwater response to rainfall indicates that the aquifers in the region are unconfined. The regular recessions also indicate that the groundwater system is dynamic, with groundwater discharging to creeks or taken up by transpiration.

Area 55

Groundwater at the Area 55 site is found in fractured schist, weathered and fractured dolomite and fresh dolomite. Depth to water level ranges between about 11 and 20 m below ground level (Figure 5.1). Groundwater levels generally follow topography and are approximately 59 m AHD at the site. Monitoring of seasonal levels shows a range of between two and eight metres.

During site investigations, step-drawdown tests, constant-discharge tests and recovery tests were undertaken to obtain an understanding of the aquifer system within Area 55. The results of the tests are presented in Tables 5.1 and 5.2 for step-drawdown and constant-discharge tests, respectively. All the bores used for these tests are shown on Figure 5.1.

Table 5.1 Step drawdown test results

Step	Pumping Rate (kL/day)	Drawdown (m)	Formation loss (m)	Well loss (m)	Well efficiency (%)
1	1,296	8.36	6.22	2.19	74
2	2,160	16.32	10.37	6.07	63
3	2,592	21.09	12.44	8.74	59
4	3,024	25.93	14.52	11.90	55

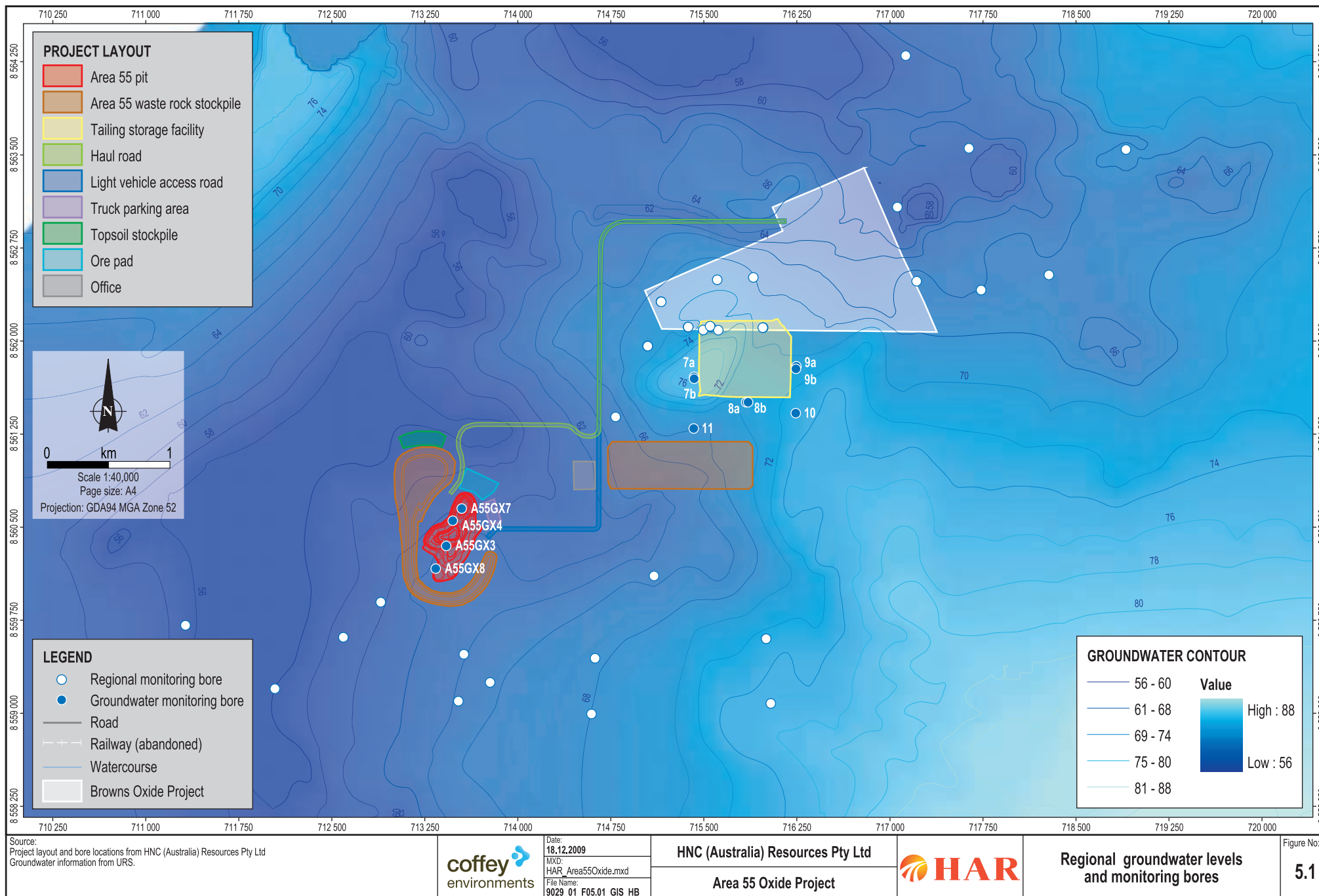


Table 5.2 Constant-discharge test results

Bore	Distance to Pumping Bore (m)	Drawdown Maximum (m)	Transmissivity (m ² /day)							Storage Coefficient
			Pumping Method					Recovery Method		
			Hantush-Jacob	Hantush	Theis	Cooper-Jacob		Cooper-Jacob		
						Early time	Late time	Early time	Late Time	
A55GX4 Pumping Bore		24.49	32			359	1,105	38	1,178	
A55GX3	209	0.09								
A55GX7	121	0.46	1,724	1,753	2,145	2,266				0.006-0.009
A55GX8	410	0.35		2,106	1,946	2,320				0.001-0.002

Notes: Date of test 15 December 2008 to 17 December 2008
Pumping rate 2,851 kL/day
See Appendix D for detail on method.

The recovery data collected during tests indicates a heterogenous aquifer, and transmissivity was estimated at 38 m²/day and 1,178 m²/day for early and late time recovery, respectively.

Groundwater in the project area generally flows from higher to lower elevations and major drainages, predominantly northeast. Recharge occurs primarily via infiltration from precipitation in topographically higher areas; discharge is in topographically low areas comprising mainly extraction wells, creeks and rivers and the Browns Oxide Project open pit.

Due to north-northeast to south-southwest orientation of major faults in the area permeability is likely directionally dependent in the same direction.

The pumping tests indicate that the rock mass may consist of nested storage 'reservoirs' comprising different storage capacities.

Water quality analyses from A55GX4 are provided in Table 5.3.

Table 5.3 Groundwater quality analyses

Analysis	Unit	Result	Guidelines*	
			Domestic Use	Stock Use
General Chemistry				
pH	-	7.9	6.5-8.5	6.5-8.5
Electrical conductivity	µS/cm	242		
Alkalinity	Mg/L	127		
Carbonate (CO ₃)	Mg/L	<1		
Bicarbonate (HCO ₃)	Mg/L	127		
Nitrate as nitrogen (NO ₂ as N)	Mg/L	<0.005		
Nitrite (NO ₂)	Mg/L	<0.02		
Nitrate as nitrogen (NO ₃ as N)	Mg/L	<0.005		

Table 5.3 Groundwater quality analyses

Analysis	Unit	Result	Guidelines*	
			Domestic Use	Stock Use
General Chemistry				
Nitrate (NO ₃)	Mg/L	<0.02	50	400
Chloride (Cl)	Mg/L	1.6	250	
Fluoride (F)	Mg/L	0.4	1.5	2
Hardness	Mg/L	127	200	
Calcium filtered (Ca)	Mg/L	8.2		1000
Potassium filtered (K)	Mg/L	2.4		
Magnesium filtered (Mg)	Mg/L	25.8		
Sodium filtered (Na)	Mg/L	1.6	180	
Silica (SiO ₂)	Mg/L	18.8		
Sulphate filtered (SO ₄)	Mg/L	5.1	250	2000
Metals and Metalloids			Trigger Values [†]	
Aluminium filtered (Al)	µg/l	0.1	55	
Arsenic filtered (As)	µg/l	4.85	13	
Barium filtered (Ba)	µg/l	2.2		
Chromium total (Cr)	µg/l	0.2	1	
Copper filtered (Cu)	µg/l	0.8	1.4	
Iron total (Fe)	µg/l	20		
Gallium filtered (Ga)	µg/l	<0.01		
Manganese filtered (Mn)	µg/l	1.99	1,900	
Molybdenum filtered (Mo)	µg/l	1.15		
Lead filtered (Pb)	µg/l	0.04	3.4	
Uranium filtered (U)	µg/l	0.43		
Vanadium filtered (V)	µg/l	2		
Zinc filtered (Zn)	µg/l	2.9	8	

* Guidelines from DNRETAS (2007b).

† ANZECC/ARMCANZ (2000).

The above water quality data indicate that Area 55 groundwater is fresh with low electrical conductivity and a slight alkalinity, dominated by magnesium ions. The data confirms circumstantial evidence collected during community consultation (Chapter 4), that groundwater in the region is of excellent quality.

TSF South

Aquifers are likely to occur within:

- Lateritic clayey gravel.
- Weathered, vuggy or fractured magnesite of the Coolmalie Dolostone.
- Weathered or fractured shale or amphibolite of the Whites Formation.
- Faults that intersect weathered or partially weathered zones of the bedrock.

Groundwater occurs at depths ranging from 3.0 to 8.4 m below surface around the TSF South site (Figure 5.1), with the direction of flow generally following topography. Groundwater under the TSF South location is likely to flow towards the Browns Oxide Project open pit, whereas in the southern portion of MLN 1157, the groundwater is likely to flow south and southeast.

Table 5.4 shows the parameters of monitoring bores in the vicinity of TSF South. All monitoring bores are shown on Figure 5.1.

Table 5.4 Groundwater monitoring bores for TSF South

Bore	Water level (RL) 19 July 2007	Water level (m below ground level)	Bore depth (m)	Cased interval (m below ground level)		Permeability (m/sec)	Permeability (m/day)
7a	72.70	6.16	10	4	10	3.0E-07	2.6E-02
7b	72.70	6.53	30	24	30	3.0E-07	2.6E-02
8a	66.50	8.20	10	4	10	3.0E-07	2.6E-02
8b	66.40	8.40	30	24	30	2.0E-07	1.7E-02
9a	68.90	3.00	10	4	10	6.0E-07	5.2E-02
9b	68.50	3.40	30	24	30	2.0E-08	1.7E-03
10	70.50	7.20	23.8	18	24	2.0E-07	1.7E-02
11	63.80	5.90	14.5	9	15	3.0E-07	2.6E-02

Groundwater Users

Groundwater users predominantly comprise local residents who rely on bores within their properties to supply water to their homes, and horticultural operations where they exist. As such all of the properties surrounding the project area have at least one bore, with some having several; not all private bores are registered making it difficult to accurately interpret the number of bores and users. However, it can be assumed that all properties surrounding the project area have a bore and utilise it for potable water supply.

Groundwater monitoring during the construction and operation of the Browns Oxide Project showed no evidence of impacts to local users as a result of this project. HAR has re-established the regional bore monitoring group in the local community to monitor the quality and level of water in local bores.

The first round of sampling of the bores of members of this re-established group, as well as the 12 others who requested it during a community meeting, was completed in November 2009.

The location of the bores monitored by HAR in the region is provided in Figure 5.1; this figure does not include the location of the additional 12 bores monitored during November 2009.

5.5.2 Potential Impacts

The potential impacts to groundwater relate to:

- **Groundwater extraction and mine dewatering.** Groundwater will be used to provide water during operation of the project. In addition, the pit will intercept the water table and as a consequence water will have to be pumped out of the pit. Groundwater extraction and mine dewatering may adversely impact regional groundwater resources and affect existing

operating bores. Preliminary modelling indicates that after several years of mining and without management and mitigation measures such as deepening existing bores (see Section 5.5.3 for more details), local users will have a reduced supply of groundwater.

- **Groundwater contamination.** Contaminates have the potential to enter groundwater aquifers from spills or seepage from waste rock storages, the TSF and final voids. Preliminary geochemical characterisation of waste rock has indicated that some has the potential to be acid forming; therefore without proper management and mitigation measures the potential for contamination exists.

5.5.3 Management and Mitigation

Management measures to reduce or avoid impacts associated with reduction in groundwater quality and quantity include:

- Operating project-related bores at sustainable extraction rates.
- Undertaking continued monitoring to establish the baseline water level in wells located on properties directly adjacent to Area 55.
- Replacing or deepening existing wells if they are substantially affected (based on the establishment of sustainable levels) by dewatering activities, or provide alternative water sources for affected users.
- Appropriately designing, constructing and draining waste rock storage areas.
- Appropriately bunding and managing wastes and chemicals.

5.5.4 Specialist Study

Objectives

An assessment of the groundwater impacts from the project has been commissioned for the EIS, the objectives of which are to:

- Characterise the existing groundwater in the project area.
- Construct and calibrate a groundwater model for Area 55 to predict drawdown due to dewatering of the pit.
- Quantitatively model solute transport to predict groundwater quality changes from TSF South, the waste rock stockpiles and the pit.
- Provide an assessment of the impacts to groundwater as a result of the project.
- Provide an assessment of the impacts to groundwater-dependent watercourses (e.g., Rum Jungle Creek) as a result of the project.
- Derive a monitoring program.

Status

Site investigations for Area 55 and TSF South are complete and the groundwater model has been constructed and calibrated with field observations. Preliminary modelling of drawdown has been undertaken; this modelling will be refined once pit optimisation is complete and all results will be reported in the EIS.

5.6 Surface Water

5.6.1 Existing Environment

The high-level description of the existing surface water environment below is based on information presented in the Browns Oxide Project public environmental report, updated where possible with the results of more recent data (including sampling and observations made during the dry and wet season aquatic fauna surveying). HAR has restarted water quality sampling in watercourses potentially affected by the project but data from this is not yet available. The EIS will present a full quantitative characterisation of the hydrology and surface water quality in the Finnis River, Rum Jungle Creek and East Finnis River.

Hydrology

Finniss River. During the dry season, the Finnis River typically consists of a series of long still pools of about 3 m water depth connected by shallower sections. The river ranges from 1 to 12 m wide and generally flows from pool to pool, with occasional periods of no flow. During the wet season, overbank flow often occurs and the depth and speed of flow along the river is more uniform than during the dry season (Jeffrey and Williams, 1980). During the wet season it is typically 10 to 20 m wide, deep and flowing around 1 m/sec.

Rum Jungle Creek. The Rum Jungle Creek is an ephemeral watercourse, which drains to the east and northwest of Area 55, joining the Finnis River to the north of Area 55. During the dry season, it dries and is a series of disconnected pools. During the wet it flows continuously and can spread into surrounding swamp areas.

East Finnis River. The East Finnis River is an ephemeral stream that drains to the northwest, meeting the Finnis River some 8 km downstream from the Browns site. Base flow is generally not established in the East Finnis River until sustained monsoonal rains arrive in January and is generally sustained until April. Salts evaporated on the river bed following the recessionary flow of the previous year are remobilised during these first rain events. Contaminant inputs to the East Finnis River then occur due to flows from the open cut pits and seepages from the overburden heaps at Rum Jungle. Discharges from the Browns Oxide Project sedimentation dam are released to the East Finnis River.

Water Quality

General water quality characteristics of the Finnis River and East Finnis River were measured during the dry season of 2007 and the wet season of 2008. The results of this are summarised in Table 5.5.

Table 5.5 Average water quality data

Location	Guideline [^]	Finniss River upstream of Area 55		Finniss River downstream of Area 55		Finniss River downstream of East Finniss River		East Finniss River	
Season		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
pH	6.0 to 8.0	7.47	7.65	7.74	7.59	7.41	8.8	6.71	7.48
Turbidity (NTU)	2	4.16	6.92	4.11	6.91	8.9	6.66	7.4	7.64
Electrical conductivity (µs/cm)	20	292.9	237.1	353.29	111.4	276.15	175.55	333.05	146.8
Dissolved oxygen (% saturation)	80 to 110	53.89	212.5	62.55	245.3 1	77.08	300	53.54	187.2
Temperature (°C)	No value	30.61	29.63	30.14	29.17	30.22	28.04	29	28.9

[^] Guideline values are ANZECC/ARMCANZ (2000) freshwater tropical lowland river guidelines. Values in bold are outside the guideline values.

A brief discussion of chemical water quality for the Finniss River and East Finniss River is presented below. Comprehensive data for these waterways, and Rum Jungle Creek, will be presented in the EIS.

Finniss River. Concentrations of total metals measured in the Finniss River pre- and post-remediation during dry season biological surveys are presented in Jeffree *et al.* (2001). Average concentrations of Cu, Zn, Co and Ni measured post-remediation in 1992 and 1995 decreased by one to two orders of magnitude downstream of the confluence of the East Finniss River compared with concentrations measured pre-remediation in 1973 to 74. Manganese concentrations also decreased but to a lesser extent. A decline in metal concentrations was also evident between 1992 and 1995. There is only a small increment in metal concentrations, if any, downstream of the East Finniss River compared with upstream locations.

East Finniss River. Metal loads and concentrations have decreased compared to levels prior to remediation of the Rum Jungle Mine site; however, they remain sufficiently elevated to impact on the freshwater ecosystem of the East Finniss River (Lawton, 1998a). Concentrations of pollutants in the East Finniss River tend to be highest during the first flush of the wet season and during the late wet season recessional flows when dilution effects are minimal.

5.6.2 Potential Impacts

Local surface water may be affected by:

- Contaminants in surface runoff.
- Eroded sediment from disturbed areas, the TSF and waste rock stockpiles.
- Leachate from waste rock and ore, particularly that with acid-generating potential.
- Drawdown of aquifers reducing supply for groundwater-dependent ecosystems.
- Altered surface water flow patterns due to surface water management on site.

5.6.3 Management and Mitigation Measures

For material with the potential to be acid forming or that has the potential to leach other contaminants, management measures to reduce or avoid impacts will include the development of a waste rock management plan which includes details on the design of the waste rock stockpiles and the selective placement of potentially reactive waste rock materials within a non-reactive (e.g., oxide) covering.

Other mitigation and management measures are described in Section 2.7 and include constructing sediment basins and bunds for surface water collection and treatment, and collecting contaminated water, such as that with low pH, and sending it back to the Browns site for reuse or discharge in accordance with the Browns Oxide Project waste discharge license. If necessary HAR will obtain a waste discharge license for all water discharged from the Area 55 site.

5.6.4 Specialist Study

Objectives

An assessment of the surface water impacts from the project has been commissioned for the EIS, the objectives of which are to:

- Characterise the existing surface water quality in and around the project area.
- Estimate storm water flows and potential environmental impacts from run-off.
- Describe the impact of the project on watercourses, wetlands, springs, riparian habitats and aquatic ecosystems.
- Derive a monitoring program.

Status

The previous operator undertook surface water quality monitoring and this has been re-established by HAR. Results of this monitoring are being assessed to characterise the existing quality of surface water. Impacts to the downstream environment will be predicted once the design of the project is confirmed; the results of this will be reported in the EIS.

5.7 Visual Amenity

5.7.1 Existing Environment

The project area generally has good vegetation coverage typical of the local environment. At Area 55, this creates a dense visual screen with views extending into the site over a distance of 20 to 30 m. The Area 55 site extends east and west, parallel to the Litchfield Park Road. The land uses associated with the blocks adjacent to Litchfield Park Road provide numerous view corridors from Litchfield Park Road towards the Area 55 site across open fields and areas of modified vegetation. The site itself (in its current condition) provides a vegetated backdrop to the road corridor.

The Browns Oxide Project processing plant is not readily visible from surrounding roads. Local residents can see a glow from lights at night when the plant is operating.

5.7.2 Potential Impacts

The project has the potential to decrease visual amenity in the area. The impact to existing visual amenity will vary with viewer sensitivity (i.e., the degree to which change is perceived or experienced by an individual), the viewer's distance from impacted areas (i.e., local, sub-regional or regional) and the phase of the mine cycle (i.e., construction, operation or closure). Given the site's proximity to sensitive receptors and Litchfield Park Road, potential impacts to visual amenity are likely and include:

- Permanent changes to landforms.
- Vegetation removal, altering existing landscape and allowing views of the project components.
- Presence of additional vehicles and project machinery, particularly haulage trucks along local roadways.

5.7.3 Management and Mitigation

Given the likelihood of impacts, management and mitigation measures will include:

- Construction of the bund to the south of Area 55.
- Maintaining a vegetation buffer around the borders of the TSF South, waste rock stockpile and mine sites.
- Revegetating the bund as soon as practicable after construction.
- Maintaining and enhancing a vegetative buffer on project tenements between Area 55 and local residents.
- Designing project components in mind when considering visual impacts, i.e., reducing height where possible, bearing in mind that a reduction in height will result in an increase in footprint and hence disturbance area.
- Progressively rehabilitating areas wherever possible.
- Maintaining a high standard of housekeeping at the site.
- Considering the colours of the surrounding landscape when selecting exterior paint colours for buildings.
- Rehabilitating and decommissioning the site at mine closure (see Section 2.12).

5.7.4 Specialist Study

Objectives

An assessment of the visual impacts from the project has been commissioned for the EIS, the objectives of which are to:

- Describe and visually model (with computer generated photo montages) the proposed mine prior to the commencement of mining, five years from commissioning and decommissioned mine.
- Describe any measures to screen the project from public view.

- Assess the landscape's ability to absorb visual changes associated with the various stages of the project from all relevant viewpoints.

Status

The character of the surrounding landscape has been established during fieldwork, and three-dimensional models of the terrain and landscape have been constructed. Modelling of the visual impact of the project will be undertaken once the layout of the project is confirmed.

5.8 Flora

5.8.1 Existing Environment

Vegetation Communities

Definition of vegetation communities covering a broad regional area based on Compass' tenements, local cadastral boundaries and surface water catchments, referred to as the project development area (PDA), was undertaken during surveys in the dry season of 2007 and the wet season of 2008 (Figure 5.2). These surveys were based on standard DNRETAS survey guidelines and provide a sound understanding of the vegetation communities in the local area. Particular effort was spent in the detection of listed threatened flora species in the survey areas.

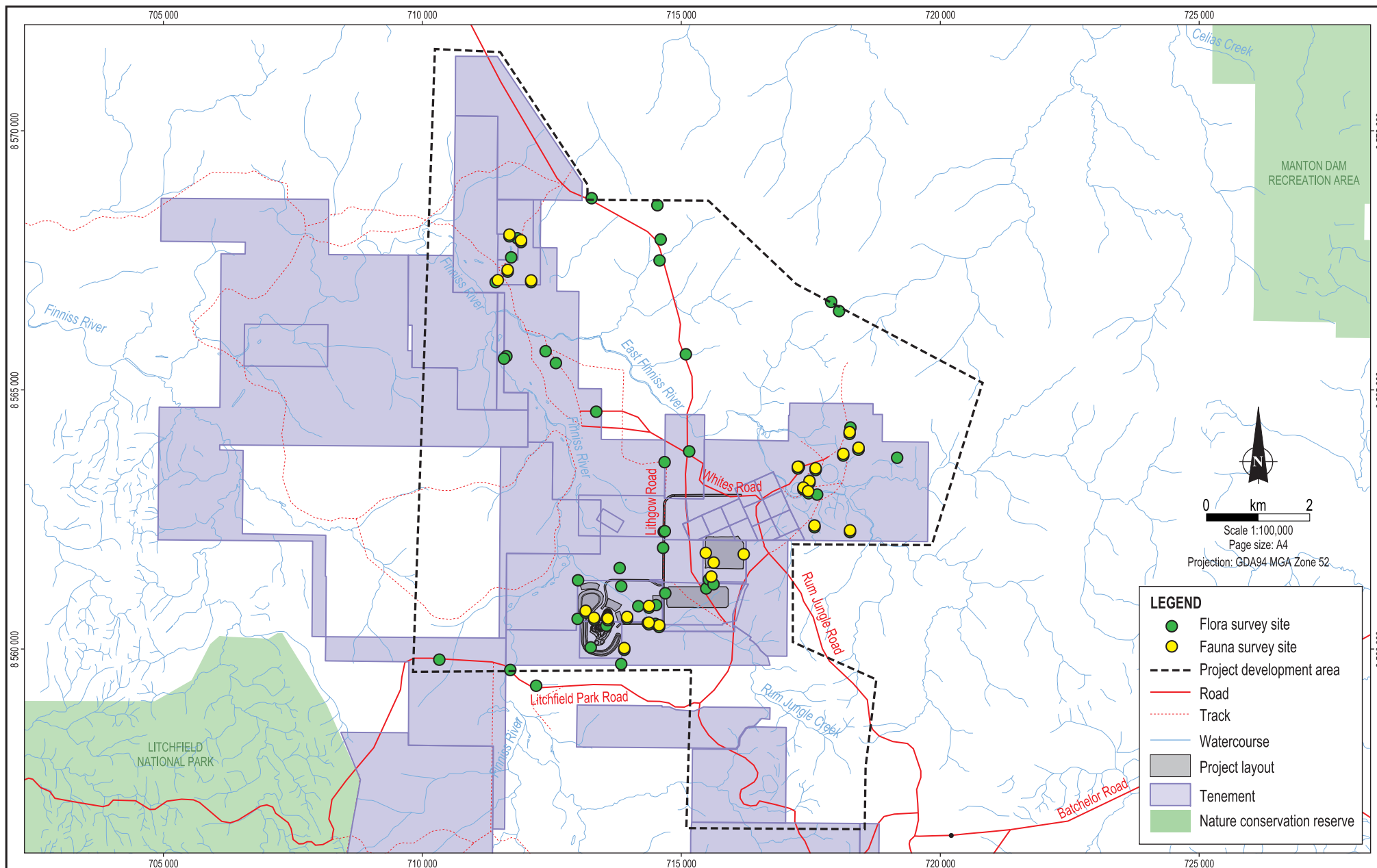
The following communities occur in the project area, including waste rock stockpile option 1 (MLN 1161 and MLNA 1162), TSF South (MLN 1157) and waste rock stockpile – option 2 (MLN 1158):

- Area 55:
 - *Eucalyptus miniata*, *Corymbia polysciadia* woodland to open woodland.
 - *Corymbia foelscheana* low woodland on poorly drained soil.
 - Scattered *Lophostemon lactifluys*, *Pandanus spiralis* above closed tussock grasslands.
 - *Acacia auriculiformis*, *Melaleuca cajuputi* and *Melaleuca leucadendra* tall closed riparian forests.
- TSF South:
 - *Eucalyptus miniata*/*Eucalyptus tetradonta* tall woodland.
 - Sparse *Corymbia foelscheana*, *Eucalyptus tectifa*, woodland over *Germaina grandiflora* closed tussock grassland.
 - *Corymbia foelscheana* low woodland on poorly drained soil.
- Waste rock stockpile option 2:
 - Vegetation mapping of this area has not been completed, however given its proximity to Area 55 and TSF South and site inspection it is expected that the vegetation will be similar.

Plates 5.1 and 5.2 show common vegetation in the project area.

Flora Species of Significance and Weeds

More targeted surveys have been undertaken for Area 55 and TSF South. Details describing flora species of significance and weeds that occur in these areas are described below.



LEGEND

- Flora survey site
- Fauna survey site
- Project development area
- Road
- ... Track
- Watercourse
- Project layout
- Tenement
- Nature conservation reserve

Source:
Project layout from HNC (Australia) Resources Pty Ltd
Roads and drainage from NTLIS (optimum scale 1:10,000)
Flora and fauna survey locations from GHD



Date:
14.12.2009
MXD:
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HNC (Australia) Resources Pty Ltd
Area 55 Oxide Project



Regional flora and fauna
survey sites

Figure No:
5.2

Plate 5.1
Woodland



Plate 5.2 Grassland



Plate 5.3
Gamba Grass on Area 55

Area 55

During detailed surveys of Area 55, 139 plants were identified to species level and an additional 20 were identified to genus level. Of these, 11 introduced plant species were identified; of these 11, the following are listed as declared weeds under the *Weeds Management Act*:

- **Gamba grass (*Andropogon gayanus*)** – this species was widely distributed across Area 55, it is listed as a schedule B/C weed meaning that efforts must be made to control the species and its spread. In addition a draft weed management plan has been developed for Gamba Grass (DNRETAS, 2009). Under this plan growth and spread of Gamba grass must be controlled in the vicinity of Area 55 (Plate 5.3).
- **Hyptis (*Hyptis suaveolens*)** – this species was found at three of eight survey sites across Area 55, it is listed as a schedule B/C weed and is recognised as a serious economic and environmental threat throughout northern Australia. Its classification requires landowners to contain growth and prevent its spread.
- **Flannel weed (*Sida cordifolia*)** – this species was found in one site, however it was in woodland that is widespread across Area 55. It is listed as a schedule B/C weed.
- **Snakeweed (*Stachytarpheta australis*)** – This species was found at only one site within Area 55, in moist soils close to a drainage line. It is quite common in the Darwin and Batchelor regions around disturbance in wetter areas.

The following species of national, territory or local conservation significance were noted as occurring or potentially occurring within Area 55:

- National significance:
 - No species of national significance were found, or are known to occur at Area 55. However, an EPBC search identified *Helicteres* sp. as potentially occurring in the area. Despite this, it was not recorded during all surveys of the area and its preferred habitat does not occur, and as such it is considered unlikely to be present.
- Territory significance:
 - *Cycas armstrongii* was recorded during the survey, this species is listed as vulnerable under the TPWC Act. *C. armstrongii* is common and widespread across Area 55, occurring in open woodland communities present over much of the site. Vegetation communities in Area 55 do not seem to provide unique or significant habitat, and it has been loosely estimated that *C. armstrongii* covers 3.4% of Area 55.
 - *Grevillea longicuspis*, listed as near threatened under Northern Territory legislation, was found during the survey. Found in open forest and woodland, 15 individuals were observed on the site.
- Local significance:
 - Nine of 159 species recorded within Area 55 are endemic to the Northern Territory (*Acacia oncinocarpa*, *Ampelocissus frutescens*, *Brachychiton megaphyllus*, *Cycas armstrongii*, *Gomphrena rosula*, *Grevillea longicuspis*, *Livistona humilis* and *Pachynema dilatatum*). Although this is a large number of species within the site, overall endemism in the Northern Territory is relatively common (11%). All of these species are regionally and locally widespread and common.

TSF South

During detailed surveys of the TSF South area, 84 species were identified to species level and an additional 7 to genus level. Of these nine introduced species were identified and two were listed under Northern Territory legislation (*Andropogon gayanus* and *Hyptis suaveolens*; see Area 55 for greater detail on introduced species).

The following species of national, territory or local conservation significance were noted as occurring or potentially occurring within the footprint of TSF South:

- National significance:
 - As with Area 55, an EPBC search identified *Helicteres* sp. as potentially occurring.
- Territory significance:
 - *Cycas armstrongii*, see above for detail.
- Local significance:
 - Seven of the 91 species of flora that occur within the TSF South site are endemic to the Northern Territory (*Acacia oenocarpa*, *Brachychiton megaphyllus*, *Corymbia porrecta*, *Cycas armstrongii*, *Gomphrena atrorouba*, *Livistona humilis* and *Pachynema dilatatum*). As for Area 55, these are regionally and locally common, and endemism is widespread in the Northern Territory.

Waste Rock Stockpile – Option 2

Although the area for the second waste rock stockpile option has not been directly surveyed, given the proximity to both the TSF South and Area 55 sites it is likely that flora composition will be similar to that described for both Area 55 and TSF South.

5.8.2 Potential Impacts

The project has the potential to impact upon individual species of flora and the vegetation communities within the project area. These potential issues are discussed below.

Loss of Vegetation

Approximately 173 ha of land will be disturbed for the project. The clearing of vegetation will remove individual plants from the broader regional population. This has the potential to impact on the distribution, dispersal and genetic diversity of populations of species in the region. However, as noted in Section 5.8.1, the vegetation of the project area is typical of the region and is not considered to be regionally significant. The removal of vegetation also has the potential to fragment and reduce the area of habitat available for fauna species dependent on it for resources.

Introduction of Weeds

Project-related vehicles and equipment (especially earth-moving equipment) have the potential to introduce and/or spread weed species within and around the project site. However, the areas are already relatively heavily infested with weeds.

Increases in weed density and distribution have the potential to further reduce the available local habitat for fauna species that are dependent on specific vegetation communities. An increase in

the presence of woody weeds also has the potential to increase the fuel load and in turn increase the intensity of fires.

Reduced Conditions Favourable for Plant Growth

Vegetation clearing, vehicle movements and day-to-day operational activities will generate dust. This has the potential to reduce conditions favourable for plant growth (e.g., reduction in photosynthesis and respiration due to an accumulation of dust on plant surfaces or damage to plants from reactive dust particles) with subsequent reduced plant health.

Ground compaction, soil or water contamination and physical damage to vegetation in the project area may also reduce the ability of plants to become established, and limit the potential for regeneration and revegetation of disturbed areas.

Mine infrastructure may alter the runoff and drainage characteristics of the project area and have adverse effects on downstream vegetation. This may promote weed invasion, reduce plant health and degrade habitat for existing vegetation.

5.8.3 Management and Mitigation

Management measures to reduce or avoid impacts associated with loss of vegetation, introduction of weeds and reduced conditions favourable for plant growth include:

- Erecting flagging tape to mark 'no-go' zones to ensure areas to be protected are clearly defined, identified and avoided and that clearing and ground disturbance will only occur within designated areas.
- Ensuring the development and implementation of vegetation clearance protocols (including an internal clearance procedure) and assessing performance against them.
- Ensuring that vehicles and project equipment arrive on site free of vegetative matter, seeds and mud.
- Implementing targeted weed control measures for any observed significant increase in the distribution or density of existing weeds, or new populations of weeds. Gamba grass control has already started; HAR began targeted burning of gamba grass areas in November 2009 and are now conducting follow up spraying with a suitable herbicide.
- Regularly monitoring areas with a high potential for, or susceptibility to, weed invasion; such as along roadsides, recently cleared areas and permanently wet areas such as the banks of the water storage facilities and drains, particularly following rainfall events.
- Controlling or preventing weed infestations in topsoil stockpiles to minimise the likelihood of weed introduction or increased distribution during respreading of topsoil.
- Progressively rehabilitating disturbed areas and avoiding unnecessary future disturbance of these areas.
- Implementing methods to monitor and maintain progressively rehabilitated and revegetated areas.

5.8.4 Specialist Study

Objectives

An assessment of the impacts to flora from the project has been commissioned for the EIS, the objectives of which are to:

- Identify the potential project impacts on species, communities and habitats of local, regional or national significance.
- Discuss the ability of identified species to withstand activities associated with the construction and operation of the proposed Area 55 Oxide Project and measures proposed to mitigate such impacts.
- Describe measures for minimising or mitigating impacts to species, communities and habitats, including recommendations for site rehabilitation.
- Identify potential offset opportunities, where impacts on Commonwealth and Northern Territory listed threatened flora species are unavoidable.
- Describe potential residual impacts of the project following implementation of mitigation measures and rehabilitation.
- List aspects for future management/monitoring and a regime for this.

Status

Field surveys of Area 55 and TSF South are complete. Impacts to flora as a result of the project will be determined once the layout of the project is confirmed; these will be reported in the EIS.

5.9 Fauna

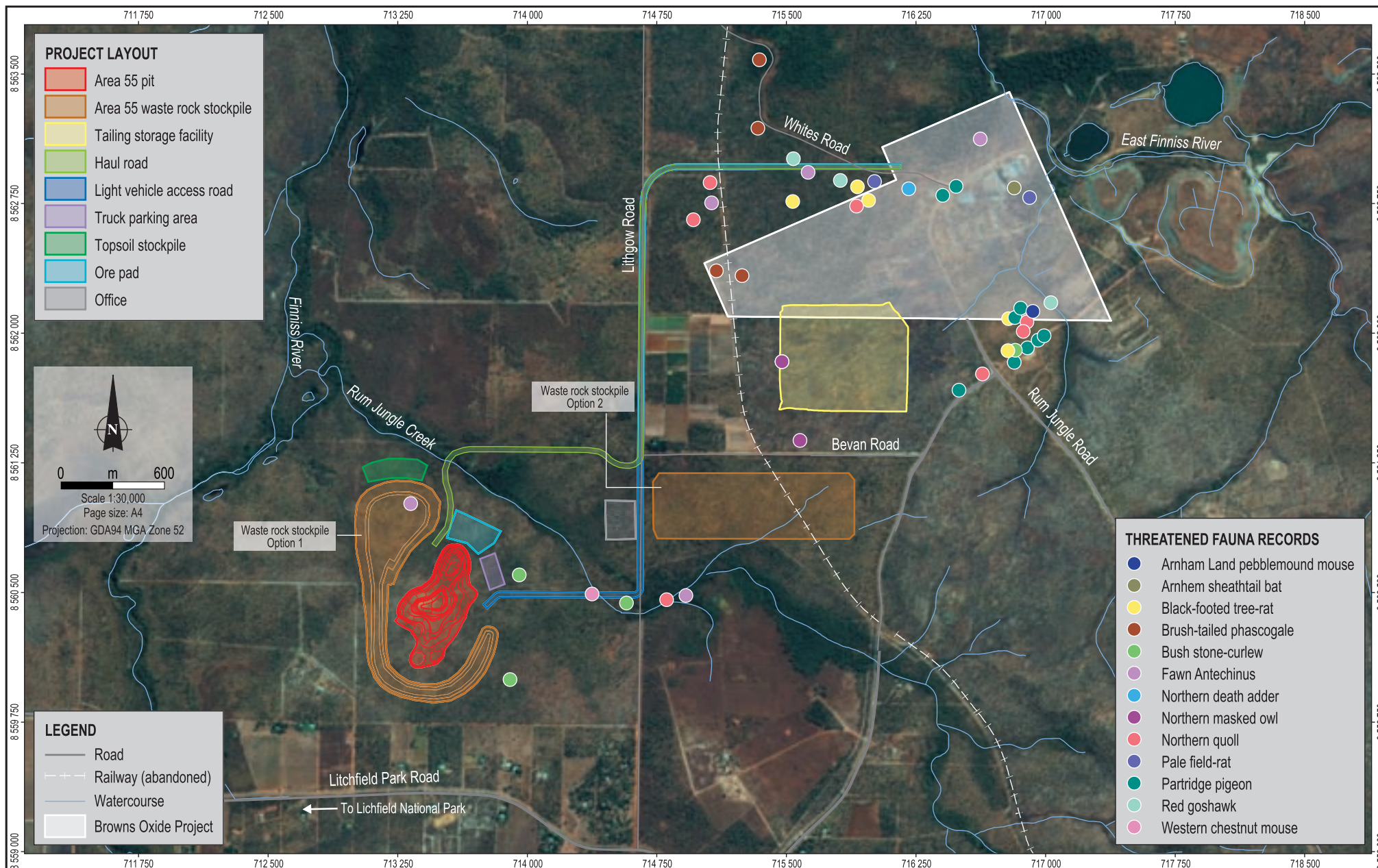
5.9.1 Existing Environment

Extensive fauna surveys across the PDA and including the Area 55 and TSF South areas was completed during November 2007 and April 2008. The location of survey sites is shown in Figure 5.2. The locations of all threatened fauna records for the local area are shown in Figure 5.3. These surveys were based on standard DNRETAS survey guidelines and provide a sound understanding of the fauna in the local area. Particular effort was spent in the detection of listed threatened fauna species in the survey areas.

Area 55

A total of 113 fauna species were recorded within the Area 55 site during the characterisation surveys, these can be broken down as follows:

- **Frogs** – Ten frog species were recorded from Area 55, none were threatened; however, two species (*Limnodynates ornatus* and *Litoria bicolor*) are listed as data deficient under the TPWC Act. The introduced cane toad is well established across Area 55.
- **Reptiles** – Fourteen reptile species were recorded across Area 55, the introduced Asian house gecko (*Hemidactylus frenatus*) was observed.



Source:
Project layout from HNC (Australia) Resources Pty Ltd
Railways, roads and drainage from NTLIS (optimum scale 1:10,000)
Imagery from Google Earth, 2009.
Fauna data digitised by Coffey Environments, accuracy could be compromised.

coffey
environments

Date:
18.12.2009
MXD:
HAR_Area55Oxide.mxd
File Name:
9029_01_F05.03_GIS_HB

HNC (Australia) Resources Pty Ltd

Area 55 Oxide Project

HAR

Threatened fauna records
in the local area

Figure No:

5.3

- **Birds** – Seventy-six species of bird were recorded at Area 55; one EPBC Act-listed threatened species, the partridge pigeon (listed as vulnerable under both the TPWC Act and the EPBC Act), was recorded. The bush stone curlew, listed as near threatened under the TPWC Act, was also recorded.
- **Mammals** – Six terrestrial and arboreal mammal species, and eight species of microchiropteran bats, were recorded from Area 55. The western chestnut mouse (*Pseudomys nanus*), listed as near threatened under the TPWC Act, was recorded. The introduced European rabbit was observed within Area 55.

The following species of conservation significance are potentially present in Area 55, in that they have been recorded in the wider area and could have appropriate habitat in Area 55; but were not recorded during the surveys:

- **Northern masked owl (*Tyto novaehollandiae kimberli*)** – listed as vulnerable under the EPBC Act and near threatened under the TPWC Act.
- **Northern quoll (*Dasyurus hallucatus*)** – listed as critically endangered under the EPBC Act and endangered under the TPWC Act.
- **Pale field-rat (*Rattus tunney*)** – listed as near threatened under the TPWC Act.
- **Square-tailed kite (*Lophoictinia isura*)** – listed as near threatened under the TPWC Act.
- **Yellow-rumped manikin (*Lonshura flavipyrma*)** – listed as near threatened under the TPWC Act.

In addition to the above, an EPBC Act protected matters database search also listed the following as potentially occurring within Area 55: bare-rumped sheath-tail bat (*Saccolaimus saccolaimus*), red goshawk (*Erythrotriorchis radiatus*) and Gouldian finch (*Erythrura gouldiae*). All are considered unlikely to occur within Area 55, although the red goshawk may forage in the area.

TSF South

A total of 75 fauna species were recorded in the TSF South site during the characterisation surveys, these can be broken down as follows:

- **Frogs** – Four frog species were recorded from the TSF South site, none were threatened; however, two species (*Limnodynastes ornatus* and *Litoria bicolor*) are listed as data deficient under the TPWC Act.
- **Reptiles** – Eight reptile species were recorded from the TSF South site, none were threatened.
- **Birds** – Fifty-three bird species were recorded from the TSF South site, three threatened species were recorded. These were the northern masked owl (*Tyto novaehollandiae*) and the partridge pigeon (*Geophaps smithi smithi*) (listed under the EPBC Act) and the bushstone curlew (*Burhinus grallarius*) (listed under the TPWC Act).
- **Mammals** – Three terrestrial and arboreal mammal species, and five microchiropteran bat species, were definitely recorded and two probable species were also recorded. None of the recorded mammals were listed as threatened.

All listed species potentially present in the TSF South area are the same as those discussed above and for Area 55, and as such will not be repeated here.

Waste Rock Stockpile – Option 2

Although the area for the second waste rock stockpile option has not been directly surveyed, given the proximity to both the TSF South and Area 55 sites it is likely that fauna composition will be similar to that described for both Area 55 and TSF South.

EPBC Listed Migratory and Marine Species

Table 5.6 details the migratory and marine species listed under the EPBC Act that were recorded within the project area.

Table 5.6 EPBC listed migratory and marine species

Species	EPBC Listing
Brown goshawk	Migratory
Collared sparrow hawk	Migratory
Whistling kite	Migratory and Marine
Magpie goose	Marine
Cattle egret	Migratory and Marine
Torres pigeon	Marine
Horsfield's bronze-cuckoo	Marine
Little bronze-cuckoo	Marine
Forest kingfisher	Marine
Sacred kingfisher	Marine
Common koel	Marine
Rainbow bee-eater	Migratory and Marine
Dollarbird	Marine
Black-faced cuckoo-shrike	Marine
White-bellied cuckoo-shrike	Marine
Cicadabird	Marine
Spangled drongo	Marine

5.9.2 Potential Impacts

The project has the potential to impact upon individual species of fauna within the project area. These potential issues are discussed below.

Habitat Loss and Fragmentation

Vegetation clearing will potentially fragment habitat in the local area, with possible consequences including increased inter- and intra-specific competition for resources due to reduced foraging areas, increased hunting pressure from prey species due to a reduction in habitat providing cover, and the isolation of breeding populations. There is also the potential for loss of individual animals during the clearing of vegetation.

Reduced Species Abundance

Species abundance can be measured by the density and diversity of species present (i.e., the number of individual animals in an area and the total number of species present in that area). There is potential for species abundance to be reduced as a result of:

- **Noise and vibration.** Project construction and operations will create noise and vibration emissions, typically generated by vehicle traffic, excavations, blasting and ore processing.
- **Surface water contamination.** Waterbodies established as part of the project (e.g., sediment ponds, TSF South) may attract waterbirds. There is the potential for adverse impacts to visiting waterbirds if these waterbodies are contaminated.

Significant Impacts to Threatened Species

Some threatened mammal and bird species present or potentially present in the project area are listed for their conservation significance. Ground disturbance (including mining) and vegetation clearing may reduce the abundance of threatened animal species in the project area.

Increase in Abundance of Introduced Fauna

Three introduced vertebrate fauna species have been identified around the project area and are common in the region: the rabbit (*Oryctolagus cuniculus*), cane toad (*Bufo marinus*) and Asian house gecko. The presence of rubbish and artificial water sources associated with the project has the potential to increase feral animal populations, however this has not been observed as a result of the Browns Oxide Project and is not likely to occur as a result of the Area 55 Oxide Project. The cane toad has colonised the area over the past few years and large numbers of toads are have invaded local habitats. The impact of cane toads on the northern quoll and reptiles is of particular concern (DEH, 2005). The presence of roads can assist the movement of some introduced prey species such as the cat and domestic dog into new areas, however, access tracks are present across the project area and the project will not be creating new pathways for such introduced prey species.

Introduced grazers such as the rabbit have the potential to degrade revegetation areas through grazing of seedlings. These species can also attract raptors to the area, which can result in an increase in predation of local endemic species such as small birds, reptiles and mammals.

5.9.3 Management and Mitigation

Management measures to reduce or avoid impacts associated with habitat loss and fragmentation, reduced species abundance, impacts to threatened species, and increase in introduced fauna include:

- Minimising the area of vegetation clearance.
- Minimising the potential for water to pool in areas where it is applied as a dust suppressant (e.g., along unsealed haul roads) to reduce the attraction for animals.
- Ensuring that waste management procedures are diligently followed to deter pest animals.
- Consolidating areas of vegetation to be cleared for access tracks and infrastructure pathways so that large blocks of habitat, rather than small fragments, are preserved.
- Rehabilitating cleared land following project completion.

- Regularly monitoring areas with a high potential for, or susceptibility to, increases in abundance of introduced species (e.g., administration facilities and around water sources).

5.9.4 Specialist Study

Objectives

An assessment of the impacts to fauna from the project has been commissioned for the EIS, the objectives of which are:

- Identify the potential project impacts on fauna species, communities and habitats of local, regional or national significance.
- Discuss the ability of identified species to withstand activities associated with the construction and operation of the proposed Area 55 Oxide Project and measures proposed to mitigate such impacts.
- Describe measures for minimising or mitigating impacts to species, communities and habitats, including recommendations for site rehabilitation.
- Identify potential offset opportunities, where impacts on Commonwealth and Northern Territory listed threatened species are unavoidable.
- Discuss methods of managing/minimising the introduction of exotic fauna species.
- Describe potential residual impacts of the project following implementation of mitigation measures and rehabilitation.
- List aspects for future management/monitoring and a regime for this.

Status

Field surveys of Area 55 and TSF South are complete. Impacts to fauna as a result of the project will be determined once the layout of the project is confirmed; these will be reported in the EIS.

5.10 Land Resources and Use

5.10.1 Existing Environment

Landform and Drainage

The project site is characterised by a peneplain of gently undulating land interspaced by plains, with low rises and hills to around 150 m above the surrounding drainage areas (Low, 2001). Sedimentation occurred over the Tertiary and into the Quaternary periods and the sub-horizontal bedding of the sediments is a major factor influencing the topographic form (Low, 2001).

Major landform groups represented in the study area include undulating lowlands (undulating lowlands and low rises of gravel and shallow lithosols over granite sub-outcrops), drainage floors and depressions (poorly drained areas subject to inundation and waterlogging during the wet season) and stream channels and levees.

The land surrounding the TSF South and waste rock stockpile option 2 sites is dissected by small creeks that flow east into the ephemeral East Finniss River and west into Rum Jungle Creek.

Rum Jungle Creek drains Area 55, and runs to the northwest to meet up with the perennial Finnis River.

Soils and Geology

The project lies in the Northern Lateritic Plains Geomorphological Unit marked by lateritic soils formed on rocks of the Brocks Creek Group. Although the area has high rainfall, erosion has generally been retarded by the relative lack of relief and the high permeability of the soils.

Soils within the project include moderate brown gravelly loam, moderate red brown silty sand, pale grey red gravelly sand, pale grey red gravelly sand in pisolitic laterite, pale yellowish-brown silt, as well as shallow lithosols associated with rock outcrops and textured 'acid' alluvial soils and heavy grey pedocals in the lowlands and floodplains.

Land Use

The project is located approximately 7 km northwest of the township of Batchelor and falls within the jurisdiction of the Coomalie Community Government Council. Two groups of Aboriginal people—the Kungarakan and Warai—have traditional ownership interests in the project area.

Compass holds mineral leases over the whole of the proposed project area made up of MLN 1157, MLN 1158, MLN 1161 and MLNA 1162 and has actively conducted exploration drilling within the area over several years. The ongoing exploration activities have caused a degree of environmental degradation to the project area and surrounds.

Residences are located on some freehold properties surrounding the project area, particularly along Litchfield Park Road to the south of Area 55. Nearby land uses include cattle grazing and horticultural activity. Litchfield National Park is 11 km west of the project area (see Figure 1.1).

5.10.2 Potential Impacts

The project has limited potential to reduce the land available for agricultural or horticultural activities in the region as extensive land suitable for these land uses remains within the region. While the project area will be rehabilitated, there will be some areas, such as the final pit voids, which will be permanently unavailable for pastoral or horticultural activities. These areas will not restrict any future pastoral or horticultural use of the remaining project area. Removal of vegetation within the project area may result in some topsoil and subsoil erosion, with subsequent impacts on the future uses of affected land.

Soil contamination may occur during project activities from chemical or fuel spills, product spills, and dust emissions. Soil contamination may inhibit revegetation and limit suitable future land uses.

5.10.3 Management and Mitigation

Management measures to reduce or avoid impacts associated with changes to land resources and use include:

- Using appropriate transport, storage and handling methods for fuels, lubricants and other chemicals.
- Using spill response procedures when required.

- Ensuring site personnel have a high level of operator training and diligence.
- Assessing soils prior to mine closure for contamination and undertaking appropriate remediation measures where necessary.
- Restricting vegetation clearing to the project footprint, undertaking progressive rehabilitation, utilising erosion controls (e.g., drains, brush matting) where appropriate and controlling surface water runoff.

5.10.4 Specialist Study

Objectives

An assessment of the impacts to geology, soils and landform from the project has been commissioned for the EIS, the objectives of which are to review existing data sources and describe the topography, geology and soils; as well as describe any necessary mitigation and management measures to ensure impacts as a result of the project are managed appropriately.

Status

This study has not yet commenced.

5.11 Infrastructure, Traffic and Transport

5.11.1 Existing Environment

Infrastructure

Electricity

Batchelor is connected to the Northern Territory electricity grid and is supplied via a 22-kV branch line from the main 132-kV service line (that runs parallel to the Stuart Highway from Channel Island Power Station on Darwin Harbour to Katherine). Power is supplied to the Browns Oxide Project from the main grid.

Water and Sewerage

Potable water is supplied to Batchelor via two potable supply bores located within the town boundary. These bores feed a 4.8 ML storage tank from which water is distributed via the local distribution system. Rural areas are serviced by bore water and/or rain tanks.

The Batchelor township is serviced by a gravity-reticulated sewerage system, which conveys sewage to waste stabilisation ponds located southwest of the town centre.

Telecommunications

Telephone and facsimile services are available in Batchelor via the Telstra network. Telstra's next generation (Next-G) network provides mobile phone coverage in Batchelor; however, coverage is patchy in the project area.

Traffic and Transport

A road network that is based around the Stuart Highway currently services the project area. A secondary road provides access to Batchelor and onto Litchfield National Park. Due predominantly to tourist traffic, June through to September are typically the busiest months of the year. Each of the roads surrounding the project are briefly described below:

- The Stuart Highway – This road functions as a Rural National Highway and is aligned in a north–south direction. It is generally a two-way two-lane road, with a speed limit outside urban areas of 130 km/h. It is generally in good condition and caters for all road users, carrying 2,100 vehicles per day, with roughly 4% (or 80 per day) of these being heavy vehicles.
- Batchelor Road – This road functions as a Rural-Secondary road and is generally aligned in an east-west direction. It is a two-way road configured with a two-lane, with a posted speed limit of 100 km/h until the approach into Batchelor where the speed limit changes successively to 80 km/h and then to 60 km/h. It is generally in good condition and carries 900 to 950 vehicles per day.
- Rum Jungle Road – This road generally functions as a Rural-Secondary road and is generally aligned in a north-west to south-east direction. It is configured as a two-way road with a two-lane, with a posted speed limit of 80 km/h. It is generally in reasonable condition and is currently used by all road user types and as a school bus route; it carries between 650 and 700 vehicles per day, including traffic to the Browns Oxide Project site.
- Litchfield Park Road – This road functions as a Rural-Secondary road and is the main access road into Litchfield National Park. It is a two-way road configured with a two-lane carriageway, 7.4-metre wide carriageway with gravel shoulders of varying width. Litchfield Park Road is generally in good condition and is mainly used by residential and tourist traffic as well as a school bus route. It carries approximately 400 vehicles per day.
- Lithgow Road – This road functions as a Rural-Local road between Litchfield Park Road and Whites Road; however, it is discontinuous between Litchfield Park Road and Bevan Road. Lithgow Road is generally aligned in a north -south direction. It is primarily used by local traffic (assumed 50 vehicles per day) and has a load restriction of 8 tonnes gross vehicle mass from mid-December to 1 May each year. There are no speed limits currently posted.
- Bevan Road – This road functions as a Rural-Local road and in the vicinity of the site is aligned in an east-west direction. It is a two-way road configured with two-lanes. Bevan Road has been upgraded in recent years and is of a high standard. It is primarily used by local traffic (assumed 50 vehicles per day) and has a load restriction of 8 tonnes gross vehicle mass from mid-December to 1 May each year. There are no speed limits currently posted.

5.11.2 Potential Impacts

Potential issues relating to the project include:

- The ability of current services and facilities to support the development (in terms of Batchelor's ability to support an increased population associated with the workforce and the provision of services to the development).
- Changes to local traffic volumes and resulting safety and amenity issues.

5.11.3 Management and Mitigation

All appropriate laws and regulations associated with the use of public roads and other infrastructure will be abided by. Management measures to reduce or avoid any impacts will include:

- Ensuring the traffic load is within the capacity of the existing road network and will not cause any significant disturbance to it.
- Selecting a transport route in consultation with the appropriate authorities and the Batchelor community that considers the impacts to road traffic, safety and condition of existing infrastructure.
- Provision of measures such as escort vehicles and appropriate signage for heavy haulage of construction and mining equipment to site.
- Construction of temporary diversion roads for local traffic (if required).
- Consultation with Northern Territory Government, local council and the community regarding traffic and road aspects of the project.

5.11.4 Specialist Study

Objectives

An assessment of the impacts to traffic from the project has been commissioned for the EIS, the objectives of which are to:

- Undertake a desktop review of traffic and transportation networks in and around the study area.
- Liaise with local Council and Department of Planning and Infrastructure to assess the existing transportation infrastructure.
- Identify constraints with existing infrastructure.
- Detail the change in user/traffic numbers during both construction and operational phases of the project.
- Assess the impacts to traffic of all proposed construction and operational traffic on local and Territory roads and existing road users.
- Describe the potential impacts of the projects on existing and future transport networks during construction and operation.
- Develop a preliminary traffic management plan.

Impacts to infrastructure will be assessed during the socio-economic assessment.

Status

Fieldwork for the traffic investigation is complete. Modelling of traffic volumes and consequent predicted impacts will be completed once the transport route of the project is confirmed; results will be presented in the EIS.

5.12 Socio-economic

5.12.1 Existing Environment

Information contained in the following socio-economic profile has been sourced from the Australian Bureau of Statistics 2006 census data (ABS, 2009).

Northern Territory and Darwin

The Northern Territory is the most sparsely populated state or territory in Australia, the population density of the Northern Territory is around 0.1 people per square kilometre, with a total population of 192,898.

The Northern Territory's economy is based on tourism (largely for Kakadu National Park and Uluru (Ayers Rock)), mining and defence. Unemployment in the Territory at the 2006 census was 4.4%. In Darwin, unemployment was lower (3.5%) with government administration (7.7%), defence (7.3%) and school education (5.4%) being the dominant employment industries.

Almost 28% of the Northern Territory population comprises Aboriginal and Torres Strait Islanders, compared with 2.3% in the whole of Australia. Nearly half of the Northern Territory is owned by Aboriginal people or held in a tenure that provides Aboriginal people with secure rights of use.

The mining industry is a major contributor to the Northern Territory economy, with a total value of \$3,942 million in 2006/07, up 42% from the previous year (\$2,775 million). Taxes and mining royalties accounted for \$47 million of Territory Government revenue in 2007/08. The Territory's expenditure on mineral exploration in 2006/07 was \$92.2 million, representing an increase of 23% from the previous year (\$74.7 million in 2005/06).

Coomalie Community Government Council Area

The Coomalie Community Government Council area covers that extends from Manton Dam in the north, to the town of Adelaide River in the south and east from the actual Adelaide River, to Litchfield National Park in the west and is made up of the following wards:

- Batchelor Township ward.
- Batchelor Rural ward.
- Adelaide River Township ward.
- Adelaide River Rural ward.
- Lake Bennett ward.
- Coomalie/Tortilla ward.

In the Coomalie area, the Finniss River Land Trust is an Aboriginal Land Trust located within the Northern Land Council area of the Northern Territory.

Batchelor Township

Batchelor has a long history as a mining town and generations of residents of Batchelor have been employed in the mining industry.

During the 2006 census, the population of Batchelor was 481, a decrease of 33% (from 718) from 2001 and one-third of the total population lived as rural residents, scattered across, predominantly, the western half of the region.

In the 2006 census, there were 216 private dwellings of which 197 (91%) were occupied. Census statistics indicated relatively affordable cost of housing in 2006. Median weekly rent was \$121, compared with \$190 in Australia (Northern Territory comparisons not available). The median monthly housing loan repayment was \$921, compared with \$1,300 in Australia.

During the week prior to the 2006 Census, 147 people aged 15 years and over who were usually resident in Batchelor were in the labour force. The most common industries of employment for persons aged 15 years and over usually resident in Batchelor were Tertiary Education 29.6%, School Education 9.6%, Parks and Gardens Operations 6.7%, Local Government Administration 5.2% and Public Order and Safety Services 4.4%.

Batchelor is largely self-sufficient for day-to-day commercial and community services needs, although residents travel to Darwin for specialist commercial and other services and are reported to sometimes purchase other commodities such as food and household goods. Services available in Batchelor include shops and commercial services, local industrial services, recreational facilities and cultural and entertainment facilities.

The town has a higher education college, the Batchelor Institute of Indigenous Tertiary Education, which provides higher education for Indigenous students from around Australia.

Adelaide River

The Adelaide River township is situated on the Stuart Highway where the road crosses the Adelaide River. The township of Adelaide River is approximately a 39 km drive southeast of Batchelor and is approximately a 114 km drive south of Darwin.

In 2006, census data recorded the population of the Adelaide River township as 190, down from 229 in 2001.

In the 2006 census, the most common industries of employment for persons aged 15 years and over usually resident in Adelaide River were School Education (14.9%), Metal Ore Mining (10.4%), Tertiary Education (10.4%), Other Social Assistance Services (7.5%) and Legal and Accounting Services (6.0%).

Adelaide River township has its own health centre, post office, general store, volunteer fire station, freight services, library, police station, primary school, three petrol outlets and a hotel. It serves as a local centre to residents and draws trade from passing traffic on the Stuart Highway and from visitors visiting the town. Residents also travel to Batchelor and Darwin for specialist commercial and other services.

5.12.2 Potential Impacts

A mining project of this scale will have positive and negative social and economic impacts on its local and peripheral communities. The existing workforce at the Browns Oxide Project is approximately 25, which is expected to increase to approximately 100 in 2010 when the project resumes mining. The majority of this workforce will be employed by HAR and sourced primarily from the local area and Darwin.

It is not envisaged that the Area 55 project will result in any major increase in employment as most of the workforce will already be employed at the Browns Oxide Project.

The development of the project, however, provides an opportunity to contribute significantly to the regional economy. Local employment and business opportunities will be created both directly and indirectly as a result of the project. There is also potential for economic benefits as a result of the project for the indigenous groups.

There are a number of potential socio-economic issues that might emerge during construction and operations which will be assessed during the EIS. These potential issues are discussed below.

Impacts on Population

The development of resources projects in remote locations can impact the composition of local and peripheral communities and impact social cohesion. Such impacts will depend on the size of the required workforces and details of the shift arrangements.

Community Services

The increase in population in the region has the potential to impact on the existing community services (e.g., health, education, emergency services).

Economic Growth and Employment in the Region

Development of the project will create direct and indirect economic benefits in the local community, peripheral communities and the Northern Territory as a whole. The project will have flow on employment benefits into the community with additional workforce requirements in sectors such as retail, community services and hospitality.

These benefits were clear to see during the operation of the Browns Oxide Project.

5.12.3 Management and Mitigation

Management measures to reduce or avoid negative socio-economic impacts, and maximise positive socio-economic benefits, include:

- Preferentially sourcing people, goods and services from within the local region and the Northern Territory and re-employing people previously employed at Browns as a first preference.
- Developing the project as quickly as possible.
- Placing a high emphasis on stakeholder consultation to foster and maintain good relationships and continue to consult with the community through all phases of the project cycle, including:
 - Planning.
 - Construction.
 - Operations.
 - Closure.
- Continuing to invest in training and education programs for employees and potential employees.

5.12.4 Specialist Study

Objectives

An assessment of the impacts to the social and economic environment from the project has been commissioned for the EIS, the objectives of which are to:

- Provide a high-level characterisation of the existing socio-economic conditions of the region.
- Assess the compatibility of the project with the provisions of the existing planning and development schemes.
- Describe of potential impacts of the project on the study area.
- Recommend future mitigation and management.

Status

Desktop research is complete, and fieldwork will be completed early in 2010. The results of the assessment will be reported in the EIS.

5.13 Radiation

5.13.1 Existing Environment

The area surrounding Area 55 is known to contain low levels of radioactive materials. Given the proximity to the historic Rum Jungle uranium mine the broader community will be concerned about the potential for radioactive materials to be mobilised by the project. Therefore, to characterise the existing environment within the project area a baseline gamma radiation survey has been undertaken and uranium assays have been completed on 6,695 samples from the Area 55 deposit.

The findings of these preliminary studies have found that dose rates within Area 55 (outside the proposed pit) were similar to Australian and world averages of 0.09 $\mu\text{Sv/h}$. Within the proposed pit, the average was approximately 70% higher, although this is well within the range of values found in area of 'normal' soil. Analysis of over 6,000 drill core samples showed that the uranium content of the all samples is low, averaging approximately 30 parts per million (ppm), with less than 3% of samples being above 100 ppm.

Apart from the proposed pit area and the southern boundary area all dose rate measurements are consistent with typical Australian and world natural background levels. Higher levels were found (as would be expected) in the proposed pit area. However, the highest measurement in the proposed pit area, (0.34 $\mu\text{Sv/h}$) would result in a dose of less than 1 mSv, which that is less than the annual limit to a member of the public if it were occupied by a miner for a full (working) year (ICRP, 2008).

No significant pathways that could be deleterious to the non-human environment have been identified.

5.13.2 Potential Impacts

The potential radiological issues are:

- Radiological doses to the workforce and the public.
- Uranium concentrations in ore and throughout the processing circuit.
- Radioactivity of end-products.
- Radiological impacts on the environment.
- Radiological issues at mine closure.

5.13.3 Management and Mitigation

Given that analysis of data has shown the absence of material in significant concentrations to have material consequences to the health of people or the environment, no specific measures for radiological control are proposed or warranted. However, general occupational hygiene controls, particularly dust control will be implemented. Similarly, no specific measures to control environmental exposures are warranted, although general control measures, such as to minimise contaminated run-off into the environment, will be implemented.

In addition some occupational and environmental monitoring will be undertaken.

5.13.4 Specialist Study

Objectives

An assessment of radiation impacts as a result of the project has been commissioned for the EIS, the objectives of which are to:

- Characterise the radioactive nature of mine material (waste rock and ore) at Area 55, based on the results of analysis of drill core samples.
- Characterise background gamma radiation and radon levels in the project area.
- Outline any potential risk for sources of radiation to have off-site impacts; this includes any potential for tailing and/or waste rock seepage to contaminate groundwater and potential radiological impacts from air emissions.
- Detail the radiological exposure potential of mining activities.
- Identify any radiological protection requirements for mine workers and members of the public.
- Outline a monitoring and reporting program to enable sound radiation management and ensure public accountability.

Status

Fieldwork for the gamma radiation survey and analysis of drill core samples is complete. Baseline radon monitoring will commence shortly. Modelling of radon emissions will be completed when quantitative air quality modeling is run. The potential impacts of radiation as a result of the project will be reported in the EIS.

5.14 Archaeology and Cultural Heritage

5.14.1 Existing Environment

Aboriginal Sacred Sites

Known sacred sites in the project area are:

- North of Area 55 along Rum Jungle Creek.
- South of MLN 1158.

Aboriginal Archaeological Sites and Sites of Non-Indigenous Cultural Heritage

Area 55 and Waste Rock Stockpile Option 2

Targeted surveys for sites of Aboriginal archaeology and heritage significance have been undertaken within Area 55 and the site of the waste rock stockpile option 2. These surveys recorded 8 Aboriginal archaeology sites and 17 background scatters of isolated stone artefacts.

One significant historic site, the remains of the Northern Australian Railway line, traverses MLN 1158, i.e., the site of waste rock stockpile option 2.

The location of these sites is shown in Figure 5.4.

TSF South

A targeted survey for sites of Aboriginal archaeology and heritage significance has been undertaken within the TSF South site. This survey identified one background scatter and one historic site, a World War Two bottle dump (Figure 5.4).

5.14.2 Potential Impacts

Sites of Indigenous and non-Indigenous cultural or archaeological significance occur within the project area and the project has the potential to disturb or destroy these sites during construction and operation. The impact of disturbance or destruction of these sites will be dependent upon the significance of the sites.

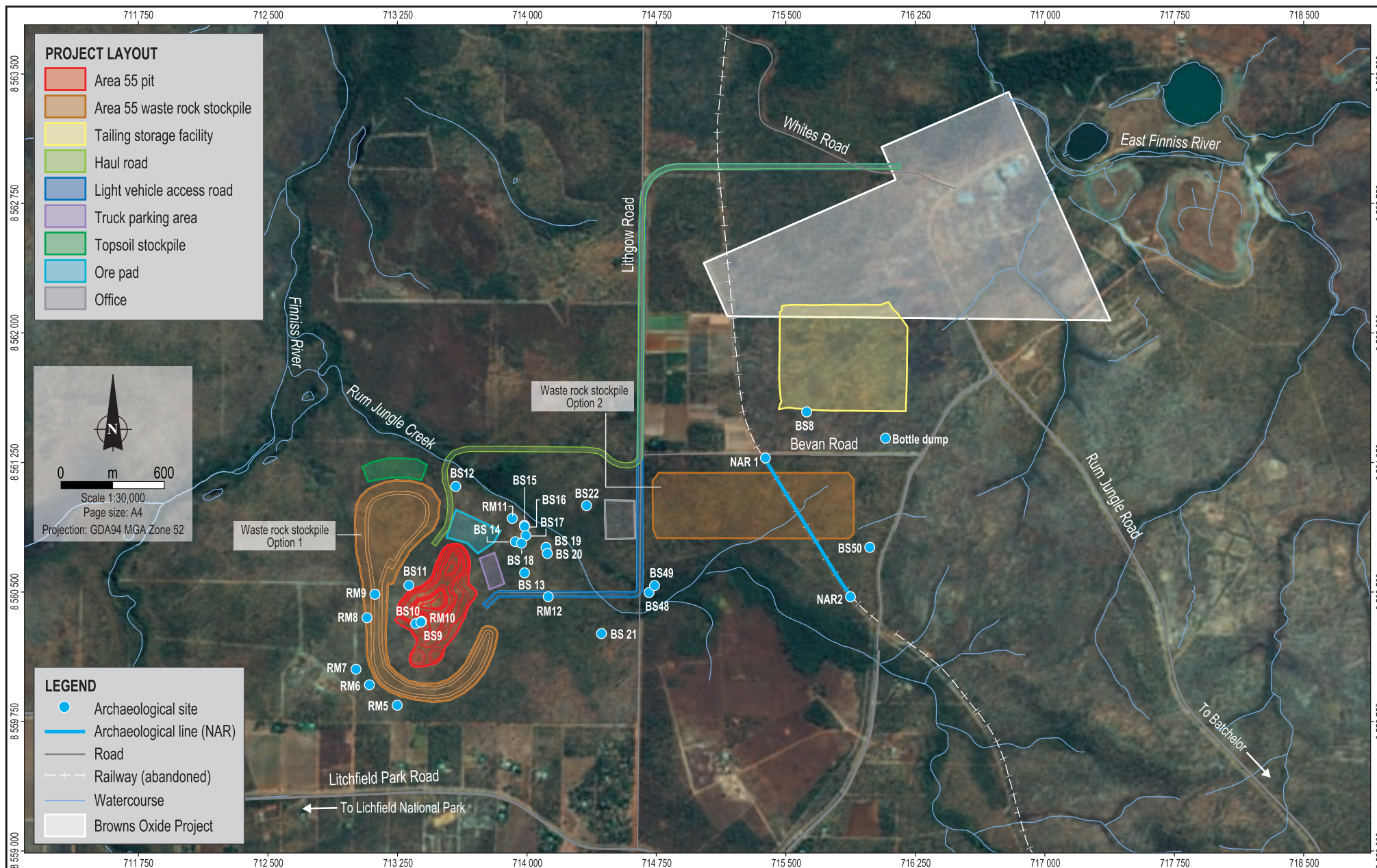
Potential impacts to sacred sites will require careful consultation and management with Traditional Owners and the NLC.

5.14.3 Management and Mitigation

HAR carries out its exploration and mining activities in accordance with authority certificates issued by the Aboriginal Areas Protection Authority to Compass Resources pursuant to the Northern Territory *Aboriginal Sacred Sites Act*. HAR will abide by all authority certificates issued to Compass and relevant to the project area, and will seek authority certificates to be issued in its name during the permitting process for the project. The NLC and Traditional Owners will be consulted regarding management of any sites potentially affected by the project.

Other management measures to reduce or avoid impacts with associated disturbance or destruction of cultural heritage and archaeological sites include:

- Avoiding sites of significance as a first priority during the design of the project.



Source:
 Project layout from HNC (Australia) Resources Pty Ltd
 Railways, roads and drainage from NTLIS (optimum scale 1:10,000)
 Imagery from Google Earth, 2009.
 Archaeological and cultural heritage sites from Begnaze Pty Ltd



Date:
14.12.2009
 MXD:
HAR_Area55Oxide.mxd
 File Name:
9029_01_F05.04_GIS_HB

HNC (Australia) Resources Pty Ltd

Area 55 Oxide Project



Archaeology and cultural
 heritage sites

Figure No:

5.4

- Incorporating Indigenous site and object recognition training into the site inductions, and ensuring employees and contractors are aware of their legislative obligations.
- Requiring clearance/disturbance forms to be completed for any ground disturbance within the project area.
- Establishing a specific protocol to be followed in the event that a suspected Indigenous site, object or burial is discovered.
- Documenting all management measures in a cultural heritage management plan.

5.14.4 Specialist Study

Objectives

An assessment of impacts to archaeology and cultural heritage as a result of the project has been commissioned for the EIS, the objectives of which are to:

- Review the results of the previous field surveys of the project areas.
- Provide recommendations for the management of any materials that may be required to be removed/destroyed for construction of the project, and the steps required for this (including obtaining government permits).
- Describe management measures for the discovery of as yet undiscovered materials or items of potential Indigenous cultural heritage and archaeological significance.
- Make recommendations for the ongoing protection and management of cultural values.
- Describe measures for the avoidance of specific sites identified during surveys that should not be disturbed.

Status

Fieldwork to identify sites is complete. An assessment of potential impacts will be presented in the EIS.

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6. ENVIRONMENTAL MANAGEMENT

HAR regards sound environmental management and protection as an integral part of its business and of playing its part in the community, and is committed to excellence in this area of activity. This commitment will be reflected in the company's environmental policy that is currently being prepared.

HAR aims to minimise environmental impacts at every stage of work, from planning, exploration, development, mining, production and through to decommissioning. Prior to the restart of operations at the Browns Oxide Project, an environmental management system, procedures and standards will be implemented to ensure:

- High operating standards in all aspects of activities to minimise environmental impact and prevent environmental harm.
- Communication and consultation with all stakeholders.
- Employee awareness of sound environmental practice as part of day-to-day activities.
- Continuous improvement through measurement of environmental performance.
- Regular audits and review of policies, systems and procedures.
- Compliance with applicable legislation.

Key elements of the environmental management systems are:

- Commitment.
- Planning.
- Implementation.
- Checking and corrective action.
- Management review.

6.1 Planning

6.1.1 Risk Management

It is necessary to anticipate, prevent and mitigate environmental risks and impacts to protect the environment. A project risk assessment will be undertaken in order to:

- Anticipate, prevent and mitigate environmental risks and impacts.
- Minimise loss in all areas of the organisation.
- Improve the quality of decision-making within the organisation.

Job risk analysis will be used as a tool to identify and record risks associated with specific work activities. A job risk analysis requires personnel to examine the task they are about to undertake and:

- Break the job into separate, defined steps.
- For each step, identify the potential hazards that could occur with that step.

- For each potential hazard, list the method to be followed to prevent the hazard causing an injury, loss, damage or environmental incident.

6.1.2 Environmental Management Plan

A risk-based environmental management plan (EMP) will be developed for the project to:

- Document project commitments and impact mitigation requirements.
- Document conditions of approval resulting from the environmental approval process.
- Provide the basis for the development of environmental guidelines and work procedures to be prepared by the construction contractor.

The EMP will be based on the environmental and social impact and management measures outlined in Chapter 5 of this report and within the EIS. The EMP will build on the existing assessed and approved EMP for the Browns Oxide Project. It will be monitored and evaluated against key environmental performance standards to ensure environmental compliance.

The EMP will include individual plans that address:

- Air quality.
- Archaeology and cultural heritage.
- Erosion and sediment control.
- Flora and fauna.
- Mine material management.
- Hazardous materials.
- Noise and vibration.
- Rehabilitation.
- Traffic.
- Waste.
- Water.

6.1.3 Emergency Response Plan

The Browns Oxide Project emergency response plan will be reviewed and revised to cover the project. All incidents, both minor and major, will be recorded in an incident register that will form part of the environmental management system documentation. In the event of a major incident the procedure will be to:

- Ensure that the area is safe.
- Take immediate action to contain the incident.
- Report emergencies to the relevant emergency service.
- Notify the relevant regulatory authority.
- Remediate the site.
- Investigate and prepare a report detailing the findings of the investigation.
- Review environmental management procedures.

The project will have an emergency response team that is trained to respond to emergencies, lead evacuations and administer first aid.

6.2 Implementation

6.2.1 Roles and Responsibility

All HAR and contractor personnel are responsible for the environmental performance of their activities and complying with the relevant environmental management procedures.

The mine superintendent will be responsible for ensuring that sufficient resources are available for all project activities to be undertaken in full compliance with statutory regulations and are consistent with any internal policies.

The mine manager will be assisted by a sustainability advisor who will ensure that the environmental management system is implemented uniformly, and is revised and maintained as required. The sustainability advisor will also implement the environmental management plan, induction procedures and appropriate training and ensure that contractors fulfil their contractual obligations.

6.2.2 Communication

Inductions

Following appointment, each employee and contractor will undergo a formal site induction to ensure that they have the appropriate knowledge concerning health, safety, environment and community relation procedures. The induction will address areas such as:

- Background to project approval.
- Legislative obligations of both individual and company.
- HAR environmental policy.
- Respect for the local community and expected behaviour.
- Key environmental issues at the site.
- Outline of the environmental management plan and obligations.
- Structure of the environment and community relations sections.
- Site environmental management policies and procedures.
- Site safety and occupational health policies, procedures and employee obligations.
- Hazard and incident reporting and management.
- Emergency services and procedures.
- Site security.
- Employment policies and conditions of employment.

Ongoing Community Consultation

The community consultation program will be ongoing and will continue through the life of the project to ensure due consideration of all project-related opportunities and concerns. Further detail about this is provided in Chapter 4.

6.3 Checking and Corrective Action

Regular inspections of construction and operations activities will be conducted to ensure that environmental management plans are correctly implemented. The frequency of inspection will depend on the potential risk associated with the activity.

Internal audits will be conducted to ensure the environmental management system is correctly implemented and management plans are effective in managing the potential environmental impacts of the project. A program of undertaking audits will also be implemented.

An auditable record system will be established and maintained that will include the following documentation:

- Audit reports.
- Complaints register.
- Environmental management plans.
- Environmental monitoring reports.
- Incident register.
- Mineral lease conditions.
- Mining management plan.
- Monitoring results.
- Risk register.

6.4 Management Review

Any environmental procedures found to be deficient as a result of an audit or investigation after an environmental incident will be revised and the environmental management plan updated to reflect the new procedures.

6.5 Monitoring

A comprehensive monitoring and reporting program for the project will be implemented. The primary objectives of the environmental and social monitoring program will be to:

- Provide information that will determine the adequacy of environmental and social management practices and allow improved practices and procedures to be developed.
- Detect and measure trends or environmental/social changes, and enable analysis of their causes.
- Confirm environmental and social impacts of particular activities and identify unforeseen effects and the need for additional management measures.

The proposed monitoring program will include monitoring of:

- General mine operations.
- Discharges and emissions from the mine site.
- Potential environmental impacts associated with the project.
- Potential social impacts associated with the project.

7. CONCLUSION

The purpose of this NOI is to give the Northern Territory Government sufficient information to determine the appropriate level of environmental assessment for the project. This has been done by:

- Providing an introduction to HAR, and the rationale for the project, in Chapter 1.
- Presenting an outline of the proposed project in Chapter 2, including the potential economic and social benefits that may be associated with it.
- Outlining community consultation activities to date, and that planned for the life of the project, in Chapter 4.
- Providing an initial environmental characterisation of the project area based on recent and historic investigations in Chapter 5.
- Identifying and describing the potential environmental and social issues associated with the project in Chapter 5.
- Describing high-level management and mitigation measures with the potential to minimise adverse environmental impacts as a result of the project in Chapter 5.
- Outlining the proposed baseline and impact assessment studies proposed to inform the environmental and social impact assessment (ESIA) for the project in Chapter 5.
- Outlining the high-level environmental management system that will be used for the project in Chapter 6.

HAR considers it appropriate for the project to be assessed as an EIS under the Northern Territory *Environmental Assessment Act* and a controlled action under the Commonwealth EPBC Act. Therefore, it seeks a prompt decision on the level of environmental assessment on this basis. This will allow the development of the EIS guidelines for the project to commence as soon as possible.

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Appendix A

Section 46 Requirements

Section 46 Requirements for the *Aboriginal Land Rights (Northern Territory) Act 1976*

Section 46 of the Act sets out the information required to be provided to the Land Council and traditional Aboriginal owners in order to grant a mining interest on Aboriginal land, as well as the process by which the mining interest will be granted. The following table only summarises the information required to be provided to the Land Council and traditional Aboriginal owners and identifies the HAR documents that contain or will contain this information.

Summary of subsection of the Act	Information required	Statutory approval document containing the information	Extent of compliance with the requirements
1(a) Comprehensive proposal in relation to the mining works that are proposed to be carried out on the land.	Anticipated mine life	Notice of Intent, Section 1.1	Full compliance, however, details may change as project planning progresses. Will be updated in the Environmental Impact Statement.
	Production capacity and scale of operation	Notice of Intent, Section 1.1	
	Proposed mining techniques	Notice of Intent, Section 2.3	
	Infrastructure requirements	Notice of Intent, Sections 2.2 and 2.7	
	Proposed vehicular access to and within the mineral lease	Notice of Intent, Section 2.2.4 and 2.2.7	
	Details on other proposed mineral lease access requirements	Notice of Intent, Section 2.7	
	Anticipated construction and operational workforce	Notice of Intent, Section 2.9	Not in compliance at this stage of project approvals.
	Potential social impacts	Notice of Intent, Section 5.12 and Environmental Impact Statement	
	Water, timber and other requirements to be obtained from the affected land	Notice of Intent, Section 2.6, Chapter 5.5	
1(a) Comprehensive proposal in relation to the mining works that are proposed to be carried out on the land.	Potential impacts within and outside the mineral lease	Notice of Intent, Chapter 5	Partial compliance. Further detailed investigation will be undertaken to determine the extent and severity. Will be updated in the Environmental Impact Statement.
	Proposed impact avoidance, mitigation and management measures	Notice of Intent, Chapter 5	Partial compliance. Will be updated in the Environmental Impact Statement.
	Rehabilitation measures	Notice of Intent, Section 2.11	Partial compliance. Will be expanded in the Environmental Impact Statement.
1(b) Miner's representatives	Terms and conditions relating to payments	Environmental Impact Statement	Not in compliance at this stage of project approvals. To be negotiated during the next stage of project approvals.
	Name, position and qualifications of representatives, not exceeding three persons	Notice of Intent, Section 1.3	Full compliance.
2. Provision of section 46 statement to the Minister	All information in relation to the requirements is to be provided to the Minister	Notice of Intent	Partial compliance. The Notice of Intent will be provided to the Minister. Further documentation will also be provided as the project progresses through the approvals process.
4. Land Council will not agree to terms and conditions unless there has been consultation and the terms and conditions are reasonable	Details of consultation with the traditional owners of the land concerning the terms and conditions of mining interest.	Notice of Intent, Chapter 4	Partial compliance. Consultation will continue throughout the approvals process. Details of when all consultation with traditional owners and the Northern Land Council will be outlined in the Environmental Impact Statement.
	Details of consultation with any other Aboriginal community or group that might be affected by the grant of the mining interest.	Notice of Intent, Chapter 4	Partial compliance. Consultation will continue throughout the approvals process. Further details will be provided in the Environmental Impact Statement.

Appendix B

Preliminary Geochemical Testwork



Document No. **3457/853**

TO: COMPASS RESOURCES NL
ATTENTION: Andrew Tan & Sally Horsnell
COPY TO: Daniel Moriarty (Coffey Natural Systems)
DATE: 22 December 2008
SUBJECT: Preliminary Geochemical Assessment of Drill Core Samples – Area 55

This memorandum provides a preliminary assessment on the geochemical characteristics of drill core samples from the Area 55 deposit that were despatched to EGi in November. To date, the 73 samples have been assessed for acid forming potential, the results of which are provided in Table 1. Further detailed testing of selected samples is underway and should be completed by end of January or early February. The results of all testing will be then be presented in report format for review by Compass.

1. Samples Descriptions

Drill core intervals suitable for geochemical assessment were selected by Garry Johansen in consultation with EGi. A total of 73 intervals were selected from across the Area 55 deposit, with each sample typically representing 5 m of core. The selection of samples encompassed the main rock units likely to be mined, with sufficient samples from each rock unit to provide an indication of the likely variability in geochemical characteristics of each unit, and with as much spatial coverage as possible given the “exploratory” nature of the geochemistry program. The numbers of samples from each rock unit were as follows:

- | | |
|----------------------|------------|
| • Sands | 14 samples |
| • Weathered Dolomite | 20 samples |
| • Dolomite | 18 samples |
| • Weathered Shale | 9 samples |
| • Shale | 12 samples |

When interpreting the results it should be noted that there are relatively limited numbers of samples representing each rock unit, and the distribution of samples between rock units does not necessarily correspond with the relative amounts of these materials that will be mined.

2. Methodology

The samples were despatched to EGi as pulps, with each pulp representing 1 m of core. The five pulps making up each interval for testing were subsequently combined on an equal weight basis. The assessment acid forming potential involved measurement or calculation of the following parameters:

Total Sulphur Content

Total sulphur content was determined by the Leco method.

Maximum Potential Acidity (MPA)

The MPA is the maximum amount of acid that can be generated by the sulphur contained within a sample assuming that all the sulphur occurs as reactive pyrite. The MPA of each sample was calculated from the total sulphur content as follows: $\text{MPA (kg H}_2\text{SO}_4\text{/t)} = (\text{Total \%S}) \times 30.6$.

Acid Neutralising Capacity (ANC)

The acid produced by pyrite oxidation will to some extent react with other minerals contained within a sample. The ANC of each sample was determined using the Sobek Method. This involved reacting a sample with a known amount of acid at around pH 1, then back-titrating to determine residual acid. The amount of acid consumed by a sample was subsequently calculated by difference.

Net Acid Producing Potential (NAPP)

The NAPP is the amount of acid that potentially can be produced by a sample after allowing for the ANC. It was calculated by subtracting the ANC from the MPA value. If the NAPP is negative then it is likely that the material has sufficient inherent buffer capacity to prevent acid generation. Conversely, if the NAPP is positive then the material may be acid generating.

ANC/MPA Ratio

The ANC/MPA ratio is essentially another way of looking at the balance between ANC and MPA, and provides an indication of the relative margin of safety with respect to the acid forming potential of a sample. A ratio less than 1 corresponds to a positive NAPP and indicates a material may be acid generating. Conversely, an ANC/MPA ratio of 2 or more generally signifies that there is a high probability that the material will remain circum-neutral in pH and hence the material should not be problematic with respect to ARD.

Net Acid Generation (NAG)

The NAG test is a rapid oxidation procedure for estimating the acid forming potential of a sample. Both acid generation and acid neutralisation reactions can occur simultaneously during a NAG test, hence the end result represents a direct measurement of the net amount of acid that a sample can generate. The test involves

reaction of 2.5 g of sample with 250 mL of 15% hydrogen peroxide for 16 hours. Flasks are then gently heated for two hours to decompose any remaining peroxide, and after cooling the pH of the NAG liquor is recorded. If the sample after reaction has a pH of 4.5 or less (*i.e.* $\text{NAGpH} \leq 4.5$) then it is considered to be acid forming. The actual amount of acidity generated by a sample (expressed as kg $\text{H}_2\text{SO}_4/\text{t}$) is subsequently determined by titration of the mixture with NaOH to an end-point of pH 7.

Classification of ARD Potential

The acid forming potential of a sample is commonly classified on the basis of the NAPP and NAG test results as either:

- Non-Acid Forming (NAF) or
- Potentially Acid Forming (PAF).

The criteria used to define PAF material were a positive NAPP and a NAGpH less than 4.5. By definition, PAF material has a significant sulphur content and the acid potential of the sulphur exceeds the inherent acid neutralising capacity of the material. This means it is likely that such material could oxidise and generate ARD if exposed to atmospheric conditions.

The criteria used to define NAF material were a negative NAPP and a NAGpH greater than 4.5. By definition, the ANC of a sample classified as NAF is more than adequate to neutralise any acid that theoretically could be produced by any sulphide minerals that may be present, and hence such material would be considered unlikely to produce ARD.

In addition, NAF samples that had negative NAPPs of less than $-100 \text{ kg H}_2\text{SO}_4/\text{t}$ were described as NAF(carbonate). Such materials invariably have a high content of calcite, limestone or dolomite) and may be suitable for blending with acid generating rock to prevent or delay acid generation, or used in drainage lines within, up-gradient, or down-gradient of waste rock dumps.

In some instances an *uncertain* classification may be assigned when there is disparity between the NAPP and NAG test results and this parity cannot be satisfactorily resolved by additional testing such as sequential NAG testing or determination of the acid buffer characteristic curve.

3. Results

The acid forming characteristics are summarised in Table 1 and are presented graphically as an acid-base account plot in Figure 1, and as an ARD classification plot in Figure 2.

The acid-base account plot illustrates the relationship between sulphur content (which determines the maximum potential acidity) and the acid neutralising capacity. Samples that lie above the $\text{NAPP}=0$ line have a negative NAPP and are more likely to be non-acid forming. Conversely, samples that lie below the $\text{NAPP}=0$ line have a positive NAPP and therefore should be considered potentially acid forming.

The ARD classification plot illustrates the concurrence of the NAPP and NAG test results. Samples that are PAF plot within the lower right quadrate (*i.e.* positive NAPP and NAGpH<4.5) whereas NAF samples plot within the upper left quadrate (*i.e.* negative NAPP and NAGpH≥4.5).

The NAF/PAF distributions for different rock units were as follows:

Rock Unit	NAF samples	PAF samples	Uncertain
Sand	14	0	0
Weathered dolomite	19	0	1
Dolomite	18	0	0
Weathered shale	8	1	0
Shale	1	10	1

Sands

All 14 samples representing sand were classified as NAF. The sand samples were essentially devoid of both sulphur and ANC, with sulphur contents typically close to, or below, the analytical detection limit of 0.01 %S and the ANCs typically less than 5 kg H₂SO₄/t. As such, the sand samples could be described as “barren” with respect to both acid potential and neutralisation potential.

Weathered Dolomite

Nineteen of the 20 samples representing weathered dolomite were also classified as NAF. In most cases the sulphur contents were negligible, with all but one sample containing no more than 0.06 %S. The ANCs of the weathered dolomite samples were also generally low, with 17 of the 20 samples having ANCs less than 20 kg H₂SO₄/t. This confirms the weathered nature of the dolomite in the sense that there was almost no carbonate content remaining. The classification of one weathered dolomite sample was uncertain in that it acidified to pH 4.1 in the NAG test but contained virtually no sulphur (0.04 %S) and had a small negative NAPP. The sulphur content of this sample is being re-checked. The response in the NAG test could have been due to reaction of organics and not related to sulphide oxidation.

Dolomite

As would be expected, all dolomite samples were classified as NAF, with the majority having very high ANCs exceeding 500 kg H₂SO₄/t (*i.e.* greater than 50% CaCO₃ equivalent). The sulphur contents of the dolomite samples were all low, with most containing no more than 0.1 %S.

Weathered Shale

A total of nine weathered shale samples were tested, eight of which were essentially barren with respect to sulphur and ANC and were classified as NAF, and one which was classified as PAF but which had a low

sulphur content (0.19 %S) and therefore a relatively low capacity for acid generation.

Shale

Shale is the major unit of concern in respect of acid generating potential. Ten of the 12 shale samples tested were classified as PAF, one was NAF, and the other could not be definitively classified. The majority of shale samples had high sulphur contents, with 9 of the 12 samples containing between 1.4 and 4.4 %S. Five of the PAF shale samples had little or no ANC (*i.e.* no more than 14 kg H₂SO₄/t) and it is expected that such materials would generate ARD within a short time if exposed to atmospheric conditions (*i.e.* short lag only). The other five PAF shale samples had moderate ANCs between 22 and 51 kg H₂SO₄/t. Potentially acid generating materials that have ANCs within this range will often exhibit a lag period of at least a year and possibly a few years, however the lag period also depends on the relative reactivities of the sulphide and carbonate mineralogies. Additional testing of shale samples is underway to assess such activities as outlined below.

4. Further Testing

Additional testing of selected samples has commenced to gain a better understanding of the geochemical characteristics of particular rock units, including tests to assess the reactivity and likely lag time for selected PAF samples, tests to assess the reactivity of carbonate mineralogy within selected NAF(carbonate) samples, and tests to identify any elemental enrichments that may be of environmental importance. The detailed testwork program being undertaken involves the following specific assays:

Measurement of Acid Buffering Characteristic Curve (ABCC)

Ten samples (5 dolomite, 2 weathered dolomite & 3 shale) were selected for assessment of their acid buffering characteristic curves. The ABCC is determined by slowly acidifying a sample with dilute (0.1 or 0.5 M) HCl acid to around pH 3 over a period of 16 to 24-hours. It represents a far less aggressive treatment of a sample than that applied in the ANC method, and it typically only accounts for more readily-available carbonates such as calcite and dolomite. When present in sufficient quantity, these minerals will typically buffer a material at near-neutral pH, which is essential for maintaining low metal solubilities.

Kinetic NAG Testing

Six PAF shale samples of differing NAPP were selected for kinetic NAG testing. The kinetic NAG test provides an indication of the reactivity of sulphides within a sample and provides a quick, qualitative assessment of the likely lag time for acidification to occur under field conditions. The method is similar to the standard NAG test, except that pH and temperature are constantly recorded during the test. The reaction kinetics exhibited in the NAG test are extrapolated to the field situation on the basis of correlations previously derived by EGi from numerous leach column tests and field observations at other mine sites.

Sequential NAG Test

Sequential NAG tests are being run on five PAF shale samples with sulphur contents exceeding 2.5 %S. When testing high sulphur samples a single stage reaction is usually not adequate for complete oxidation of all sulphides, and a sequential procedure must be employed (i.e. 2.5 g of sample is reacted several times with 250 mL aliquots of 15% hydrogen peroxide).

Figure 3 shows a plot of NAPP versus NAG results. This indicates some discrepancy between NAPP and NAG for some of the samples with higher sulphur contents. The aim of the sequential NAG tests is to resolve whether these differences are real (i.e. due to not all sulphur being pyritic) or whether they are due to incomplete oxidation in the single stage NAG test.

Multi-Element Analysis of Solids and Water-Soluble Elements

A total of 14 composite samples have been prepared and submitted to ALS Brisbane for multi-element analyses to identify if waste rock from any of the rock units is likely to be significantly enriched with metals and metalloids that might be of environmental concern. Water extractions of the same composites will also be carried out to assess the solubilities of metals and metalloids in such materials when first exposed to atmospheric conditions. Each composite comprises between 2 and 4 samples of the same rock unit from the same drill hole. The samples being tested include 2 sand, 2 weathered dolomite, 2 dolomite, 3 weathered shale, and 5 shale.

Table 1: Acid forming characteristics of drill core samples from the Area 55 deposit

Deposit	Section	Rock Unit	Hole ID	Depth (m)		Interval (m)	EGi Sample Code	ACID-BASE ACCOUNT					NAG TEST		ARD Class	Comment
				From	To			Total %S	MPA	ANC	ANC/MPA	NAPP	NAG	NAGpH		
AREA 55	Section 11	Sands	07A5535	5	10	5.0	37286	<u>0.01</u>	0	4	13.1	-4	0	5.4		NAF (barren)
AREA 55	Section 11	Sands	07A5535	15	20	5.0	37287	<u>0.01</u>	0	0	0.0	0	0	5.4		NAF (barren)
AREA 55	Section 11	Sands	07A5535	25	30	5.0	37288	0.01	0	0	0.0	0	0	4.8		NAF (barren)
AREA 55	Section 11	Sands	07A5535	35	40	5.0	37289	0.02	1	1	1.6	0	0	4.9		NAF (barren)
AREA 55	Section 11	Sands	07A5537	5	10	5.0	37284	<u>0.01</u>	0	5	16	-5	0	5.5		NAF (barren)
AREA 55	Section 11	Sands	07A5537	15	20	5.0	37285	<u>0.01</u>	0	8	26	-8	0	5.2		NAF
AREA 55	Section 11	Sands	07A5593	5	10	5.0	37282	<u>0.01</u>	0	3	9.8	-3	0	5.3		NAF (barren)
AREA 55	Section 11	Sands	07A5593	15	20	5.0	37283	0.02	1	1	1.6	0	0	4.5		NAF (barren)
AREA 55	Section 12	Sands	07A5595	5	10	5.0	37280	0.01	0	2	6.5	-2	0	4.7		NAF (barren)
AREA 55	Section 12	Sands	07A5595	15	20	5.0	37281	0.02	1	2	3.3	-1	0	4.6		NAF (barren)
AREA 55	Section 9	Sands	07A5545	2	7	5.0	37290	<u>0.01</u>	0	6	20	-6	0	6.5		NAF
AREA 55	Section 9	Sands	07A5594	5	10	5.0	37291	0.01	0	10	33	-10	0	5.8		NAF
AREA 55	Section 9	Sands	07A5594	15	20	5.0	37292	0.01	0	0	0.0	0	0	4.8		NAF (barren)
AREA 55	Section 9	Sands	07A5594	25	30	5.0	37293	0.04	1	3	2.5	-2	0	5.1		NAF (barren)

Table 1: Continued

Deposit	Section	Rock Unit	Hole ID	Depth (m)		Interval (m)	EGI Sample Code	ACID-BASE ACCOUNT					NAG TEST		ARD Class	Comment	
				From	To			Total %S	MPA	ANC	ANC/MPA	NAPP	NAG	NAGpH			
AREA 55	Section 10	Weathered Dolomite	07A5505	3	8	5.0	37278	<u>0.01</u>	0	17	56	-17	0	8.4		NAF	(re-checking S)
AREA 55	Section 10	Weathered Dolomite	07A5506	2	7	5.0	37279	0.01	0	9	29	-9	0	7.8		NAF	
AREA 55	Section 12	Weathered Dolomite	07A5507	5	10	5.0	37275	<u>0.01</u>	0	6	20	-6	0	7.1		NAF	
AREA 55	Section 12	Weathered Dolomite	07A5507	15	20	5.0	37276	<u>0.01</u>	0	6	20	-6	0	7.6		NAF	
AREA 55	Section 12	Weathered Dolomite	07A5540	8	13	5.0	37277	<u>0.01</u>	0	10	33	-10	0	7.9		NAF	
AREA 55	Section 14	Weathered Dolomite	07A5508	20	25	5.0	37271	<u>0.01</u>	0	13	42	-13	0	7.3		NAF	
AREA 55	Section 14	Weathered Dolomite	07A5509	10	15	5.0	37272	<u>0.01</u>	0	10	33	-10	0	7.8		NAF	
AREA 55	Section 14	Weathered Dolomite	07A5538	10	15	5.0	37273	0.04	1	3	2.5	-2	9	4.1#		Uncertain	
AREA 55	Section 14	Weathered Dolomite	07A5538	20	25	5.0	37274	0.05	2	7	4.6	-5	0	5.6		NAF	
AREA 55	Section 16	Weathered Dolomite	07A5510	10	15	5.0	37267	<u>0.01</u>	0	14	46	-14	0	7.6		NAF	
AREA 55	Section 16	Weathered Dolomite	07A5572	10	15	5.0	37268	0.02	1	18	29	-17	0	7.7		NAF	
AREA 55	Section 16	Weathered Dolomite	07A5575	20	25	5.0	37269	0.03	1	12	13	-11	0	7.9		NAF	
AREA 55	Section 16	Weathered Dolomite	07A5575	40	45	5.0	37270	0.37	11	14	1.2	-3	0	7.5		NAF	
AREA 55	Section 22	Weathered Dolomite	07A5556	15	20	5.0	37263	<u>0.01</u>	0	8	26	-8	0	6.9		NAF	
AREA 55	Section 22	Weathered Dolomite	07A5557	15	20	5.0	37264	<u>0.01</u>	0	15	49	-15	0	7.0		NAF	
AREA 55	Section 22	Weathered Dolomite	07A5559	5	10	5.0	37265	0.01	0	11	36	-11	0	7.4		NAF	
AREA 55	Section 22	Weathered Dolomite	07A5559	20	25	5.0	37266	<u>0.01</u>	0	43	141	-43	0	8.5		NAF	
AREA 55	Section 27	Weathered Dolomite	07A5528	18	23	5.0	37261	<u>0.01</u>	0	39	127	-39	0	7.5		NAF	
AREA 55	Section 27	Weathered Dolomite	07A5530	15	20	5.0	37260	<u>0.01</u>	0	23	75	-23	0	7.6		NAF	
AREA 55	Section 27	Weathered Dolomite	07A5531	27	32	5.0	37262	0.06	2	13	7.1	-11	0	7.6		NAF	

Table 1: Continued

Deposit	Section	Rock Unit	Hole ID	Depth (m)		Interval (m)	EGi Sample Code	ACID-BASE ACCOUNT					NAG TEST		ARD Class	Comment	
				From	To			Total %S	MPA	ANC	ANC/MPA	NAPP	NAG	NAGpH			
AREA 55	Section 10	Dolomite	07A5504	15	20	5.0	37256	0.10	3	19	6.2	-16	0	9.0		NAF	(carbonate)
AREA 55	Section 10	Dolomite	07A5504	25	30	5.0	37257	0.10	3	21	6.9	-18	0	8.7		NAF	
AREA 55	Section 10	Dolomite	07A5506	30	35	5.0	37258	0.10	3	782	256	-779	0	8.6		NAF	
AREA 55	Section 10	Dolomite	07A5547	30	35	5.0	37259	0.10	3	25	8.2	-22	0	6.9		NAF	
AREA 55	Section 12	Dolomite	07A5540	20	25	5.0	37252	0.10	3	558	182	-555	0	8.9		NAF	(carbonate)
AREA 55	Section 12	Dolomite	07A5541	25	30	5.0	37253	0.10	3	641	209	-638	0	8.7		NAF	(carbonate)
AREA 55	Section 12	Dolomite	07A5541	35	40	5.0	37254	0.10	3	744	243	-741	0	8.9		NAF	(carbonate)
AREA 55	Section 12	Dolomite	07A5595	50	55	5.0	37255	0.11	3	566	168	-563	0	7.2		NAF	(carbonate)
AREA 55	Section 14	Dolomite	07A5538	45	50	5.0	37248	0.01	0	828	2706	-828	0	9.4		NAF	(carbonate)
AREA 55	Section 14	Dolomite	07A5538	55	60	5.0	37249	0.02	1	923	1508	-922	0	9.1		NAF	(carbonate)
AREA 55	Section 14	Dolomite	07A5538	65	70	5.0	37250	0.23	7	939	133	-932	0	8.4		NAF	(carbonate)
AREA 55	Section 14	Dolomite	07A5538	75	80	5.0	37251	0.11	3	693	206	-690	0	7.9		NAF	(carbonate)
AREA 55	Section 16	Dolomite	07A5572	65	70	5.0	37247	0.04	1	601	491	-600	0	9.2		NAF	(carbonate)
AREA 55	Section 22	Dolomite	07A5558	25	30	5.0	37245	<u>0.01</u>	0	22	72	-22	0	8.3		NAF	(carbonate)
AREA 55	Section 22	Dolomite	07A5558	35	40	5.0	37246	<u>0.01</u>	0	566	1850	-566	0	8.9		NAF	
AREA 55	Section 27	Dolomite	07A5529	20	25	5.0	37243	0.04	1	55	45	-54	0	8.4		NAF	(carbonate)
AREA 55	Section 27	Dolomite	07A5529	30	35	5.0	37244	0.07	2	433	202	-431	0	8.5		NAF	
AREA 55	Section 27	Dolomite	07A5530	25	30	5.0	37242	<u>0.01</u>	0	31	101	-31	0	7.9		NAF	

Table 1: Continued

Deposit	Section	Rock Unit	Hole ID	Depth (m)		Interval (m)	EGi Sample Code	ACID-BASE ACCOUNT					NAG TEST		ARD Class	Comment	
				From	To			Total %S	MPA	ANC	ANC/MPA	NAPP	NAG	NAGpH			
AREA 55	Section 19	Weathered Shale	07A5574	5	10	5.0	37239	0.02	1	1	1.6	0	0	4.5		NAF	(low capacity)
AREA 55	Section 19	Weathered Shale	07A5574	15	20	5.0	37240	0.02	1	1	1.6	0	0	4.5		NAF	
AREA 55	Section 19	Weathered Shale	07A5574	25	30	5.0	37241	0.05	2	1	0.7	1	2	4.7		NAF	
AREA 55	Section 20	Weathered Shale	07A5566	5	10	5.0	37237	0.01	0	2	6.5	-2	0	5.3		NAF	
AREA 55	Section 20	Weathered Shale	07A5566	15	20	5.0	37238	0.03	1	4	4.4	-3	0	6.3		NAF	
AREA 55	Section 21	Weathered Shale	07A5567	5	10	5.0	37235	0.08	2	1	0.4	1	0	4.8		NAF	
AREA 55	Section 21	Weathered Shale	07A5567	15	20	5.0	37236	0.08	2	2	0.8	0	0	5.0		NAF	
AREA 55	Section 27	Weathered Shale	07A5525	2	7	5.0	37233	0.11	3	6	1.8	-3	0	4.5		NAF	
AREA 55	Section 27	Weathered Shale	07A5525	9	14	5.0	37234	0.19	6	0	0.0	6	6	3.9		PAF	
AREA 55	Section 19	Shale	07A5574	50	55	5.0	37231	1.44	44	5	0.1	39	33	2.6		PAF	
AREA 55	Section 19	Shale	07A5574	60	65	5.0	37232	2.79	85	27	0.3	58	49	2.4		PAF	
AREA 55	Section 20	Shale	07A5566	30	35	5.0	37228	2.16	66	1	0.0	65	51	2.3		PAF	
AREA 55	Section 20	Shale	07A5566	40	45	5.0	37229	3.50	107	39	0.4	68	53	2.3		PAF	
AREA 55	Section 20	Shale	07A5566	50	55	5.0	37230	2.03	62	22	0.4	40	36	2.6		PAF	
AREA 55	Section 21	Shale	07A5567	25	30	5.0	37223	3.27	100	0	0.0	100	66	2.2		PAF	
AREA 55	Section 21	Shale	07A5567	35	40	5.0	37224	0.20	6	14	2.3	-8	4	4.2		uncertain	
AREA 55	Section 21	Shale	07A5567	45	50	5.0	37225	3.00	92	14	0.2	78	57	2.3		PAF	
AREA 55	Section 21	Shale	07A5567	55	60	5.0	37226	0.06	2	11	6.0	-9	0.0	6.2		NAF	
AREA 55	Section 21	Shale	07A5567	65	70	5.0	37227	0.50	15	12	0.8	3	11	3.5		PAF	
AREA 55	Section 27	Shale	07A5525	25	30	5.0	37221	4.00	122	46	0.4	76	76	2.2		PAF	
AREA 55	Section 27	Shale	07A5525	35	40	5.0	37222	4.35	133	51	0.4	82	82	2.2		PAF	

Footnotes:

Underlined values signifies concentration less than limit of analytical reporting

Total Sulphur Content -- determined by Leco analyser

Acid Neutralising Capacity (ANC) - determined using the Sobek method

Maximum Potential Acidity (MPA) - calculated from Total-S assay

Net Acid Producing Potential (NAPP) - calculated from the MPA and ANC

Net Acid Generation (NAG) - determined using the hydrogen peroxide oxidation procedure

NAF = Non-Acid Forming

PAF = Potentially Acid Forming

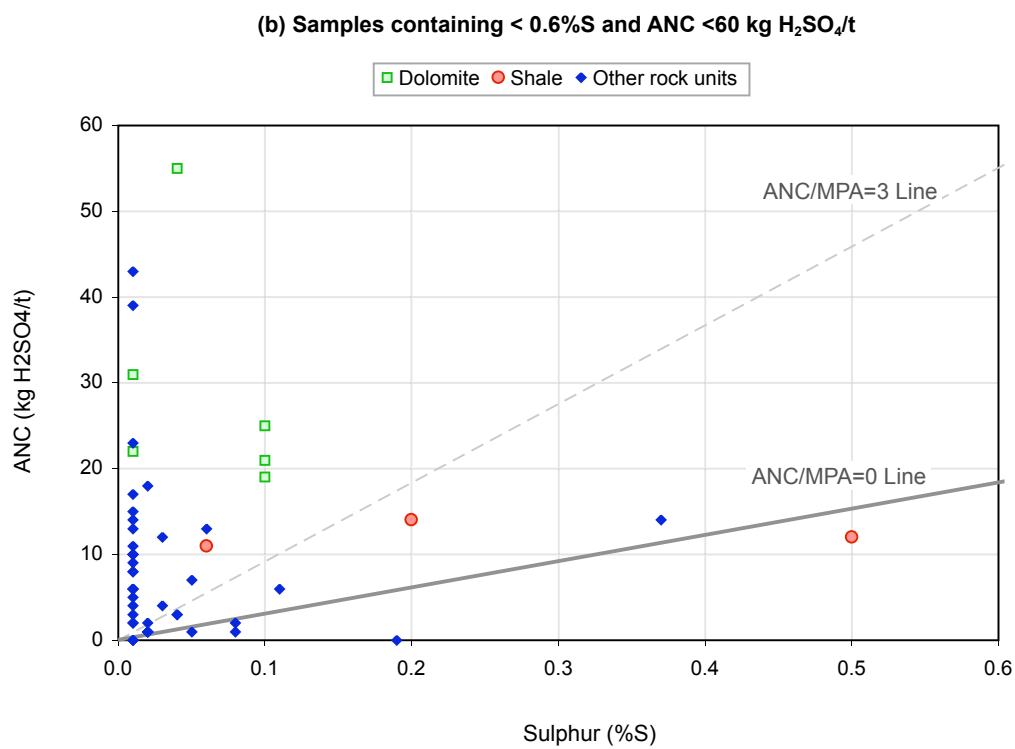
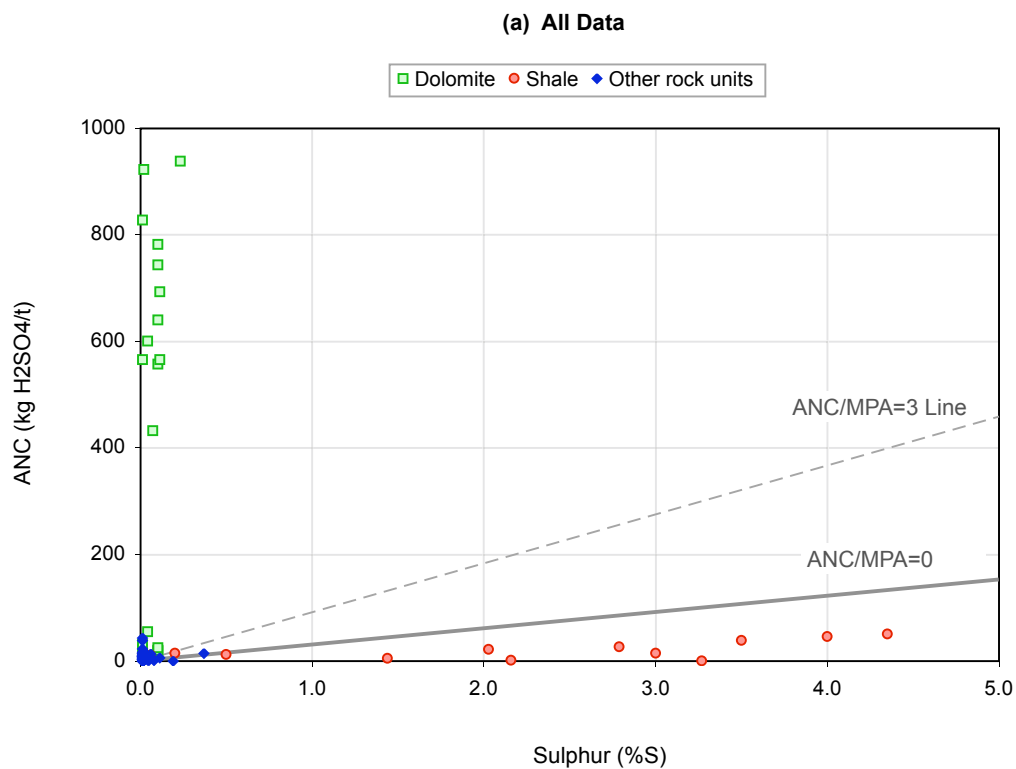


Figure 1. Acid-base account plot for drill core samples - Area 55

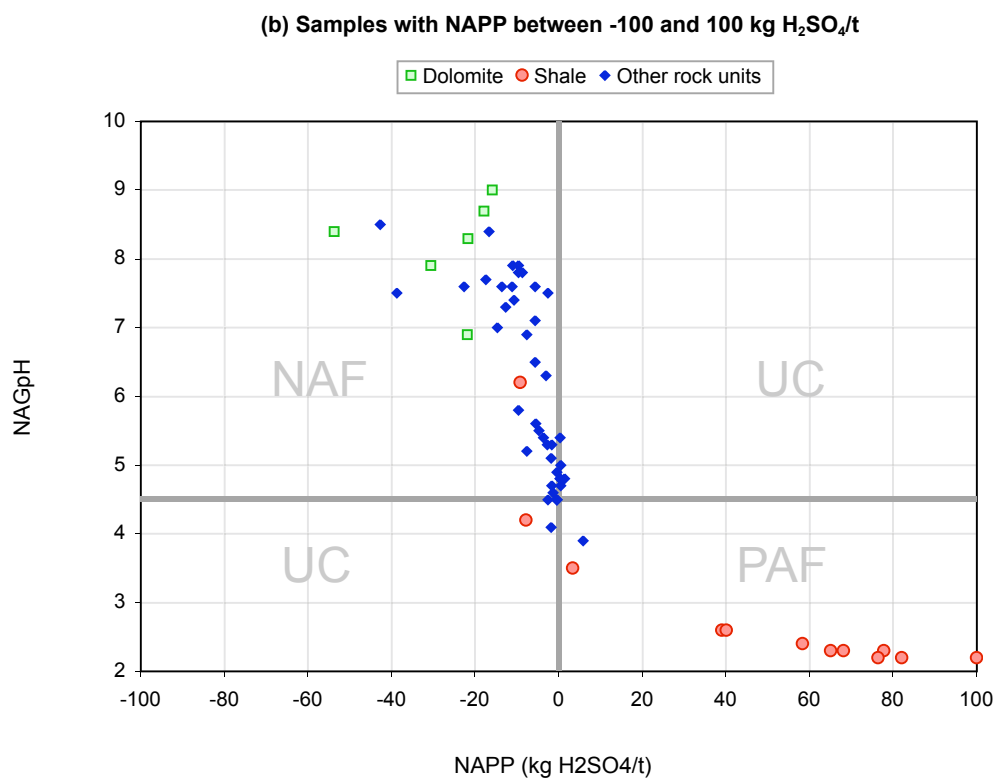
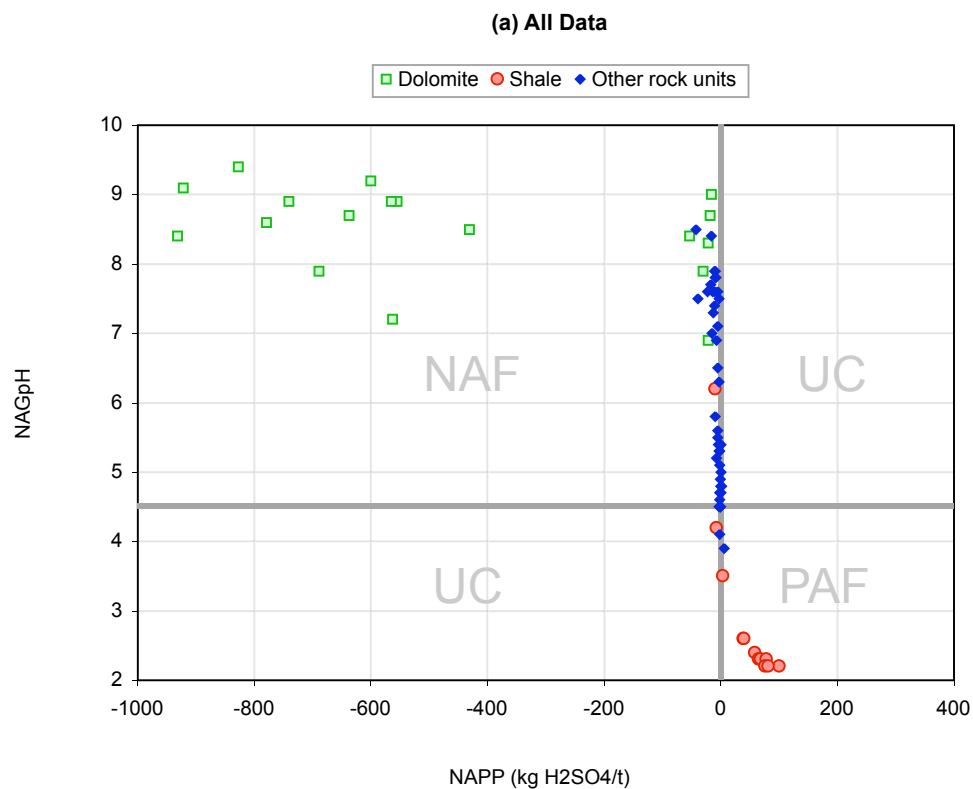


Figure 2. ARD classification plot for drill core samples - Area 55

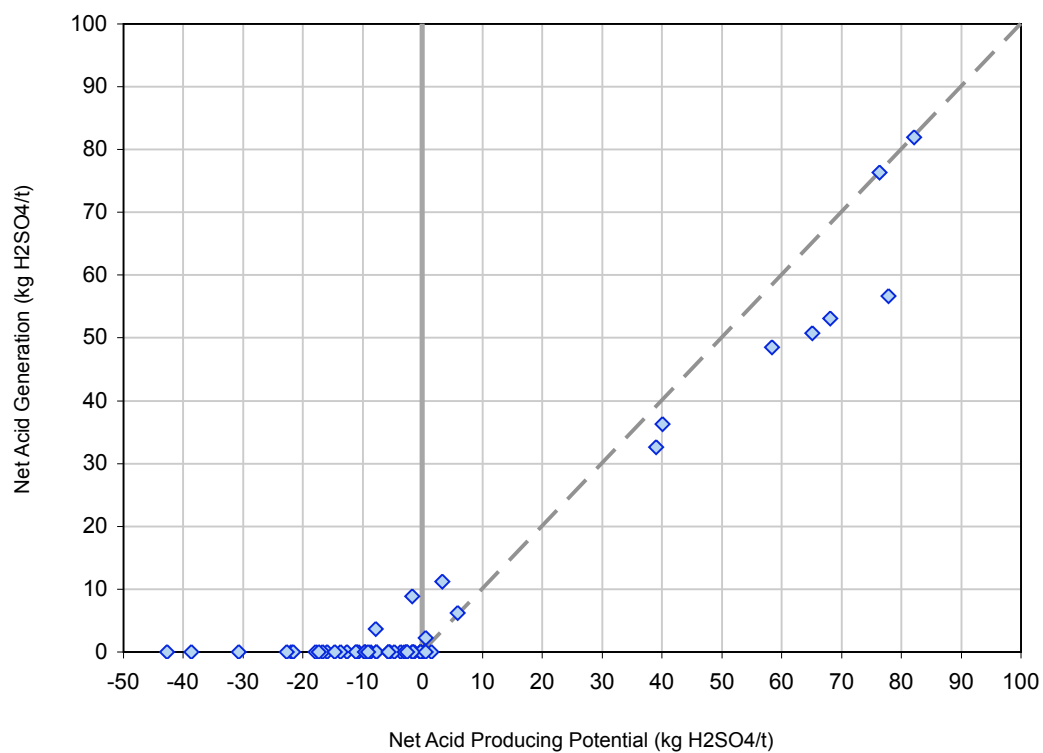


Figure 3. Relationship between NAG and NAPP values for PAF samples - Area 55