(AUSTRALIAN MANGANESE PROPRIETARY LIMITED)

ROBERTSON RANGE IRON ORE PROJECT ENVIRONMENTAL MANAGEMENT PLAN

July 2009

Document Status						
Rev No.	Author	Reviewer/s	Date	Approved for Issue		
				Name	Distributed To	Date
2	T. Souster	D. Utley	8/07/2009	J. Berry	DMP	July 2009

Restrictions on Use

This report has been prepared specifically for FerrAus Ltd. Neither the report nor its contents may be referred to or quoted in any statement, study, report, application, prospectus, loan, or other agreement document, without the express approval of FerrAus Ltd and/or *ecologia* Environment.

ecologia Environment

1025 Wellington Street

WEST PERTH WA 6005

Phone: 08 9322 1944

Fax: 08 9322 1599

Email: admin@ecologia.com.au

Internet: www.ecologia.com.au

Table of Contents

Tables

Figures

1.0 CURRENT STATUS

FerrAus intends to develop the Robertson Range Iron Ore Project to mine and process 2Mtpa of direct shipping grade iron ore for export (Figure 1-1). The Project involves the development of an open pit mine in the Robertson Range project area, and mining and stockpiling of Run of Mine (ROM) and processed ore to the west of the pit sites.

A crushing and screening facility for the processing and blending of ore will be established at Robertson Range in the vicinity of the ore stockpiles. Overburden stockpiles of waste rock will be developed adjacent to the pit incursions. The ore will then be transported to rail or port infrastructure for loading onto ship for export.

The mine development has a number of potential environmental impacts that must be managed to fulfil obligations under the *Mining Act 1978* and the *Environmental Protection Act 1986*. There are number of other legislative requirements related to individual environmental impacts that are discussed in subsequent sections of this document.

This Environmental Management Plan (EMP) has been developed as a supporting document for the Robertson Range Iron Ore Project Mining Proposal, and will be provide structured guidelines for environmental impact assessment, management/rehabilitation, monitoring, and reporting for the Project. This document will be updated periodically throughout the life of the mine to address changes to management strategies and any environmental short-comings or non-conformances.

This page has been left blank intentionally

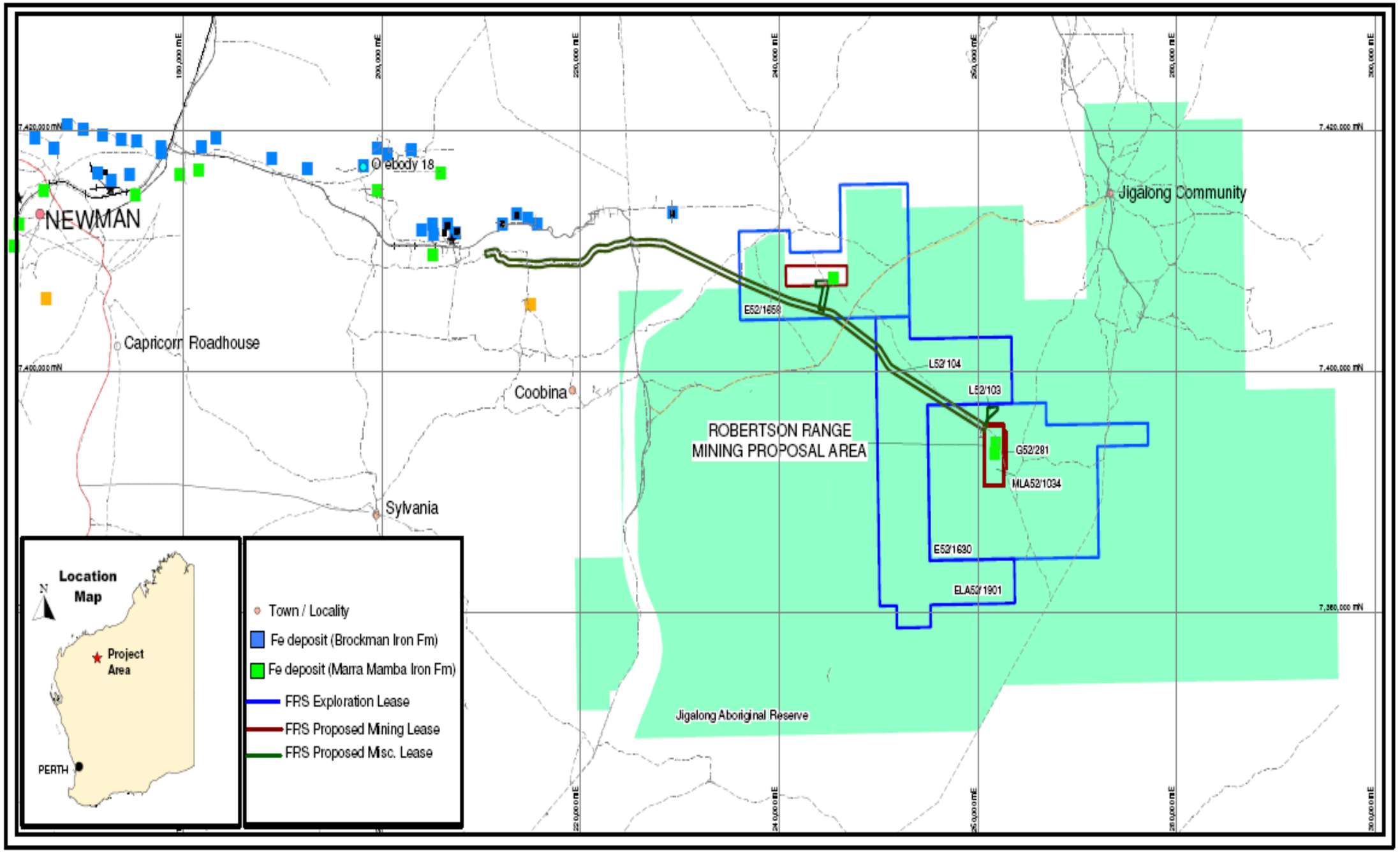


Figure 1-1: Robertson Range Project Location Plan

2.0 RECEIVING ENVIRONMENT

2.1 CLIMATE

Robertson Range is situated in the Mid-West region of Western Australia and experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September. Annual evaporation exceeds rainfall by as much as 500 mm per year. Seasonally low but unreliable rainfall, together with high temperatures and high diurnal temperature variations are also characteristic climatic features of the region. This region has in the past experienced no rainfall in any month of the year, which is typical of a desert climate (Beard, 1975).

Within the region, meteorological data has been recorded at the Bureau of Meteorology (BOM) weather station at Newman. This BOM weather station is located approximately 70 km to the west of Robertson Range, providing an indication of climatic conditions experienced within the project area.

The average annual rainfall is 310 mm, occurring over 45 rain days. It loosely follows the typical Pilbara bimodal distribution pattern, with a peak between December and March and a smaller peak in May and June (Figure 2-1). Most of the rainfall occurs in the summer period, with over 55 % of total annual precipitation occurring between December and March.

Mean annual maximum and minimum temperatures for Newman are 31.3°C and 17.3°C respectively. Mean monthly maxima range from 38.8°C during January to 22.2°C in July, while mean monthly minima range from 25.3°C in January to 8.0°C in July (Figure 2-1).

Wind roses for Newman demonstrate that the wind regime is consistent from summer to autumn (Figure 2.2). Throughout these seasons, morning and afternoon wind speeds of 11 km/hr to 30 km/hr from the north-east and south-east prevail, with easterly winds more consistent in autumn. During the spring, winds from the east, south-east, south and south-west prevail in the mornings, with a slight tendency to the west and north-west in the afternoon. High temperatures and moderate wind speeds contribute to high evaporation rates and prevailing dust levels are maximised in these conditions.

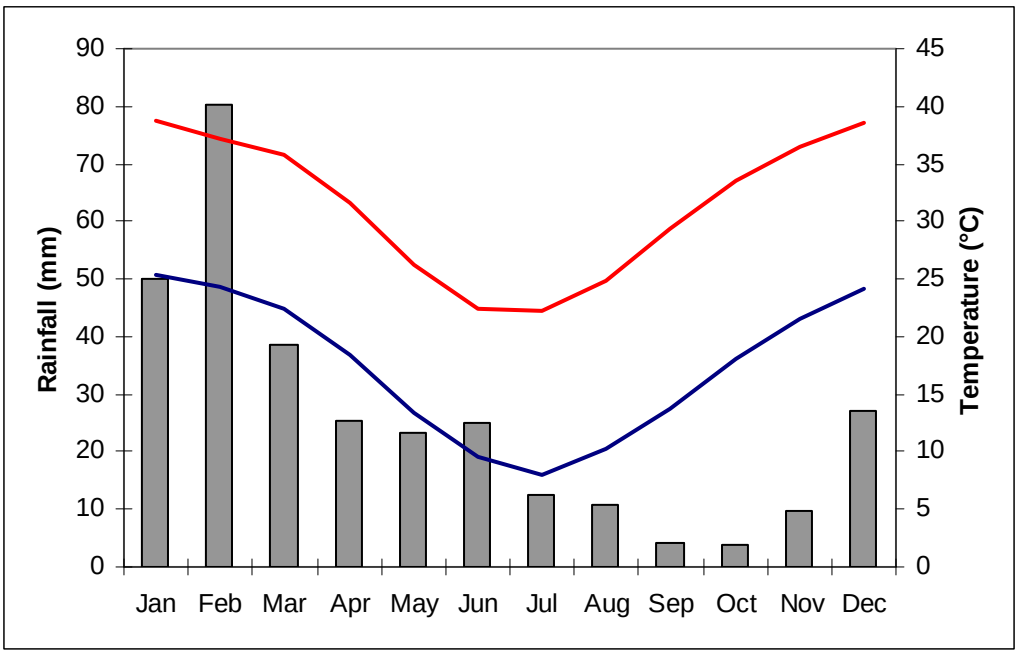


Figure 2-1: Rainfall and Temperature of the Robertson Range Area. Source: BOM 2007

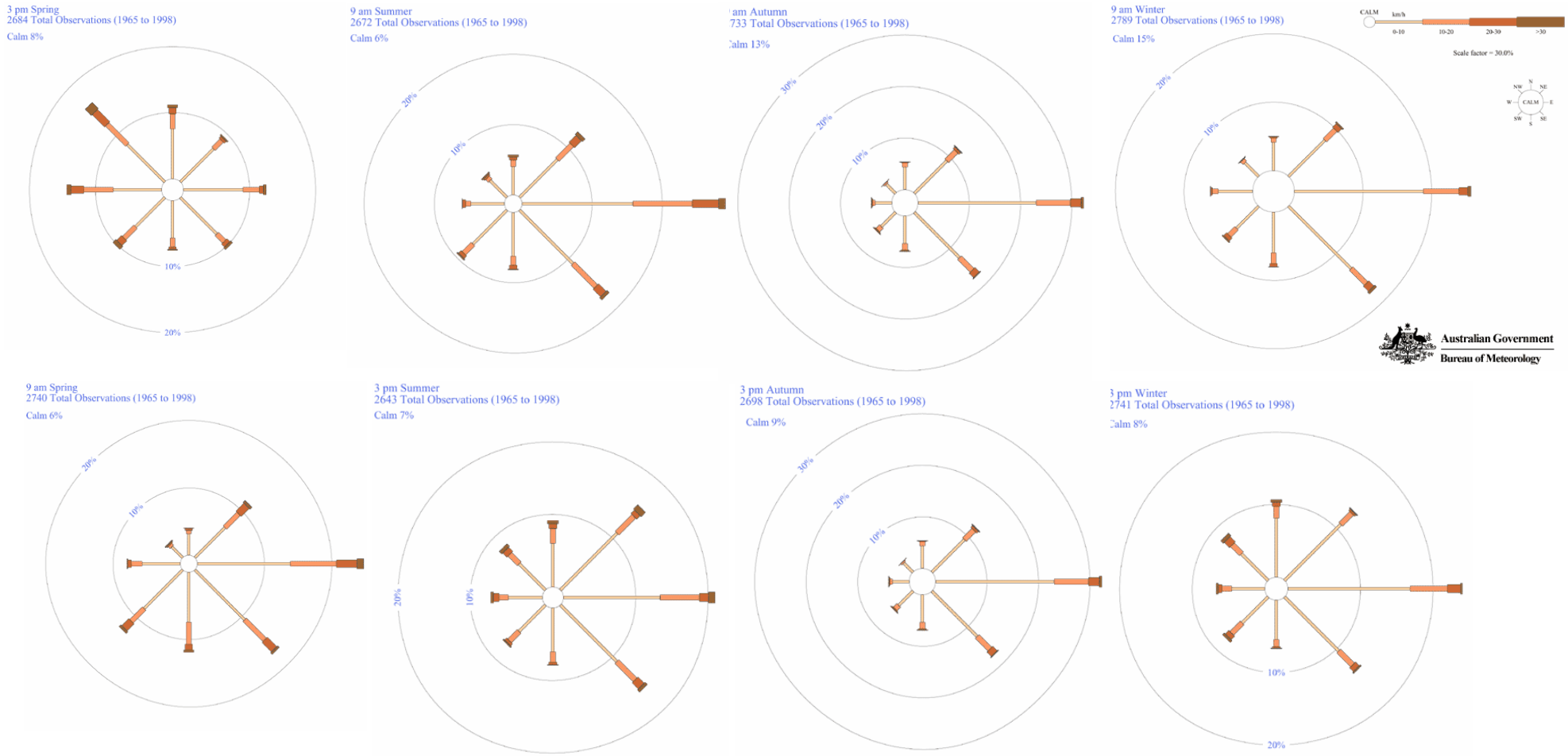


Figure 2-2: Wind Regime of the Robertson Range. Source: BOM 2007

2.2 TOPOGRAPHY AND LANDFORMS

The project area is characterised by a low, iron rich, hill (Marra Mamba formation) in the north west of Mining Lease M52/1034, with scree slopes tending to a flat sandy plain which covers 95% of the lease area. The flat plain is approximately 580 m AHD, with the low hill reaching 615 m AHD. A Digital Radio Concentrator Station is situated on the peak of the hill.

One main drainage line runs north from the rocky, iron hill, then east and south, parallel to the access track on the eastern edge of the project area. There are also several minor channels running through the centre of the project area.

2.3 GEOLOGY AND SOILS

2.3.1 Regional Geology

The geology of the FerrAus tenement project area has been mapped and described in detail by Williams and Tyler (1991). Five geological substrates were identified and are described in Table 2.1, below.

Table 2.1: Geology of the Robertson Range Project Area.

#	Composition	Location in survey area	Approximate % in survey area
1	Eolian sand; in sheets, longitudinal, chain and net dunes.	Southern flat area	93
2	Marra mamba formation; Chert, ferruginous chert and minor shale.	Raised, rocky northern section	3
3	Scree talus slope deposits – Colluvium and minor alluvium; Quartz pebble and rock fragments in silt and sand.	Adjacent to the Marra mamba formation	2
4	Lateritic sands, with a ferruginous hard crust, massive, nodular, pebbly and pisolitic.	One small area towards the south	1
5	Quartz veins.	Adjacent to the Marra mamba formation	1

The Marra Mamba Formation features in the project area and is composed of chert, iron formation and shale. It is a basal member of the Hamersley Group, and is host to many high grade iron ore deposits in the surrounding area, including deposits in the region of Newman. Surrounding the raised Marra Mamba formation are extensive deposits of colluvium and alluvium that form scree talus slopes. Quaternary Aeolian sand covers the majority of the flat region of the FerrAus lease, with one small section composed of Lateritic sands.

East of the project area the Robertson Range forms a prominent north-north-easterly trending sandstone scarp up to 90 m high. The Ranges are part of the Coondra Formation of the Savory Group and are composed of coarse-grained sandstone. A belt of low hills to the west of the project area reach up to 150 m and are part of the Archean Formation, composed of metagranite and metagranodionte (Williams & Tyler, 1991).

2.3.2 Soils

The soils of the Robertson Range project area have been determined as part of the Land System Classification, detailed by Van Vreeswyk et al. (2004). They range from red deep sands and red sandy earths seen in the Divide Land System, to stony soils with red shallow loams or sands, on the higher slopes, and stony soils with red loamy earths, on the lower slopes, seen in the Newman Land System.

Drill core results indicate that sulphide compounds do not occur in high concentration in the soil profile, and are confined to depths below the mineralisation zone. pH has been measured as slightly alkaline pH ranging from 7.6 to 7.7 in hydrological tests (AquaTerra, 2007). The soils of the area are typically low in clay content. The area is previously undisturbed, so has not been subject to contamination.

2.4 GROUNDWATER AND SURFACE WATER

During mineral exploration drilling at Robertson Range, groundwater has been encountered in variable quantities and a range of groundwater in-flows to bores have been noted anecdotally. Very low in-flow rates have been common however at some locations in-flow rates have been high enough to impede the progress of drilling. At 'Davidson Creek' (some 17 to 18 km to the west of the proposed site) a bore has provided reliable stock water of good quality for over 50 years. Details of bore construction are not available however the groundwater level at Davidson is believed to be within 30 m of surface. It is likely that some portion of recharge is the result of periodic flooding during significant rainfall events.

The proposed project area falls within the Savory Creek Proclaimed Catchment Area, and also within the Savory Creek P1 Wild Rivers Area (Figure 2-3), as designated by the State Department of Water. P1 Wild River areas are those with no or minor impact from clearing, altering the landscape, loss of vegetation due to grazing, road or track construction, introduced exotic animals, plants or plant diseases, increased fire frequency, unnatural erosion and sedimentation or alterations to waterway and riparian ecosystem. Although the mine site itself will not require any such disturbance, it is estimated that five creek systems will need to be disturbed through the establishment of roadways and culverts, and as such FerrAus will submit a bed & banks application to DoW for disturbance of these areas. All 26D and 5C bore establishment and extraction licensing will also be submitted for approval of these activities as this is required.

A number of minor drainage channels and gullies are present within the project area as shown in Figure 2-4. Flow direction is typically to the north and south of the low rocky outcrop in the north west of the project area. The main drainage line runs north from the ridge, then east and south, parallel to the access track on the eastern edge of the project area. There are also several minor channels running through the centre of the project area. The sand plain covering the bulk of the project area has the potential to become seasonally flooded, and mine operations may be impacted over the wet season. All flood management structures will be designed to minimise this impact. All flood management structures for the site will be fully detailed within the associated project *Environmental Protection Act 1986* Part V works approval application.

The proposed permanent camp facility will be located in the same location as the existing exploration camp (i.e. 3km north of the proposed mine site). The proposed site lies at the head of a northward flowing creek system that dissipates in ill-defined drainage systems ~10km to the north (Figure 2.3). The site itself slopes north-east at grades of typically 2% with no defined watercourses. Surface water runoff in the area will be predominately by sheet runoff. Although the site is not flood prone there

will need to be some diversion of water in order to keep water from higher ground out of the pit and from running onto the site in general. All flood management structures will be designed to minimise this impact. Surface water runoff from disturbed areas is potentially sediment laden and will require treatment in sediment traps.

Discharge water quality is reportedly suitable for discharge to the environment. (Refer to Mining Proposal Technical Appendix 2 – Aquaterra Dewatering Study)

There are no water management areas or groundwater dependent ecosystems located within 2 km of the project area. Hydrological studies indicate that groundwater levels are at depths of approximately 35 metres, and that there are no perched aquifers occurring within the project area.

A number of the drainage lines are more densely vegetated than the surrounding sand plain and rocky outcrops. The communities represented in these areas are open mixed medium to tall shrubland, dominated by *Acacia ancistrocarpa* and/or *Grevillea wickhamii* subsp. *Hispidula.* While these vegetation communities are not dependent on groundwater, they may be affected by disruption to surface flow. Interference to drainage lines will be avoided where possible. Where drainage lines have been altered, they will be reinstated to represent a natural state upon mine closure.

Drilling at Robertson Range has suggested that:

- The geology is variable over relatively short distances which affects the hydrogeology.
- The groundwater surface is approximately 30 – 35 m below ground surface over much of the area.
- The ore body, when intersected tends to have a comparatively high hydraulic conductivity and strong groundwater interceptions.
- Sections without significant ore body tend to have a hydraulic conductivity approximately an order of magnitude lower than that in the ore body.
- Hydraulic conductivity can change significantly over relatively short distances.
- The groundwater is likely to be semi-confined.
- Groundwater is generally of good quality.

Results from analysis of groundwater in the project area are included in the Robertson Range Dewatering Study, conducted by Aquaterra (Aquaterra, 2007).

This page has been left blank intentionally

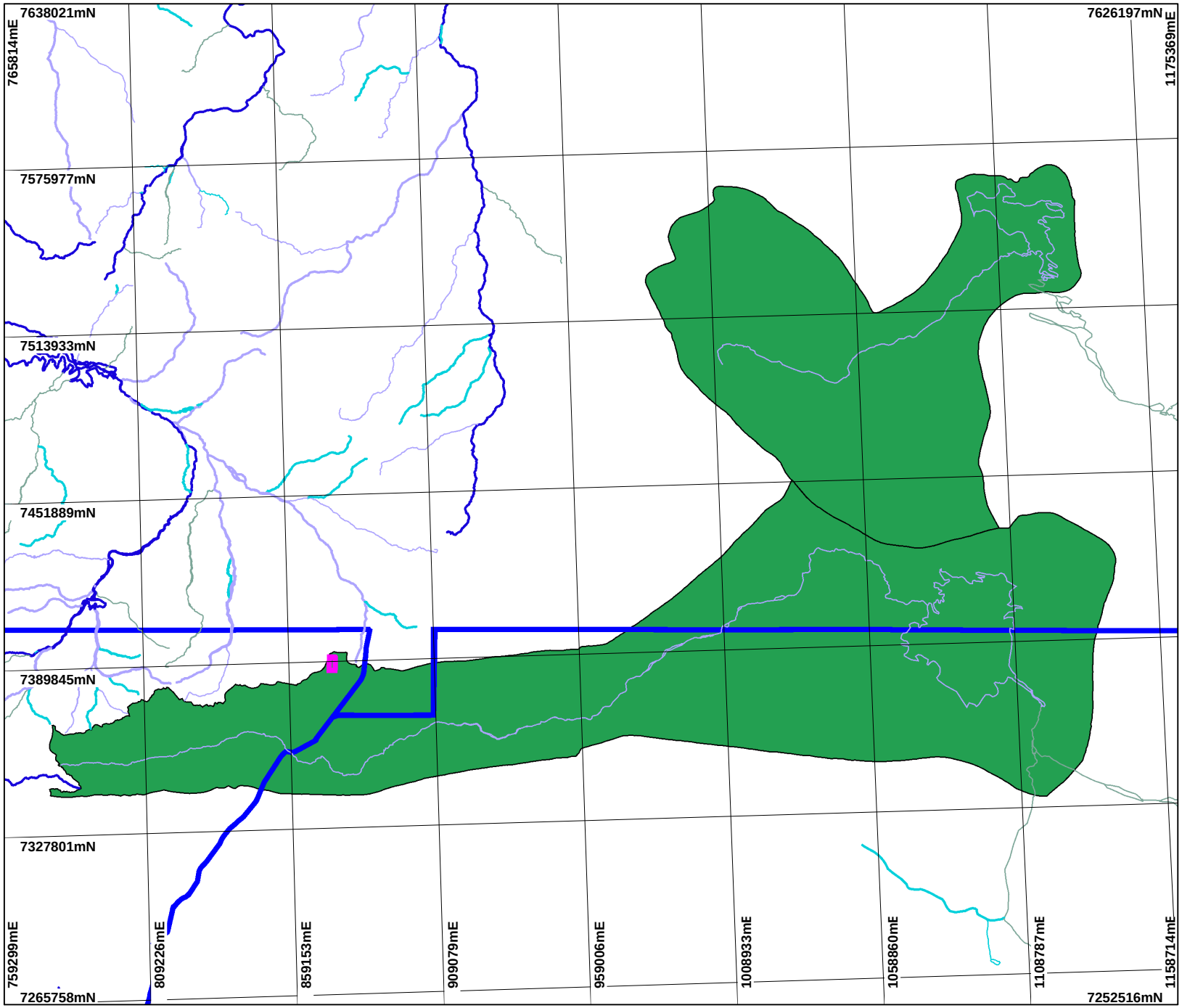


FIGURE 2-3

Wild Rivers - DOW

- Downgraded
- P1
- P2

Local Government Authorities - DLI

Hydrography, linear (hierarchy) - DOW

- Coastal Waterline
- Estuarine
- Infrastructure
- Insignificant Trib
- Inundation Area
- Mainstream
- Major River
- Major Trib
- Minor River
- Minor Trib
- Paleo-Drainage Line
- Significant Stream

N

0 ~50 km

Scale 1:1952694

(Approximate when reproduced at A4)

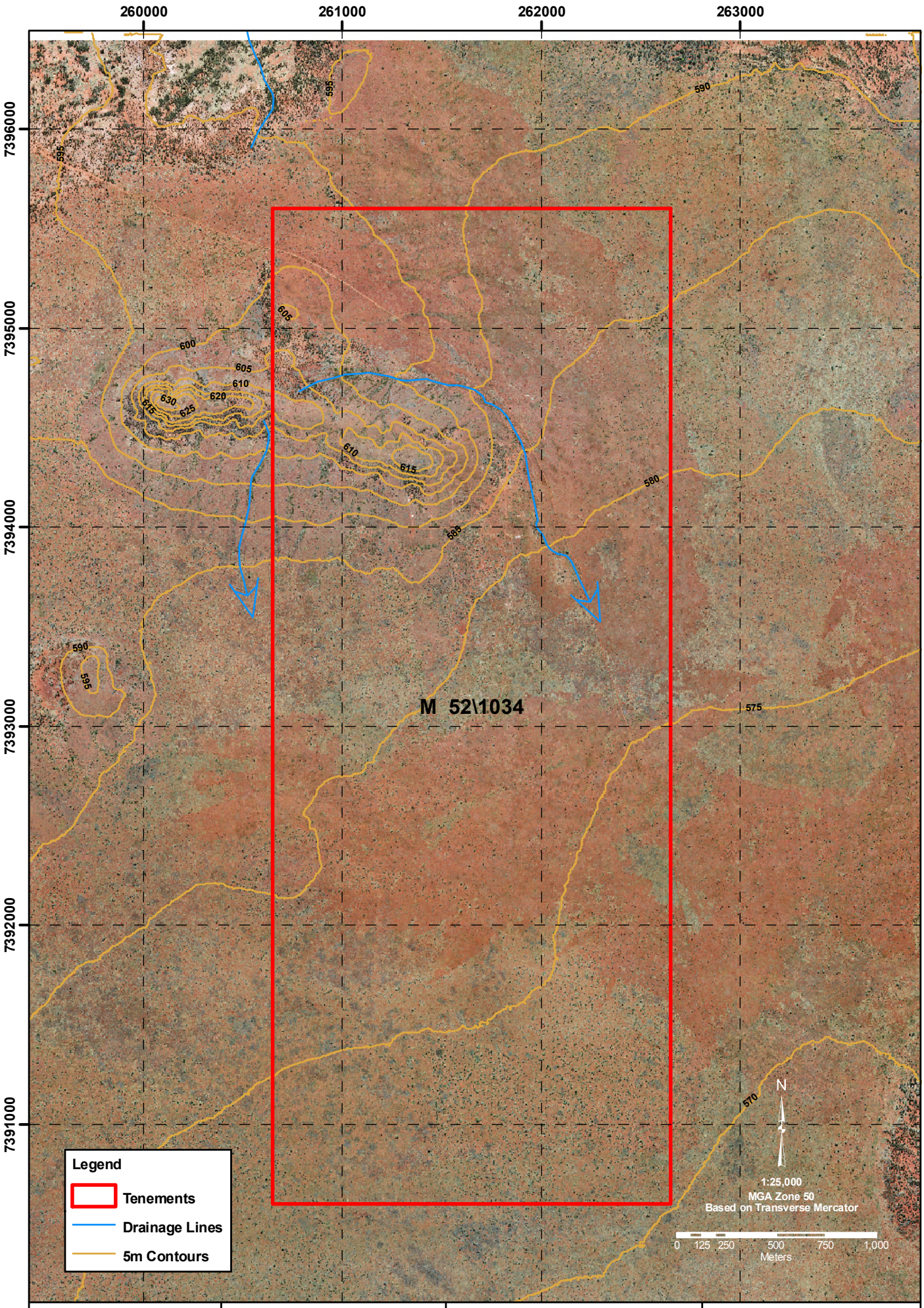
Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Prepared by: costerc
Prepared for:
Date: 12/09/2008 12:11:17 PM

Information derived from this map should be confirmed with the data custodian acknowleged by the agency acronym in the legend.

Department of Environment



ecologia ENVIRONMENT

FerrAus LIMITED

Robertson Range
Major Drainage Lines

Figure 2.4: Surface Drainage

Coordinate System
Name: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

2.5 FLORA AND VEGETATION

A vegetation and flora survey was conducted by *ecologia* in April 2007, after a wet season above average in rainfall (Mining Proposal technical Appendix 5 – Robertson Range Biological Survey). The area surveyed encompassed the entire mining lease (M52/1034), General Lease G52/281 and Miscellaneous Lease L52/103. The survey methods used were developed to meet the Environmental Protection Authority's Guidance Statement 51 (*Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*; EPA, 2004a) and Position Statement Number 3 (*Terrestrial Biological Surveys as an element of Biodiversity Protection*; EPA, 2002). Results and recommendations of this survey have been incorporated into this Mining Proposal.

2.5.1 Regional Context

The Robertson Range project area is situated in the Augustus subregion of the Gascoyne biogeographic region (GAS3). Van Vreeswyk et al. (2004) have inventoried land systems in the Robertson Range area.

The Gascoyne is characterised by rugged, low, Proterozoic sedimentary and granite ranges divided by broad flat valleys, containing the headwaters of the Ashburton and Fortescue Rivers (Thackway and Cresswell, 1995). There are extensive areas of alluvial valley-fill deposits.

In the Gascoyne the typical vegetation types are;

- Mulga (*Acacia aneura*) woodlands on *Triodia* occurring on shallow stony loams on rises and;
- Mulga parkland covering the shallow earthy loams and hardpans of the plain (Desmond *et al*., 2003).

The plain vegetation of the Project area is more typical of the eastern section of the Pilbara, Fortescue Plains subregion which is characterised by scattered *Eucalyptus gamophylla*, over hard spinifex. This region forms the northern limit of Mulga (*Acacia aneura*), typical of the Gascoyne region, which is not a dominant vegetation variety in the survey area (Thackway and Cresswell, 1995).

Two land systems occur within the project area; the Divide and the Newman Land Systems. These land systems are summarised in Table 2.2 below. Soils in the area range from red deep sands and red sandy earths seen in the Divide Land System, to stony soils with red shallow loams or sands, on the higher slopes, and stony soils with red loamy earths, on the lower slopes, seen in the Newman Land System.

Table 2.2: Land systems within the Robertson Range Project Area

Land System	Land Type	Geology	Vegetation	Approx % in survey area
Divide (Div)	11. Sand plains	Sandplains and occasional dunes composed of quaternary Aeolian sands.	Scattered shrubs and trees; including Grevillea, Acacia spp. and Eucalyptus, over hard spinifex (*T. basedowii*) grasslands.	95
Newman (New)	1. Hills and ranges	Rugged jaspilite plateaus, ridges and mountains. Contains Iron Ore deposits.	Scattered shrubs and trees; including Acacia, Senna, *Grevillea wickhamii* and *Eucalyptus leucophloia*, over hard spinifex grasslands.	5

2.5.2 Vegetation Units

The Robertson Range project area is situated in the Ashburton Botanical District of the Gascoyne Region, in the vicinity of the junction of the Pilbara, Gascoyne and Little Sandy Desert regions. Three vegetation units have been described by Beard (1981) in this area and are described below:

1. *Eucalyptus gamophylla*, over spinifex;
2. Mulga low woodland, with spinifex on rises;
3. Mulga trees, in patches or groves.

The area surveyed contained vegetation typical of these described by Beard, 1981 and therefore contained vegetation types typical of the region (Figure 2-5). These vegetation types are well represented both within the immediate vicinity, and throughout the eastern Pilbara and northern Gascoyne.

The vegetation communities within the survey area are described below and illustrated in the Plates below. They were classified on the basis of landforms and vegetation assemblages, and have been consequently separated broadly into four main units;

1a. Scattered outcropping Hakea spp. and other low trees, over moderately dense mixed low shrubs and mixed hummock grasses, on a red-orange sandy plain.

1b. Scattered outcropping Hakea spp. and other low trees, over moderately dense mixed hummock grasses, with sparse mixed shrubs, on a red-orange sandy plain.

1c. Open *Eucalyptus gamophylla* low woodland, on red-orange sandy plains.

1d. Moderately dense high *Acacia ancistrocarpa* shrubland, on red-orange sandy plains.

1e. Open *Acacia trudgeniana* mixed medium shrubland, on red-orange sandy plains.

2. Open mixed low shrubland, with open mixed soft grasses, on red-orange sandy footslope.

3a. Open to moderately dense *Acacia aneura* var. *aneura* low woodland, on rocky midslopes.

3b. Sparse mixed Acacia spp. medium to high shrubland, on rocky midslopes.

4. Open mixed medium to tall shrubland, dominated by *Acacia ancistrocarpa* and/or *Grevillea wickhamii* subsp. *hispidula* on rocky and sandy minor drainage channels.

Plate 2-1: Vegetation Unit 1a.

Plate 2-2: Vegetation Unit 1b.

Plate 2-3: Vegetation Unit 1c.

Plate 2-4: Vegetation Unit 1d.

Plate 2-5: Vegetation Unit 1e.

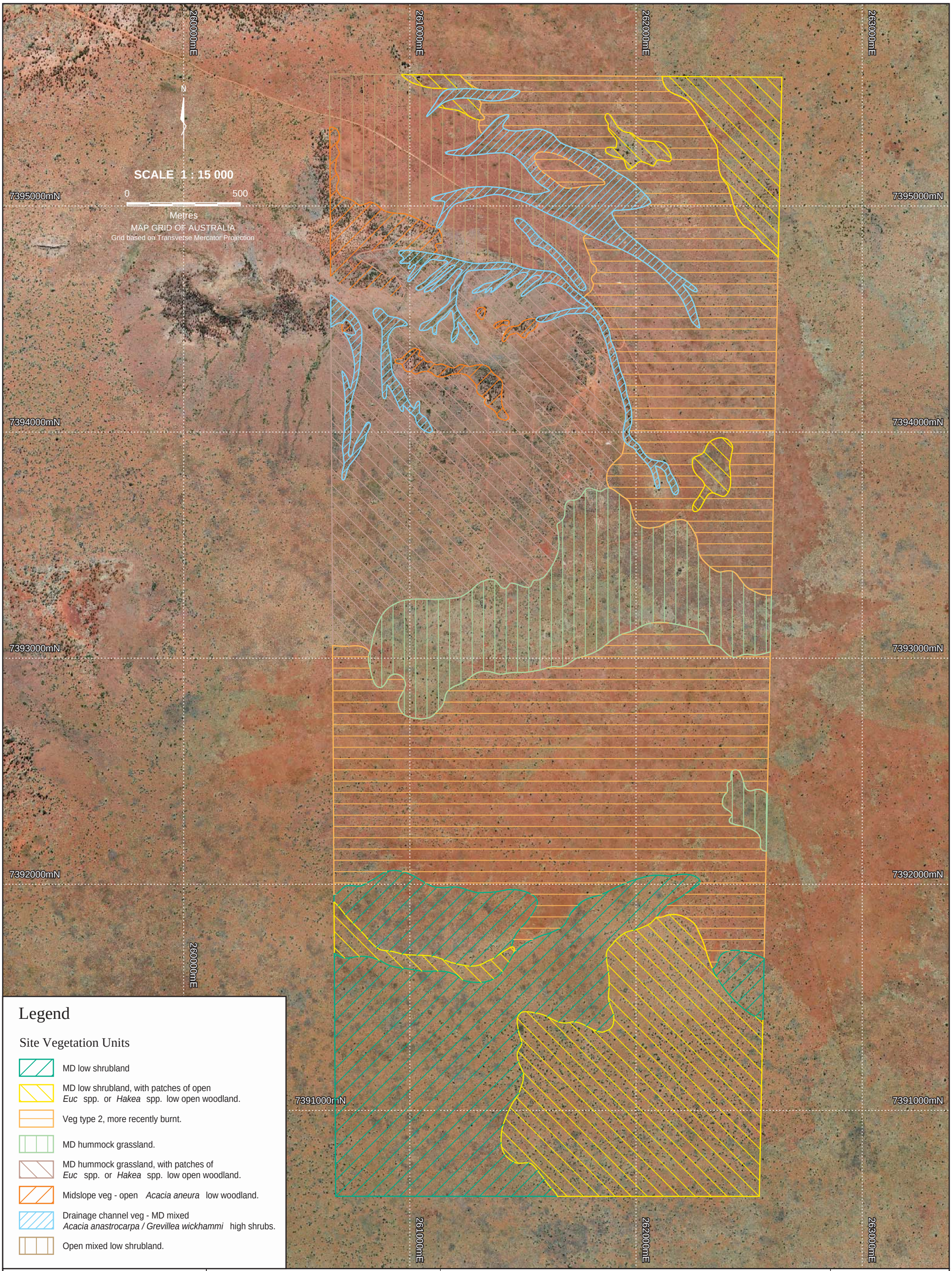
Plate 2-6: Vegetation Unit 2

Plate 2-7: Vegetation Unit 3a.

Plate 2-8: Vegetation Unit 3b.

Plate 2-9: Vegetation Unit 4.

This page has been left blank intentionally



ecologia ENVIRONMENT

Author: M.Hay | Drawn: S.Coleman

Client: **FERROZ**

Project: **ROBERTSON RANGE IRON ORE MINING PROPOSAL**

ROBINSON RANGE VEGETATION TYPES

A3

Date: 28 September 2007

Scale: 1:15 000

Figure No. **2.5**

Plan No. **RR-001**

2.5.3 Declared Rare Flora

No Declared Rare Flora taxa were recorded at the Robertson Range project area during the July 2007 *ecologia* survey or September 2007 *ecologia* survey (*Technical Appendix 5*) and no previous surveys have been conducted in the project area.

2.5.4 Priority Flora

No Priority Flora were recorded at the Robertson Range project area during the July 2007 ecologia survey (ecologia, 2007a) or September 2007 ecologia survey (ecologia, 2007b), and no previous surveys have been conducted in the project area.

Eight Priority Flora taxa potentially could occur at the Robertson Range project area based on previous surveys and habitat suitability.

Within a range of 100 km from the Robertson Range project area, seven Priority Flora species have been recorded during flora surveys carried out by ecologia Environment for other resource projects.

2.5.5 Introduced Flora

No general/environmental or declared weed species were recorded as occurring at the Robertson Range study site.

Two declared weed species potentially occur within the Pilbara; *Parkinsonia aculeata and *Salvinia molesta.

Three general/environmental weeds have been recorded near Robertson Range; Buffel Grass (*Cenchrus ciliaris); Ruby Dock (*Acetosa vesicaria); and Bipinnate beggartick (*Bidens bipinnate).

2.5.6 Riparian Flora

There are no riparian vegetation communities present in the project area.

2.6 VERTEBRATE FAUNA

The survey area is situated in the Augustus (GAS3) subregion of the Gascoyne biogeographic region. Based on the location and the sale of the development, Guidance Statement No. 56 recommends that a Level 2 survey (comprehensive field survey) be undertaken. Full details of survey methodologies and results are outlined in Technical Appendix 10 – Robertson Range Vertebrate Fauna Survey.

The first phase of the survey was carried out in April 2008 and the second in October 2008. The survey methods adopted by *ecologia* were aligned with the Environmental Protection Authority's Guidance Statement No. 56 (EPA, 2004b) and Position Statement 3 (EPA, 2002a). A literature review was conducted prior to field work at Robertson Range. Systematic and opportunistic sampling methods were used to assess the faunal assemblages of the project area. Six trapping sites were assessed over the two phases, while a large number of opportunistic sites covering nearly the entire project area were assessed and searched for faunal habitats.

2.6.1 Fauna Habitats

Two main fauna habitats occur in the Project area, which are defined by topography and substrate:

- A low rocky ridge in the northern section of the project area.
- Sandy spinifex plains encompassing the remaining area.

Low Rocky Range

The low rocky range occurs in the north-western part of the project area, covering about 5% and continues outside the tenement boundaries. The habitat is characterised by mulga over low shrubs and Spinifex on a rocky substrate, interspersed with small pockets of dense mulga woodland. The rocky range is small, isolated from similar landforms and is relatively rare in the region.

The rocky range habitat supports a large number of bird and reptile fauna that are otherwise not present on the plains. The Mulga stands provide ideal habitat for a number of thornbills and honeyeaters. The *Grevillea wickhamii* was flowering at the time of survey, which encouraged a number of birds into the area, including the nomadic Black Honeyeater *Certhionyx niger*. Reptile species that are likely to occur in this habitat include the gecko *Gehyra punctata,* which lives in rock cracks and under boulders, the Ring-tailed Rock Dragon *Ctenophorus caudicinctus*, and goannas such as the Ridge-tailed Monitor *Varanus acanthurus*.

The Western Pebble-mound Mouse *Pseudomys chapmani*, listed by the Department of Environment and Conservation (DEC) as Priority 4 only occurs on rocky scree slopes in the Pilbara, Gascoyne and Murchison regions of Western Australia. The small range within the project area could potentially provide habitat for this species, however, isolation from other suitable habitat limits this possibility.

Sandy Spinifex Plain

The Sandy Spinifex Plain habitat type covers approximately 95% of the project area and is characterised by scattered mulga and mallee over low shrubs and Spinifex hummocks of varying density and height. The Sandy Spinifiex Plain is well represented in adjacent areas. The predominantly sandy substrate, combined with the hummock grassland provides ideal habitat for a number of burrowing mammals and reptiles. There was evidence of the presence of goannas as borrows were observed. These are likely to be from the goanna *Varanus gouldii*. Hopping mouse burrows were also common within

spinifex habitat. The Blue-tailed Skink *Ctenotus calurus* was observed to be common in this habitat.

While the open tree and large shrub composition of the plains makes this habitat less suitable for birds than the range habitat, small patches of low, dense shrubs provide habitat for fairy wrens (such as the White-winged Fairy-wren, *Malurus leucopterus*, and the Variegated Fairy-wren, *M. lamberti*), and Zebra Finches *Taeniopygia guttata.* These species were observed within this habitat in large numbers.

2.6.2 Vertebrate Fauna Identified in the Project Area

Based on records from the Western Australian Museum, Department of Environment and Conservation (DEC), and Birds Australia and on surveys previously undertaken in the vicinity of the project area, 26 native and 7 introduced mammal species, 124 bird species, 83 reptile species and 7 amphibian species potentially occur in the survey area.

During the survey, 17 native and 4 introduced mammal, 56 bird, 45 reptile and 2 amphibian species were recorded in the project area based on trapping, observations of individuals, tracks, scats and burrows.

Mammals

Out of a potential of 26, 17 native mammal species were recorded during both phases of this survey. Mammal species recorded included 5 dasyurid species, 2 macropods, 7bats and 4 native rodents.

Of the 5 mammal species of conservation significance that could potentially occur in the project area, 2 of which were recorded in this study:

- the Western Pebble-mound Mouse (*Pseudomys chapmani*), listed Priority 4 by the DEC; and
- the Brush-tailed Mulgara (*Dasycerus blythi*), listed as Vulnerable under the EPBC Act, Schedule 1 under the WA Wildlife Conservation Act and Priority 4 by the DEC.

Evidence that both species are present, or have recently been present in the study area, was found in the form of abandoned burrows.

Birds

A potential number of 124 bird species could occur in the project area. Of these, 56 species were recorded in this survey.

The list of potential bird species includes many that are considered migratory or opportunistic. Such species would only visit the project area following heavy rainfall such as the Eastern Great Egret (*Ardea modesta*) or during mass flowering events such as the Pied Honeyeater (*Certhionyx variegates*).

The list of potential species includes 6 species of conservation significance, two of which were recorded in this study. These are the Australian Bustard (*Ardeotis australis*), listed Priority 4 by the DEC and the Rainbow Bee-eater (*Merops ornatus*), listed Migratory under the EPBC Act.

Reptiles

A database search and previous study reports indicate that a total of 83 reptile species have the potential to occur in the project area. None of these species are currently listed as being of conservation significance. In this study 45 reptile species were recorded. These included 11 geckos, 4 legless lizards, 17 skinks, 2 dragons, 5 varanids and 6 snakes.

Amphibians

Seven species of amphibians could potentially occur in the project area, none of which are currently conservation listed.

Two species of amphibians, the Desert Tree Frog (*Litoria rubella*) and the Spencer's Frog (*Limnodynastes spenseri*) were recorded in the project area during the autumn survey in April. This survey phase was preceded by two months of significant rainfall and the fact that these frog species were active and could be recorded, was probably related to the after-effects of these rains.

Introduced Species

Seven introduced mammal species could occur in the project area, 4 of which were recorded during this survey. These were the Fox (*Vulpes vulpes*), Cat (*Felis catus*), European Rabbit (*Oryctolagus cuniculus*) and One-humped camel (*Camelus dromedaries*).

Species of Conservation Significance Potentially Occurring in the Survey Area

A search of the Department of Environment and Water Resources Protected Matters database, the Department of Environment and Conservation's Threatened Fauna database, Birds Australia's Birdata database and review of previous surveying in the area, indicates that 4 species of mammal, 9 species of bird and 2 species of reptile that are listed as being of conservation significance have been recorded, or have the potential to occur in the vicinity of the Robertson Range project. These are listed in the Mining Proposal Technical Appendix 5.

Species of Conservation Significance Recorded in Survey

One species of conservation significance was recorded during the reconnaissance survey; the Australian Bustard, *Ardeotis australis*, which is listed as Priority 4 by the DEC.

Three Australian Bustards were observed while driving on the main north-south access track on the morning of 12 April 2007. The seeding grasses and heavy rainfall preceding the survey created ideal feeding grounds for the Bustard within the project area. It is likely to be a nomadic visitor to the area when conditions are favourable.

2.7 INVERTEBRATE FAUNA

Field surveys of subterranean invertebrate fauna were conducted by *ecologia*, as detailed below.

2.7.1 Short Range Endemics

Short range endemism occurs where evolutionary pressures are exerted on isolated communities/species. These pressures include the capacity of the species to migrate, the desiccation resistance of the species, the time required to attain sexual maturity breeding biology and, the longevity of the species.

A desktop review was conducted and is included as Technical Appendix 8 – Robertson Range SRE Literature Review. The desktop habitat assessment failed to identify any habitats within the impact area footprint of the project conducive to the habitation of short range endemic (SRE) species within the FerrAus lease. One habitat area in close proximity but outside of the impact footprint was identified that was considered likely to harbour SRE invertebrate species. Consequently, no targeted SRE survey work has been recommended or undertaken to date.

2.7.2 Stygofauna

Mining will not occur below the ground water level for the first 5-7 years of operation and is not included in the scope of this Mining Proposal. Stygofauna will, therefore, not be impacted upon as a result of mining and dewatering activities.

FerrAus is committed to conduct Stygofauna surveys to determine the impact of mining below the water table and dewatering drawdown effects. This survey work will be submitted as part of an addendum to this Mining Proposal to get approval for mining below the water table.

2.7.3 Troglofauna

Troglofauna are subterranean organisms that are restricted to living in the air spaces between and within rock strata (i.e. voids and fractures) in subterranean habitats. A species is considered truly troglobitic if it displays morphological characteristics that appear to restrict it entirely to a subterranean habitat. These characteristics include a significant reduction or complete loss of eyes, pigmentation, wings, and a circadian rhythm (24-hour biological cycle) as well as development of elongated appendages, slender body form and a lower metabolic rate.

The presence of porous rock and groundwater within the Robertson Range was identified as having the potential to support troglofauna, which may be impacted upon by future mining activities. Ecologia conducted the troglofauna assessment using exploration drill holes at Robertson Range to sample troglofauna using troglofauna traps. A total of 87 drill holes were selected. The survey was designed so that areas were sampled both inside and outside the impact footprint over three phases of sampling (Technical Appendix 8).

Sampling produced a large number of invertebrate specimens, most of which were non-troglobitic species such as springtails, mites and aranaeomorph spiders. Two probable troglobitic species were collected which included a thysanuran (silverfish) species at survey site T29 and an onicidean isopod species at survey sites T2, T29 and T35. Of these sites only T2 is within the impact zone.

2.8 LEGISLATIVE REQUIREMENTS

The Robertson Range project is subject to State and Federal legislative requirements managed by a number of Government agencies. This EMP has been developed in accordance with legislative requirements which guide standards and reporting requirements for the project. Table 2.3 summarises the legislation and responsible agencies as relevant to the EMP.

Table 2.3: Legislation Relevant to the Project.

Legislation	Responsible Government Agency
Commonwealth Legislation	
Environmental Protection and Biodiversity Conservation Act 1999	Department of Environment and Heritage
Native Title Act 1993	National Native Title Tribunal
State Government Legislation	
Aboriginal Heritage Act 1972	Department of Indigenous Affairs – Heritage and Culture
Aboriginal Affairs Planning Authority Act 1972	Department of Indigenous Affairs – Aboriginal Lands Trust
Conservation and Land Management Act 1984	Department of Environment and Conservation
Contaminated Sites Act 2003	Department of Environment and Conservation
Dangerous Goods Regulations 1992	Department of Consumer and Employment Protection
Environmental Protection Act 1986	Department of Environment and Conservation
Explosives and Dangerous Goods Act 1961	Department of Industry and Resources
Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992	Department of Industry and Resources
Health Act 1911	Department of Health
Health (Pesticides) Regulations 1956	Department of Health
Mining Act 1978	Department of Industry and Resources
Mines Safety and Inspection Act 1994	Department of Consumer and Employee Protection
Rights in Water and Irrigation Act 1914	Department of Environment and Conservation
Soil and Land Conservation Act 1945	Department of Agriculture, Western Australia
Water and Rivers Commission Act 1985	Department of Environment and Conservation
Waterways Conservation Act 1976	Department of Environment and Conservation
Wildlife Conservation Act 1950	Department of Environment and Conservation

3.0 RISK ASSESSMENT

A Risk Matrix (Appendix 1) determines the level of risk by the point at which the consequence severity and likelihood / probability rankings intercept in the Risk Matrix.

This risk assessment is meant to identify the aspects of the Project that require management (aspects), and assign the level of risk. See Table 3.1.

Table 3.1: Risk Assessment of Project Activities and Impacts.

Project Activity	Pathway to Impact	Impact	Aspect	CS	L	Risk
Flora and Heritage Surveys	Surveys not conducted before clearing commences	Accidental clearing of protected species / heritage area	Legal commitment	2	C	M
	Areas of protected vegetation / heritage not identified to site personnel	Accidental clearing of protected species / heritage area	Flora Heritage	2	B	S
Clearing	Areas not marked and surveyed in advance of clearing	Unnecessary clearing	Flora Fauna	2	D	L
Waste Management	Inappropriate storage of waste	Proliferation of pest species.	Fauna	C	1	L
	Inappropriate containment of waste products	Soil and water contamination occurs	Water Soil	D	2	L
Bore Development	Consumption of water exceeds licence	Liability. Water licence may be revoked	Water Legal Commitment	D	3	M
	Water condition is not monitored	Salinification of groundwater and reduced hydraulic head	Water	E	4	M
	Unapproved development of bores	Liability	Water Legal Commitment	E	3	M
Waste Dumps	Waste dumps poorly located	Interference with surface drainage lines.	Water	E	4	M

Project Activity	Pathway to Impact	Impact	Aspect	CS	L	Risk
	Waste dumps do not conform to design criteria	Erosion of soil and sedimentation of surrounding areas. Difficulty rehabilitating	Flora Soil Rehabilitation	E	4	M
	Waste dumps do not conform to surrounding landforms	Landscape values are impacted.	Landscape Values	E	1	L
Topsoil Stockpiling	Topsoil not stripped using correct methods or to sufficient depth	Insufficient topsoil for rehabilitation.	Soil	C	3	M
	Topsoil is stockpiled in inappropriate location	Topsoil stockpiles subject to erosion – loss of topsoil	Soil	D	3	M
	Insufficient volumes of topsoil and subsoil stockpiled.	Rehabilitation success reduced	Soil	C	3	S
	Topsoil is not stockpiled according to guidelines	Bioactivity is reduced, mixing occurs and topsoil is lost.	Soil	C	2	M
Rehabilitation	Insufficient provenance seed	Rehabilitation is delayed and success reduced	Flora	C	3	S
	Ripping, moon scaping and / or contouring is not conducted, or insufficient	Reduced success rate in vegetation re-establishment. Soil is eroded.	Flora Soil	D	4	S
	Rehabilitation is not conducted progressively	Reduced rehabilitation success rate.	Flora	C	2	M
	Topsoil not retained during clearing	Loss of biodiversity / Potential for erosion	Soil	3	C	S
	Introduction of weeds	Loss of flora	Flora	3	D	M
	Incorrect rehab techniques used	Soil erosion / no stability	Flora / Soil	3	C	S

Project Activity	Pathway to Impact	Impact	Aspect	CS	L	Risk
Pits	Final design of abandoned pits is unsafe.	Accidental death of fauna, erosion and instability of pit walls.	Landscape values Soil Fauna Safety	D	2	L
	Signage and access restrictions not in place	Hazard to public safety	Safety	E	3	M
	Insufficient baseline subterranean fauna studies.	Endemic species impacted	Fauna	C	3	S
Site Access	Site access is not controlled adequately	Unauthorised access to Reserve and breach of Aboriginal Agreement.	Heritage	C	2	M
Ore Processing	Dust generated in processing is inadequately controlled.	Elevated dust levels effect site safety	Safety	D	1	L
Transportation	Site speed limits not followed.	Accidental death of fauna	Fauna	E	2	L
Storage of Waste and Hydrocarbons	Inadequate waste storage facilities	Fauna hazard / Windblown litter from waste bins	Fauna	2	C	M
	Burning of waste	Emissions to air / Bushfire	Air / Noise	3	C	S
	Inadequate Hydrocarbon storage areas (no spill kits)	Surface water / Ground water and Soil contamination Safety	Water	2	C	M
	Breach / explosion in hydrocarbon storage area	Surface water / Ground water and Soil contamination Safety	Water Fauna Flora Air Soil Safety	4	E	M

4.0 ADMINISTRATIVE MANAGEMENT

4.1 ENVIRONMENTAL AWARENESS TRAINING

All personnel including contractors will undergo an environmental and heritage awareness induction before commencing work at Robertson Range Iron Ore Mine.

4.1.1 Objectives

- To maintain and enhance a culture of environmental awareness on site.
- Ensure that all staff has an understanding of and commitment to environmental protection values as a priority at Robertson Range.

4.1.2 Implementation

All staff and personnel, including contractors, will undergo an environmental induction to ensure environmental awareness. The induction will include:

- FerrAus' Environment Policy.
- Relevant legislation and environmental requirements.
- An overview of environmental management procedures as outlined by this document, including:
    - inspections;
    - the importance of no access (restricted) areas;
    - incident reporting;
    - Aboriginal heritage;
    - flora and fauna of conservation significance;
    - weed and pest management;
    - Vegetation Disturbance Permits;
    - vegetation clearance and vegetation clearing demarcation standards;
    - topsoil management;
    - access tracks;
    - borrow pits, mine pits, waste dumps & ROM pads;
    - surface and ground water;
    - rehabilitation;
    - vehicle and equipment servicing;
    - hydrocarbon, chemical and explosives management and transport;
    - hydrocarbon and chemical spills;
    - dust management;
    - waste management;
    - contaminated sites management; and
    - bushfire control.

Employees and contractors will receive training for the management of significant environmental impact risks. The effectiveness of training will be reviewed in the event of

incidents and non-conformances, and corrective actions implemented. Task specific training may be implemented as required.

4.1.3 Performance Indicators

- All staff and contractors have undertaken environmental awareness induction.
- Where necessary, procedural training has been completed.
- Clear records have been kept detailing training and improvements.
- Independent environmental audits have been undertaken, demonstrating a commitment to improvement and monitoring of environmental issues.

4.1.4 Management

- The Mine Manager will ensure that all training requirements are met.
- The Environmental Officer will ensure training requirements are identified and induction and training records are maintained in a Training and Inductions Register.
- The Contractor Supervisor is responsible for ensuring that procedures are followed by contractual staff.

4.1.5 Monitoring

- A Training and Inductions Register will be maintained.

4.1.6 Contingencies

- Training and induction details will be reviewed and updated as necessary where improvements in environmental management have been identified and/or incident investigations demonstrate the need.
- Training procedures will be updated in line with improvements in environmental management procedures and practices.

4.2 INSPECTIONS AND AUDITS

4.2.1 Objectives

- Ensure that environmentally acceptable activities are undertaken, and that remedial action is being followed where non-conformances occur.
- Verify that EMP procedures are being followed and monitored.
- Ensure that the EMP is reviewed and updated to continually improve environmental management and performance.

4.2.2 Implementation

- Regular audits will be conducted by the site Environmental Officer to ensure compliance with the EMP, legal requirements and relevant regulations.
- Procedures outlined in the EMP will be regularly reviewed and updated as an improvement process.
- Appropriate remedial action will be taken where there are non-compliances.

4.2.3 Performance Indicators

- An inspection and audit schedule has been agreed and adhered to.

4.2.4 Monitoring

- The site Environmental Officer will conduct inspections at appropriate intervals, and report the results on an Environmental Inspection Form.
- Inspections and audits will be documented in the Inspection and Audit Schedule Register.

4.2.5 Contingencies

- Where internal audits have been insufficient to ensure environmental objectives are met, an independent audit will be undertaken to advise on improvement of audit and monitoring procedures.

4.3 INCIDENT REPORTING

4.3.1 Overview

In the event an environmental incident occurs, immediate corrective action will be taken by staff and contractors as per procedural guidelines to reduce the impact and severity of the incident. Environmental incidents, near-misses and potential hazards will be immediately reported to a supervisor when identified.

4.3.2 Objectives

- Ensure that all environmental incidents are immediately and fully investigated, documented, reported and remedial action undertaken.
- Ensure that sufficient detail is provided in records to enable identification of causes of the incident and guide remedial action.
- Update, develop and monitor remedial action to ensure future impacts are avoided.

4.3.3 Implementation

- Staff and contractors will be required to report environmental incidents, near-misses and potential hazards via their supervisor by completing an Incident/Non-conformance Report.
- Incidents will be reported immediately.
- Notifiable incidents and emergency events will be reported in accordance with relevant government regulation requirements.
- Spills less than 205 L will be reported as minor spills.
- Significant hydrocarbon incidents are >205 L and will be treated as emergencies.
- Incidents that will require reporting include:
    - unauthorised clearing
    - inappropriate management of topsoil
    - new infestations of pests or weeds
    - death of native fauna within the project area
    - contamination of ground or surface water
    - failure of containment sumps
    - major erosion of access tracks; waste dumps and/or stockpiles
    - disturbance to existing, or identification of new Aboriginal, or Non-Indigenous Heritage Sites
    - fires
    - hydrocarbon or chemical spills
    - incorrect disposal of waste
    - breaches or potential breaches of government regulations or environmental law
    - all unplanned or unapproved impacts to the environment.

In the event that an environmental incident occurs, the person to first observe the incident is required to:

- Implement immediate corrective action, if safe to do so, to minimise and/or eliminate the immediate risk to personnel, property, the natural environment and clean-up liability; and
- Verbally report the incident to their supervisor and/or the Mine Manager, site Environmental Officer or delegate.

Supervisors are required to:

- Ensure that resources are available to bring the incident under effective control; and
- Investigate and report the incident to Mine Manager using Incident/Non-conformance Report form.

4.3.4 Performance Indicators

- All environmental 'near misses', non-conformance incidents or potential hazards are reported to the Mine Manager or delegate using Incident/Non-conformance Report.
- Recorded environmental impact incidents / non-conformances are not re-occurring.

4.3.5 Monitoring

- All Incident/Non-conformance Reports are signed off by the Mine Manager, site Environmental Officer or delegate to ensure investigations and follow-up actions have been completed.
- Incident/Non-conformance Reports will be maintained in the Environmental Incident and Non-conformance Register.

4.3.6 Contingencies

- Where Incident/Non-conformances are reoccurring, or monitoring and reporting procedures are deemed inadequate an external party will be requested to conduct an audit of administrative record keeping, monitoring procedures and reporting. This may include development of a formal Environmental Management System if required.

This page has been left blank intentionally

5.0 MANAGEMENT PLAN

This section describes in detail the strategies for management of individual environmental issues related the project. Each issue is addressed separately as follows:

- **Potential Impacts:** The main environmental/social impacts of the project or environmental aspect.
- **Objectives:** Defines core objectives for environmental management.
- **Implementation:** Strategies implemented to satisfy objectives
- **Performance Indicators:** Measurable indicators that illustrate environmental performance against objectives.
- **Monitoring:** Monitoring to be implemented to ensure Performance Indicators are recorded. E.g. Incident / Non-conformance Report, Registers, Inspections. Some reporting requirements may be included in this section.
- **Contingencies:** Strategies and corrective actions in the event of environmental incidents.

Aspects of the environment to be managed have been sorted according to perceived importance, based on the environmental impact risk assessment (Table 3.1).

A large number of environmental issues are addressed below; however, the prime focus of management should be based around environmental impacts that are greatest in influence and most likely to occur. For the Robertson Range Iron Ore Project, the issues of Aboriginal heritage, land rehabilitation, stockpiling of waste rock, land clearing and topsoil management are environmental management priorities.

5.1 FLORA AND VEGETATION

5.1.1 Current Status

No declared rare or priority flora were identified during the biological survey, however, FerrAus is committed to minimising project impact to native vegetation as far as is possible. In particular, vegetation communities associated with drainage lines should be avoided.

5.1.2 Potential Impacts

The total clearing of native vegetation resulting from the project will be 323.37 ha.

No priority flora or flora of conservation significance was identified within tenement M52/1034 during the April 2007 survey conducted by *ecologia*.

Direct loss of a portion of native species will occur as a result of land clearing, and some secondary impacts may result from the Project development, including fire, proliferation of weeds and introduction of pest species. These factors can all contribute to a loss in native vegetation cover and reduction in community health.

5.1.3 Objectives

- Limit clearing to that approved or the maximum necessary for that aspect of the project.
- Undertake progressive clearing and rehabilitation.
- Clearly identify clearing boundaries for site preparatory works.

- Maintain the abundance, species diversity, geographic distribution and productivity of flora and vegetation communities.
- Limit secondary impacts to vegetation through pest, fire and weed management strategies.

5.1.4 Implementation

Vegetation Clearance

- A flora and vegetation survey has been conducted prior to land clearing activities.
- Clearing will be limited to areas that have been surveyed by ecologia.
- Mine planning will avoid clearing of vegetation occurring along drainage lines where possible.
- A Vegetation Disturbance Permit will be issued prior to any clearing.
- Prior to commencement of works, areas to be disturbed will be demarcated in the field by a reference to design/site plans. This will constitute a hold point requiring written approval from the Site Manager prior to disturbance.
- All clearing activities will be scheduled to minimise the time between initial clearing and rehabilitation. Waste dump design will allow for progressive rehabilitation.
- Bushfire, weed and pest management strategies will be followed.
- Fragmentation of habitat will be minimised and will be achieved by planned layout of disturbance areas.
- Vehicles and machinery will only use designated tracks / roads. Off-road traversing will be prohibited. Where practicable on tracks, raised blade disturbance will be conducted to minimise vegetation removal.
- All employees / contractors will be inducted on the importance of:
    - minimising vegetation clearing and disturbance;
    - “no access” areas; and
    - avoiding existing weed infested areas and introducing weeds.
- Access to areas outside the designated disturbance footprint will be prohibited.
- If significant flora is identified in any subsequent surveys, communities will be clearly demarcated and avoided. The Environmental Officer will consult with DEC regarding any threatened/significant flora or vegetation communities which may be impacted.
- Erosion and sedimentation will be minimised by the construction of erosion control bunds and berms.
- Vegetation and topsoil will be stripped and immediately placed on areas to be rehabilitated or stockpiled for later use in rehabilitation. Topsoil management procedures will be followed.
- No burning of vegetation spoil will occur. Vegetation will be stockpiled in windrows or use as cover on topsoil stockpiles.

Demarcation Standards

- Areas to be cleared will be clearly delineated on project drawings and pegged/flagged-out in the field by the contractor to define the extent of authorised clearing.

- Boundaries of areas to be cleared or disturbed will be identified by GPS coordinates.
- Areas to be cleared will be identified on a map and made available to dozer operators.
- Clearing will not occur beyond the boundaries delineated.

5.1.5 Performance Indicators

Vegetation Clearance

- Topsoil and vegetation has been direct returned or stockpiled for later use.
- A significant flora and weed identification guide made available for all persons.
- Employees trained in fire safety procedures and weed management strategies.
- Environmental induction implemented, including Vegetation Clearance Procedures.

Demarcation Standards

- Vegetation Disturbance Permit approved.
- Clearing boundaries consistent with approved permit.

5.1.6 Monitoring

Vegetation Clearance

- A Vegetation Disturbance Permit will be submitted to the Environmental Officer for approval before the works begin.
- The Environmental Officer will regularly inspect operational areas to ensure:
  - clearing plans are followed;
  - clearing limits are pegged / flagged adequately;
  - only authorised clearing is being undertaken; and
  - vegetation and topsoil direct returned or stockpiled in suitable locations.
- The Environmental Officer will maintain a Vegetation Disturbance Permit Register.

Demarcation Standards

- Periodic checks of areas approved for clearing will be undertaken by the Mine Manager or delegate.

5.1.7 Contingencies

Vegetation Clearance

- Non-conformances will be analysed by the Environmental Officer to identify any short-comings in the clearing process. The Vegetation Disturbance Permit and employee induction process will be reviewed, and any necessary changes made to the EMP and site procedures.

Demarcation Standards

- Clearing beyond approved limits will be reported using Environmental Incident/Non-conformance Report.

5.2 TOPSOIL

5.2.1 Current Status

Topsoil will be disturbed as a result of land clearing, construction, mining/pit development and waste dumps. A total of 323.37 ha of land will require stripping over the life of the project. Although some progressive rehabilitation and direct return of topsoil will be possible, large areas will required topsoil stockpiling for the duration of the project. Therefore, correct stripping and stockpiling methodologies are imperative for later rehabilitation success.

Topsoil and subsoil availability is generally high throughout the proposed clearance areas due to the depth of the sand plain. The top 100mm of soil is abundant in vegetative matter and seeds, and will remain active if stockpiled appropriately. Additional seed stock will be collected as part of the rehabilitation program.

Cleared vegetation will be available to assist in topsoil stockpile maintenance.

5.2.2 Potential Impacts

Topsoil and subsoil availability is not anticipated to be a problem for rehabilitation.

Sulphide compounds and high clay content have not been identified in high concentrations in the soil profile.

If managed inappropriately, stockpiled topsoil could have reduced bioactivity, effecting rehabilitation success, and may be lost to erosive events. Topsoil stockpiling should be the focus of management procedures.

5.2.3 Objectives

- Ensure that topsoil resources are adequately characterised and quantities estimated to enable effective rehabilitation.
- Store and maintain all topsoil in a manner that will ensure no loss to erosion, and maximise viability for rehabilitation.

5.2.4 Implementation

- A plan will be prepared showing all areas requiring topsoil removal prior to commencement of stripping.
- The top 100 mm of topsoil will be stripped prior to land disturbance, wherever it is present and safely accessible.
- The top 200 mm of subsoil will be stripped prior to land disturbance, wherever it is present and safely accessible.
- Where practical, topsoil will not be stripped when wet as this can lead to compaction and loss of soil structure.
- Topsoil will be applied as soon as possible to areas being rehabilitated. If stripped topsoil exceeds rehabilitation requirements at that time, excess topsoil will be stockpiled for later use.
- Topsoil stockpiles will be constructed (no higher than 2 m) and managed to preserve its biological activity.
- Subsoil and topsoil will be stockpiled separately and clearly signposted.

- Stockpiles will be scarified to encourage germination and seed bank enrichment during this time, and cleared vegetation will be spread on the topsoil surface (if available).
- If dust lift-off is noticeable from topsoil stockpiles non-saline (< 5000 ppm TDS) water will be applied when required. Surfaces will be monitored to ensure crusting does not inhibit seed germination, and ripped if required.

5.2.5 Performance Indicators

- Topsoil and subsoil have been cleared in advance of all development and stockpiled in accordance with specifications.
- Topsoil and subsoil stockpiles have been placed in accordance with site plans.
- Topsoil and subsoil has been respread to rehabilitation areas as they become available.
- Topsoil and subsoil maintain bioactivity.

5.2.6 Monitoring

- The site Environmental Officer will confirm that a Vegetation Disturbance Permit has been completed in advance of clearing, and that topsoil stripping is scheduled. Stripped areas and stockpiles will be checked upon completion of earthworks and assessed for conformance to design criteria.
- Topsoil stockpiles will be checked every 3 months by the site Environmental Officer to ensure that no crusting or erosion has occurred. Inspection results will be recorded in the Rehabilitation Register.

5.2.7 Contingencies

- Where non-conformances occur, the site Environmental Officer will assess the Vegetation Disturbance Permit procedure and site inductions to identify the root cause. The EMP and site procedures will be updated accordingly.
- Where crusting or erosion is occurring on topsoil stockpiles, ripping, wetting-down or increase in cover by vegetative matter may be conducted as required.
- If topsoil or subsoil availability is assessed to be a potential issue later in the mine life, additional subsoil material will be stockpiled from the south zone pit for use in rehabilitation areas.

5.3 WASTE DUMPS

5.3.1 Current Status

Waste rock dumps will be developed from pit material and waste rock to the north and south of the pit area, and are anticipated to cover 169 ha of land totalling 46.6 million tonnes of material.

5.3.2 Potential Impacts

Waste rock stockpiles, produced at Robertson Range (haematite and detrital ore), are anticipated to be generated at a rate of 2.54 Mtpa. The ore deposit that waste rock stockpiles will be formed from is characterized by:

- Low S content rock types, particularly those proposed to be mined.
- An abundance of oxidised rocks, likely relatively high sulfate: sulfide ratio, especially those proposed to be mined.
- Climate of low rainfall and high temperatures not suited to AMD microorganisms.

All of which contribute to the conclusion that from the data and observations currently available, this deposit has low AMD potential, and accordingly waste rock stockpiles carry a low AMD potential (Mining Proposal Technical Appendix 4).

Sulphide waste rock is not likely to be an issue. As part of the Project's environmental monitoring program, acid generation will be monitored. If necessary, strategies will be implemented to manage potential acid forming material through encapsulating in neutralising material or clay.

New waste dumps will be developed in the north and south of tenement M52/1034 and General Lease G52/281, covering 169 ha, this will result in clearing of native vegetation.

5.3.3 Objectives

- Waste rock is adequately characterised to identify Acid Rock Drainage potential, sodicity and dispersion potential.
- Waste rock dumps are designed to ensure geotechnical stability, resistance to erosion and ability to retain moisture.
- Suitable topsoil is utilised to ensure permanent and independently sustainable revegetation using local native species sourced from provenance seed collection.
- Design of waste dumps match existing topography and maintain the aesthetics of the area.

5.3.4 Implementation

Clearing

- Vegetation will be cleared in accordance with Flora and Vegetation management strategies.
- Topsoil will be managed in accordance with Topsoil management strategies.

Waste Dump Design

- Waste dumps will be planned and constructed in compliance with the Guidelines for Mining in Arid Environments (DoIR, 2006).

- Waste dump sites will be located so as not to interfere with pit developments and significant drainage lines.
- Final waste dumps will have an average slope of no greater than 20° to minimise erosion and improve revegetation success.
- Waste dump slope profile will be designed to mimic surrounding slope topography where possible and feasible.
- Waste dump design will consider the physical nature of material and landform stability, chemical nature of waste materials, associated pollution prevention, integration into surrounding landscape and revegetation issues.
- Maximum waste dump height will not exceed that of surrounding ridges, 620 m AHD.
- Dump construction will be conducted to enable early and progressive rehabilitation while topsoil viability is highest.
- Measures to control erosion including hard drainage structures, drop down drains, rock armouring and sediment traps will be utilised where required.
- Deep ripping along contours and/or moon scaping will be conducted to improve vegetation establishment and reduce erosion.
- A site caretaker will be present at the mine site during the rainy season to ensure the stability of landforms is maintained.

Rehabilitation

- Progressive rehabilitation will be conducted in accordance with Rehabilitation management strategies.
- Waste dump will be designed with an open footprint to enable progressive revegetation on outward faces.

5.3.5 Performance Indicators

- Cultural landscape values and aesthetics are maintained in the area as accepted by Jigalong Aboriginal Community.
- Waste dump design conforms to specified construction criteria.

5.3.6 Monitoring

- Site inspections will be conducted by the site Environmental Officer at regular intervals during construction and rehabilitation and recorded on a Site Inspection Form to ensure waste dumps conform to the EMP.

5.3.7 Contingencies

- Major erosion or flooding events are to be reported immediately using Environmental Incident/Non-conformance Report.
- Where erosion or rehabilitation issues occur, additional ripping, seeding or armouring will be conducted to address the problem.

5.4 GROUND AND SURFACE WATER

5.4.1 Current Status

Drilling at Robertson Range has suggested that:

- The geology is variable over relatively short distances which affects the hydrogeology.
- The groundwater surface is approximately 30 – 35 m below ground surface over much of the area.
- The ore body, when intersected tends to have a comparatively high hydraulic conductivity and strong groundwater interceptions.
- Sections without significant ore body tend to have a hydraulic conductivity approximately an order of magnitude lower than that in the ore body.
- Hydraulic conductivity can change significantly over relatively short distances.
- The groundwater is likely to be semi-confined.
- Groundwater is generally of good quality.

Mining will not interfere with the ground water level until year 7 of operation. Approval for this activity will be sought via an addendum to this Mining Proposal once the relevant tenure has been granted.

Regarding surface waters, a number of minor drainage channels and gullies are present within the project area. Flow direction is typically to the north and south of the low rocky outcrop in the north west of the project area. The main drainage line runs north from the ridge, then east and south, parallel to the access track on the eastern edge of the project area. There are also several minor channels running through the centre of the project area. The sand plain covering the bulk of the project area has the potential to become seasonally flooded, and for this reason mine operations will shut-down over the wet season.

The proposed permanent camp facility will be located in the same location as the existing exploration camp (i.e. 3km north of the proposed mine site). This site lies at the head of a northward flowing creek system that dissipates in ill-defined drainage systems ~10km to the north. The site itself slopes north-east at grades of typically 2% with no defined water courses. Surface water runoff in the area will be predominately by sheet runoff.

5.4.2 Potential Impacts

Surface water drainage lines will be affected by the development of infrastructure and waste dumps. Some vegetation units occur on these drainage lines and are likely to be influenced by changes in surface water flow. There are no vegetation communities occurring in the project area that are dependent on groundwater or perched aquifers.

Potential impacts may include changes to composition and/or density of vegetation growth, weeds, reduction in the distribution of vegetation, potential problems with exotic flora and fauna; as well as other issues such as attraction of pest animal species, water contamination, cultural heritage issues, wastage of water, potential impact of surrounding aquifers, etc. Additional impacts include interruption to existing surface water flow patterns, impact on downstream vegetation communities that may be dependent on this drainage, and discharge of various chemicals, hydrocarbons and other pollutants. Overloading the creek system (i.e. flooding) would exacerbate the effects, causing vegetation shifts such as water tolerant reeds and grasses, less larger trees due to water logging.

Surface water runoff from disturbed areas is potentially sediment laden and requires treatment in sediment traps.

5.4.3 Objectives

- Use of groundwater will be completed in a manner that is not detrimental to the existing surrounding environment.
- Surface water flow will remain effective through this region and will not be inhibited by elements of the project.

5.4.4 Implementation

Surface Water

- Management of hydrocarbon, chemical and waste products on site will be in accordance with the Project EMP.
- Pre-existing haul roads and access tracks will be used where possible to minimise interference to natural drainage.
- Upstream surface water flows will be diverted around the camp (and its structures), with appropriate grades into adjacent or downstream surface water flow pathways. The generally low slopes on the site indicate that effective site drainage can be readily achieved and localised drainage within the camp will be handled by the stormwater provisions for drainage within the developed areas.
- Runoff from the camp area will be controlled, via bunding as appropriate, to contain surface water runoff and ensure it does not cause undue erosion and potential contamination of downstream watercourses (Figure 5-1).
- Potentially sediment laden (internal) water will not be allowed to mix with (external) “clean water”, so as to reduce the volume of water to be treated.
- Any new disturbance areas will be located to avoid drainage lines and designed for minimal impact on surface drainage as far as practicable.
- Drainage of the minor streams and drainage lines that the haul route crosses will be maintained with effective culverts and/or floodways.
- During high rainfall events the effect of stormwater discharge from the site will be controlled. Adequate drainage will be assured through site structures, stockpiles and roadways, to negate the possibility of Project enhanced flooding, erosion and sedimentation. Caretakers will be present during the mine shut-down in the wet season to monitor erosion and flooding.
- Final placement of site waste rock and product stockpiles will consider stormwater flow and drainage in the local area. In terms of physical water flow, the Project will be implemented to have little impact on surface water runoff in the region, however, sediment and erosion control measures will be incorporated into the site design.
- The support infrastructure will be designed to ensure the safe storage and handling of all hazardous and waste materials to prevent contamination.
- Overburden stockpiles will be constructed with sufficient surface to groundwater table distance (with considerations to the hydroconductivity of the geology) to minimise the potential for groundwater contamination. Use of physical barriers such as clay or artificial liners will be used to prevent contamination where required.
- No water will be used in the processing circuit, this is a dry screening operation and as such no processing water will be discharged from the mine site.
- Drainage areas and settling basins will be suitably designed to minimise contamination of surface water.
- Cleared vegetation and topsoil will be stockpiled away from watercourses and in discrete stockpiles to avoid any interference to surface flows.

- Contaminated water from work areas will be kept separate from clean storm water.
- Work areas will be assessed and cleaned prior to mine shut-down in the wet season to avoid contamination of surface and groundwater.
- Water interfacing with work areas will be directed to oil-water separators.

Ground water

The overall management objective is to minimise impacts to the extent practicable, and to minimise the potential for weed and pest species to become established.

- A hydrological and vegetation monitoring system will be established to ascertain the effects of the additional water in the creek system.
- Remediation measures will include bush regeneration, weed eradication, implementation of pest control measures.
- All groundwater utilised for dust suppression activities will achieve a TDS (total dissolved solids) value of less than 5,000 ppm.
- Approvals and licensing will be sought from the Department of Water for all new bores developed for the project, and if necessary, modelling of the effect of use on groundwater flow.

5.4.5 Performance Indicators

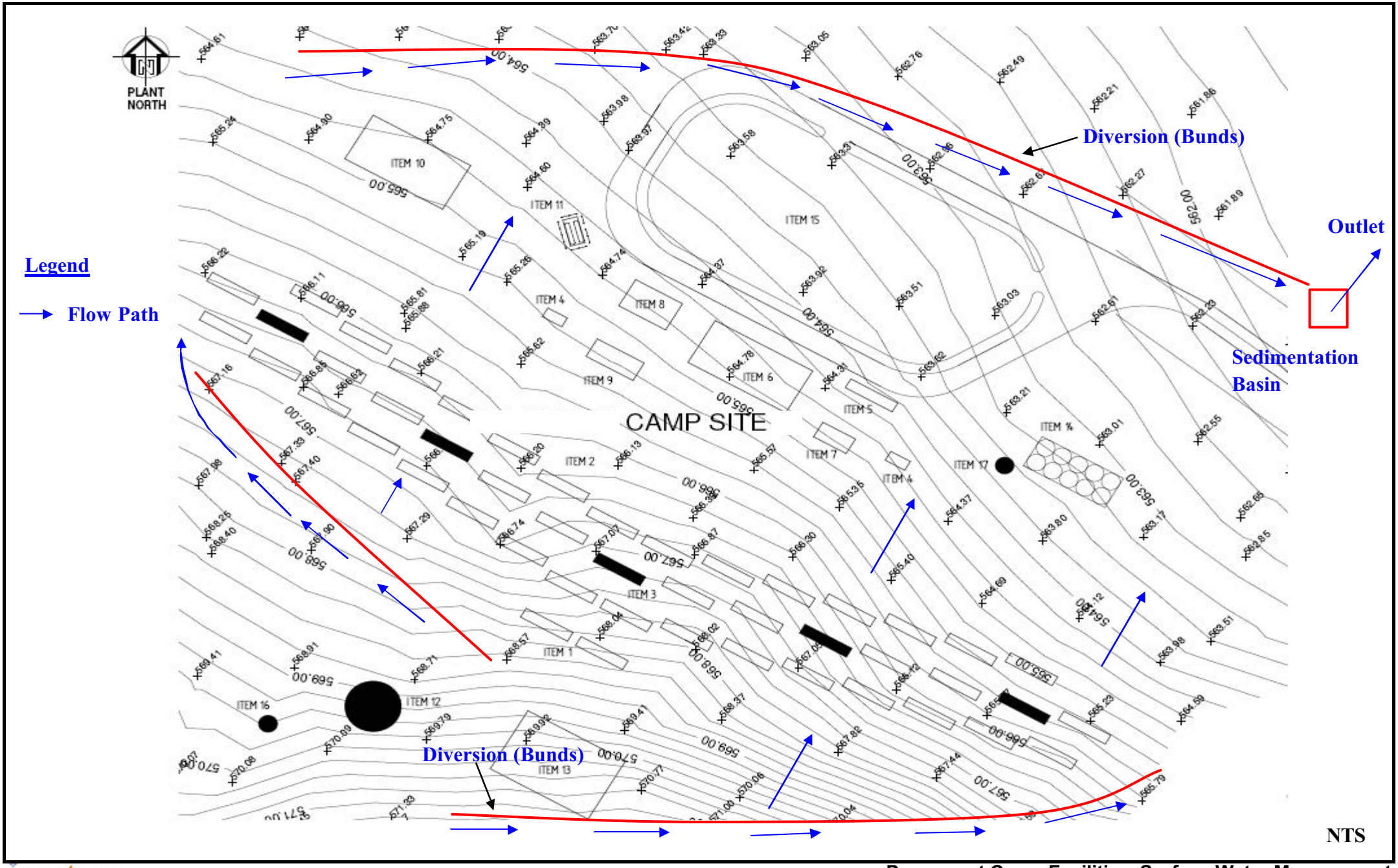
- All groundwater utilised for dust suppression activities will achieve a TDS (total dissolved solids) value of less than 5,000 ppm.
- Approvals and licensing will be sought from the Department of Water for all new bores developed for the project, and if necessary, modelling of the effect of use on groundwater flow. The conditions of these approvals will be adhered to.

5.4.6 Monitoring

- Drainage lines that have been altered through implementation of the project will be inspected in an ongoing basis by the Environmental Officer.

5.4.7 Contingencies

- Major erosion or flooding events are to be reported immediately using Environmental Incident/Non-conformance Report.
- Where erosion issues occur, reshaping will be conducted to address the problem.



aquaterra

F:\Jobs\791\C\C3\Final Report\Figures\Figure 2.doc

Permanent Camp Facilities: Surface Water Management
Fig.5.1

5.5 VERTEBRATE FAUNA

5.5.1 Current Status

Species of conservation significance known to occur in the area include the Mulgara, Pebble-mound Mouse and the Australian Bustard. A stage 1 fauna survey conducted in the project area in April 2007 did not identify a current population of Mulgara or Pebble-mound Mice, although three potential inactive Mulgara burrows were identified in the south of the project. The Australian Bustard was recorded during the survey; however, it is not exclusively dependent on habitat present in the survey area.

5.5.2 Potential Impacts

The Australian Bustard has a distribution that covers the majority of mainland Australia and has a nomadic life history strategy. The project area is surrounded by vast areas of contiguous habitat currently not impacted by human influences. Provided measures are implemented to ameliorate secondary impacts from the project (i.e. fire and weed infestation), the loss of habitat arising from the Robertson Range project will unlikely impact this species.

Although species of conservation significance are unlikely to be impacted by the project, native species that are not protected are likely to be impacted directly through habitat destruction, and indirectly through other project aspects, as outlined below.

Direct Impacts

- Habitat loss and fragmentation through clearing of native vegetation.

Secondary Impacts

- Increased risk of fire associated with movement of employees and machinery.
- Degradation of fauna habitat due to invasion and spread of weeds.
- Increased movement of feral fauna in the area resulting in increased predation pressure.
- Disruption to resident fauna due to increased noise and dust pollution.

5.5.3 Objectives

- Maintain the general abundance, species diversity and geographical distribution of fauna.
- Protect Threatened Fauna and Priority Fauna species and their habitats consistent with the provisions of the Wildlife Conservation Act 1950.

5.5.4 Implementation

- Baseline studies of terrestrial fauna, stygofauna and troglofauna will be conducted prior to commencement of disturbance.
- Hydrocarbon and other chemicals will be handled and stored in accordance with section 5.11 to ensure groundwater is not contaminated and subterranean habitats are not impacted.
- The minimum area required for the project will be cleared.
- Vegetation clearing is conducted in accordance with Vegetation and Flora management requirements.
- Rehabilitation of disturbed areas will be conducted in accordance with Rehabilitation procedures.

- Operational control procedures, site inductions and employee training programs will be implemented to protect native fauna from intentional harm, and to appropriately manage injured fauna if found.
- Native fauna will not be captured, intentionally harmed or fed without appropriate permits.
- Vehicles will only use approved access tracks and maintain safe driving speeds to minimise the chance of road fauna deaths.
- All refuse will be in sealed containers to prevent encouragement of feral/domesticated animals.
- No feral or domesticated fauna will be introduced to the project area.
- Deaths of native species will be reported using an Incident/Non-conformance Report Form and any death of fauna of conservation significance will be reported to DEC.
- Posters containing summary information and photographs of native species known to occur in the area will be displayed in communal areas to aid in informing the workforce on native fauna matters.
- Wildfire from accidental ignition will be avoided as far as is possible.
- Dead trees will be regarded as valuable habitat and will be protected. Collection of firewood from the area will be prohibited.
- Foundation holes, drill holes and trenches will be covered, fenced, bunded or otherwise capped to prevent fauna entrapment.

5.5.5 Performance Indicators

- No preventable native fauna deaths related to mine construction, operation or decommissioning activities.
- No loss of habitat related to unapproved clearing.

5.5.6 Monitoring

- Any areas cleared or impacted without approval will be inspected for impact to native fauna deaths and significant fauna habitat impact.
- Areas that have been disturbed and are under rehabilitation will be checked for rehabilitation progress on a routine and ongoing basis by the Environmental Officer and records of progress maintained.

5.5.7 Contingencies

- Where areas have not been rehabilitated to be suitable fauna habitats, the rehabilitation contingencies will be implemented.

5.6 INVERTEBRATE FAUNA

5.6.1 Current Status

A desktop review was conducted and is included as Technical Appendix 7. The desktop habitat assessment failed to identify any habitats within the impact area footprint of the project conducive to the habitation of short range endemic (SRE) species within the FerrAus lease. One habitat area in close proximity but outside of the impact footprint was identified that was considered likely to harbour SRE invertebrate species. Consequently, no targeted SRE survey work has been recommended or undertaken to date.

Mining will not occur below the ground water level for the first 5-7 years of operation and is not included in the scope of this Mining Proposal. Stygofauna will, therefore, not be impacted upon as a result of mining and dewatering activities.

FerrAus is committed to conduct Stygofauna surveys to determine the impact of mining below the water table and dewatering drawdown effects. This survey work will be submitted as part of an addendum to this Mining Proposal to get approval for mining below the water table.

The presence of porous rock and groundwater within the Robertson Range was identified as having the potential to support Troglofauna, which may be impacted upon by future mining activities. *Ecologia* conducted the troglofauna assessment using exploration drill holes at Robertson Range to sample troglofauna using troglofauna traps. A total of 87 drill holes were selected. Sampling produced a large number of invertebrate specimens, most of which were non-troglobitic species such as springtails, mites and aranaeomorph spiders. Two probable troglobitic species were collected which included a thysanuran (silverfish) species at survey site T29 and an onicidean isopod species at survey sites T2, T29 and T35. Of these sites only T2 is within the impact zone.

5.6.2 Potential Impacts

Troglobitic communities are generally threatened by two direct processes related to the proposed mining activities:

- Removal of strata containing ore.
- Dewatering of the aquifer to enable extraction of the ore body.

Species may also be impacted upon via indirect pathways such as hydrocarbon or nutrient contamination, or via changes to aquifer dynamics due to the sealing of the ground above.

5.6.3 Objectives

- Maintain the general abundance, species diversity and geographical distribution of invertebrate fauna.
- Ensure proposal activities do not adversely impact on troglofauna diversity.

5.6.4 Implementation

- Baseline studies have been conducted prior to commencement of disturbance.
- FerrAus will develop and implement an ongoing troglofauna monitoring program in consultation with DEC and in accordance with EPA Guidance Statement 54 and 54a, with the objective of collecting sufficient data to confirm that current and future mining in the locality is unlikely to impact significantly on troglofauna diversity.
- Wherever the state of taxonomy of the affected group allows, species level identifications will be undertaken for all troglofauna specimens collected through previous and future sampling.

- FerrAus will develop strategies to manage impacts on troglofauna in the event that the ongoing monitoring indicates that the mining proposal is having an adverse impact on any species identified through species level identification.

5.6.5 Performance Indicators

- Troglofauna monitoring is developed and implemented on an ongoing basis.
- Strategies are developed and implemented to manage adverse impacts on Troglofauna species.

5.7 HERITAGE

5.7.1 Current Status

The proposed development occurs within Aboriginal Reserve 41265, which is vested in the Aboriginal Lands Trust with administration provided by Jigalong Community Incorporated. The Jigalong Community therefore has an interest in the mine, and an Aboriginal Agreement has been drafted by FerrAus to outline employment and training opportunities, and any limitations required for the project to satisfy heritage and community values.

A Work Area Clearance Survey of the Robertson Range ("King Brown") area was designed to comprehensively inspect areas of high archaeological potential (the ridge) and sample the remaining area of low archaeological potential (sand plain) (Technical Appendix 10). Eureka conducted this by walking a series of parallel transects and sections of sand plain. In this way, the survey team inspected approximately 60% of the Robertson Range project area. A survey of the camp area was conducted in a similar manner.

Archaeological sites were recorded to Site Avoidance level only and the boundaries marked with pink and black stripped flagging tape. This means that FerrAus will avoid disturbing any sites found and therefore would not be required to engage the consent provisions in section 18 of the *Aboriginal Heritage Act* 1972.

An ethnographic survey was conducted by Big island Research Pty (Technical Appendix 11) which identified Telstra Hill as ethnographically significant. Consequently, an interim boundary for the site has been established as the lowest contour at the base of the hill. This is likely to cause a planning issue for any potential waste dumps for potential mine expansion. The survey team members stated that ground disturbance should not occur within the site boundaries.

5.7.2 Potential Impacts

- Unapproved disturbance of Aboriginal Heritage sites.
- Reduction in landscape values.

5.7.3 Objectives

- Ensure that the proposal meets the requirements of the *Aboriginal Heritage Act* 1972.
- Meet all obligations of the Aboriginal Agreement.
- Preserve cultural, heritage and landscape values of the area.

5.7.4 Implementation

- Aboriginal Agreement has been confirmed and signed by FerrAus, Jigalong Community Incorporated, and other relevant stakeholders as required.
- Ensure that the proposal meets the requirements of the *Aboriginal Heritage Act* 1972.
    - o Heritage surveys will be conducted in all proposed clearance areas in advance of development.
    - o No heritage sites will be disturbed without Section 18 approval.
    - o Any new heritage sites identified will be immediately reported to the Jigalong Community and Department of Indigenous Affairs.
- Nyiyaparli people and Jigalong Community will be consulted as part of any application for section 18 approval under the *Aboriginal Heritage Act* 1972.

- Any new heritage sites identified will be immediately reported to the Nyiyaparli Native Title Applicants, the Jigalong Community and Department of Indigenous Affairs.
- With the assistance of the Nyiyaparli people and Jigalong Community Incorporated, FerrAus will, in advance of development, conduct heritage surveys in all proposed clearance areas which may contain unidentified Aboriginal sites.
- Ensure that Entry Permits are applied for and granted for all staff, contractors and visitors prior to entering the Jigalong Aboriginal Reserve in accordance with the Aboriginal Agreement.
- Ensure that Jigalong Community Incorporated and the Nyiyaparli Native Title Applicants are kept informed of project developments.

5.7.5 Performance Indicators

- Heritage surveys have been conducted in advance of all clearing activities.
- A Vegetation Disturbance Permit has been completed in advance of all clearing activities.
- All requirements of the Aboriginal Agreement have been fulfilled.
- Jigalong Community and Native Title claimants have been consulted with and informed of mining progress and any updates to the project scope.
- All requirements of the Aboriginal Heritage Act 1972 have been fulfilled.

5.7.6 Monitoring

- Regular consultation will be conducted with representatives from the indigenous community.

5.7.7 Contingencies

- If heritage sites are identified during surveys or operations, all work will stop and the Department of Indigenous Affairs will be contacted immediately for advice.

5.8 REHABILITATION

5.8.1 Current Status

Rehabilitation will be required upon closure over disturbed areas, and progressively on waste dumps. Some rehabilitation has been conducted on exploration tracks and drill pads; however, much of this area will be cleared as a result of the mine development.

5.8.2 Potential Impacts

Potential impacts associated with rehabilitation are related to poorly implemented or incomplete rehabilitation works. These impacts are generally related to waste-dump design and landscape terra-forming, revegetation techniques and availability/storage of topsoil. Cumulatively, mismanagement of these components can result in extended rehabilitation times with reduced success, and consequently greater overheads related to the rehabilitation program.

The long term effects of poorly implement rehabilitation programs include loss of plant biodiversity and vegetative cover, loss of fauna habits, changes to drainage lines and increased erosion, and reduced landscape values.

A well designed and implemented rehabilitation program can help to encourage the re-establishment of self-sustaining natural ecosystems.

5.8.3 Objectives

- To meet the tenement conditions with respect to the rehabilitation of disturbed areas associated with FerrAus' exploration and mining operations; and
- To encourage the re-establishment of self-sustaining ecosystems compatible with surrounding undisturbed areas.

5.8.4 Implementation

- All areas disturbed by FerrAus will be rehabilitated.
- Where practicable, disturbed areas will be progressively rehabilitated.
- Long-term visual impact will be minimised by creating landforms which are compatible with the adjacent landscape.
- Stakeholders will be consulted during the life of mine regarding existing landform / landscape values.
- Rehabilitation will be undertaken as soon as practicable to facilitate fauna habitat restoration.
- Reshaped land will be formed so that it is inherently stable, adequately drained and suitable for the desired long-term use.
- Where practicable, natural drainage patterns will be reinstated.
- Compacted surfaces will be ripped to a depth of approximately 300 mm or greater should ground condition and hydrology allow.
- Cleared vegetation and topsoil will be utilised in rehabilitated areas.
- Disturbed areas to be recovered with topsoil as soon as possible to a depth of 100 mm.
- Local provenance seed and plants will be utilised to boost flora density.
- Management of environmental weeds in rehabilitated areas will be in accordance with Weed and Pest management strategies.

- FerrAus will monitor and manage rehabilitated areas until such time as criteria for relinquishment are met, in accordance with relevant government agencies.
- Progressive rehabilitation areas will be monitored for effectiveness, and results incorporated into future rehabilitation strategies.

5.8.5 Performance Indicators

- Rehabilitation implemented in consideration of guidelines specified in Mine Rehabilitation, (Department of Industry, Tourism and Resources, 2006).
- Progressive rehabilitation of disturbed areas.

5.8.6 Monitoring

- Monitoring of rehabilitated areas monthly by the site Environmental Officer using standard sampling techniques.
- Results of monitoring to be recorded in the Rehabilitation Register.
- Monitoring of each major rehabilitation area will be undertaken systematically at regular intervals 12 months after rehabilitation and again in years 2 and 5 any deficiencies will be reported using an Incident/Non Conformance Report to ensure corrective actions are implemented.

5.8.7 Contingencies

- Major erosion or flooding events are to be reported immediately using Environmental Incident/Non-conformance Report.
- Where erosion or rehabilitation issues occur, additional ripping, seeding or armouring will be conducted to address the problem.

5.9 PIT VOID

5.9.1 Current Status

This mining proposal is for a mining operation above the water table (30m). Mining below groundwater level is only expected to start 5 - 7 years after mining operation has commenced. Mining will then be carried out up to a 100m depth. FerrAus will seek approval for this via an addendum to this Mining Proposal.

Ore and waste will be mined from the Robertson Range open pit in two passes on a bench by bench basis. Blasting will be required, except for some highly oxidized material near the surface. Conventional drill and blast techniques will be used. Blasting will occur on five metre benches, with drill hole sizes, patterns and blast sequencing subject to final design and modification during mining. Blast holes will be sampled for grade control, with samples analysed on site.

5.9.2 Potential Impacts

99.53ha of vegetative clearance will be required for the mining pit to be established.

5.9.3 Objectives

- Ensure that mining pit topsoil and overburden are stored and managed effectively.
- Rehabilitation will be carried out progressively on cleared areas where this is possible.

5.9.4 Performance Indicators

- Condition of stockpiles formed is stable and under accepted parameters
- No erosion events form an issue.

5.9.5 Monitoring

- Regular inspections will be conducted to ensure that topsoil and waste rock stockpiling is carried out effectively and considers drainage lines.

5.9.6 Contingencies

- Where erosive events, or unsuccessful stockpiling or rehabilitation has occurred, pit development will be performed to correct the problem.

5.10 ACCESS TRACKS, HAUL ROADS AND BORROW PITS

5.10.1 Current Status

A number of existing tracks will used to support mining activities at Robertson Range. Once tenure has been granted for Miscellaneous Lease L52/104 FerrAus will seek approval for the clearing and construction of a haul route. This will be applied for as an addendum to the Mining Proposal. Borrow pits will be excavated within the surveyed mining tenement boundaries.

5.10.2 Potential Impacts

Native fauna can become trapped in borrow pits that have not been correctly rehabilitated to allow safe exit. Fauna are also at risk from increased vehicle traffic.
Borrow pits that are not rehabilitated fully can impact surrounding areas of vegetation through erosion, and reduced available habitat.

5.10.3 Objectives

- Minimise the adverse impacts of access tracks on native flora and fauna, and natural drainage.
- Prevent erosion resulting from access tracks.
- Limit damage to surrounding vegetation, erosion and visual impacts related to borrow pits.
- Successfully and progressively rehabilitate borrow pits and access tracks when no longer utilised.

5.10.4 Implementation

Planning of Borrow Pits and Access Tracks

- Existing tracks will be used in preference to clearing new areas.
- Existing tracks and roads will not be upgraded.
- Routes will be located along contours and on low incline slopes to minimise earth moving disturbances and erosion potential.
- Mature trees will be avoided where possible.
- Clearance of vegetation along natural drainage systems will be minimised.
- In areas that have not been cleared previously, the route will be clearly marked by flagging tape to ensure that all relevant employees and contractors know the width and location of proposed track or road.
- If they are identified by field surveys, locations of Declared Rare and Priority flora will be marked out by the Environmental Officer or nominated person and preserved.

Track Use

- Vehicle use will be restricted to tracks and roads where-ever practicable.
- Speed limits will be adhered to so as to reduce the occurrence of fauna fatality and dust generation.
- Wetting down with non-saline water will be conducted as necessary on tracks and haul routes.

Planning of Borrow Pits

- Borrow pits will be located within the corridor surveyed for the haul route.
- A Vegetation Disturbance Permit will be completed and the location of Borrow Pits will be approved by the Environmental Officer before new areas are disturbed.
- Where costeans are dug to determine quality and volume of borrow material, vegetation disturbance will be kept to a minimum and backfilled when no longer required.
- Where possible, borrow pits will be situated behind physical terrain and/or vegetation belts, at minimum distances of 50 metres from access tracks, and 20 meters from the next borrow pit.
- Trees and heavy stands of vegetation will be demarcated by the Environmental Officer and avoided.
- Access to borrow pits will be from a single track only.
- The location and size of borrow pits will be pegged out/flagged before the works begin.
- Borrow pits will be located on slopes if possible, and designed to allow for self draining.
- Borrow pits will conform to natural contours/drainage of the area to minimise ecosystem impact.

Throughout the construction and operation of borrow pits, the following measures will be followed:

- Borrow pits will not exceed 3 hectares in surface area, and 1.5 metres in depth at any point.
- Vegetation overburden will be recovered and stockpiled on the longer sides of the borrow pit.
- The top 100 mm of soil profile (Topsoil) will be recovered and stockpiled along the elongated sides of the borrow pits.
- Topsoil stockpiles will be no higher than 1 metre and will be located 2 metres from the borrow pit boundary to allow for battering during rehabilitation.
- Borrow pits will have slopes graded to permit safe passage of animals (maximum incline of 20 %).
- The removal of borrow material will be limited to the designed pit areas only.
- The final pit floor will be free draining.

Rehabilitation of borrow pits will include:

- Progressive rehabilitation, or rehabilitation as soon as possible following pit closure.
- All rubbish will be removed from areas of the borrow pits.
- Diversion drains and upslope windrows will be utilized to divert surface water flow from entering the pit causing ponding and erosion.
- Topsoil will be spread evenly over the pit floor/edges and access track and then ripped on contour to promote runoff infiltrations.
- Areas will not be driven on after being ripped.
- Local provenance seed will be broadcast to promote revegetation.

5.10.5 Performance Indicators

Access Tracks

- Regular inspections conducted to ensure haul road erosion is minimal.
- A Vegetation Disturbance Permit submitted and approved prior to work commencing in undisturbed areas.
- Baseline flora, fauna and heritage surveys completed.
- Topsoil and vegetation direct returned or stockpiled for later use.
- Site clearing complies with Vegetation and Flora, and Soil management requirements.
- Compliance with the approved plans for the work.
- Progressive rehabilitation of available areas has occurred.

Borrow Pits

- A Vegetation Disturbance Permit approved prior to work commencing in undisturbed areas;
- Site clearing complies with Vegetation and Flora, and Soil management requirements.
- All available topsoil and vegetation stockpiled for later use.
- Borrow pits progressively rehabilitated as soon as possible following pit closure.

5.10.6 Monitoring

Access Tracks

- The Mine Manager or delegate will undertake regular inspections to ensure that haul roads and tracks are established, used and maintained according to the above procedures.

Borrow Pits

- The construction of the borrow pits will be monitored by the Contractor Supervisor.
- Rehabilitation activities will be monitored by the Environmental Officer.

5.10.7 Contingencies

- Where unauthorised clearing has occurred, DEC and DMP will be notified. Vegetation clearing procedures will be examined for any shortcomings.
- Where erosive events, fauna entrapment, or unsuccessful rehabilitation has occurred, borrow pit and haul route design and reforming will be conducted to correct the problem. Rehabilitation contingencies will be undertaken if required.

5.11 WASTE MANAGEMENT

5.11.1 Current Status

Domestic and industrial waste will be stored temporarily on site, and removed by a licensed contractor to landfill sites in Newman. Recycling facilities will be incorporated into the mine campsite and recyclable waste removed separately from other waste. Chemical waste, oily rags, oil and fuel containers and used batteries will be taken to a licensed disposal facility.

5.11.2 Potential Impacts

If inappropriately managed, waste matter can polluted ground and surface water and soil profiles, having negative implications for vegetation communities and fauna habitat. If not properly stored, domestic waste can encourage introduced pest species in the area, influencing local native flora and fauna.

Some chemical and industrial wastes require special methods of disposal, and must be taken to a licensed facility as disposal in landfill results in pollutant leachates.

5.11.3 Objectives

- Ensure wastes are contained and isolated from ground and surface water surrounds and treatment or collection does not result in long term impacts on the natural environment.
- Maximise the recycling and reuse of wastes wherever practicable.
- Ensure waste management practices comply with current legislation, industry standards and waste disposal guidelines.

5.11.4 Implementation

- Waste generation, where practicable, will be minimised through the adoption of efficient designs, reduction of materials required, and reuse and recycling where practicable.
- Reduction – where possible waste reduction will be a priority.
- Recycling – where practical solid materials such as scrap metal will be recycled or reused.
- Recyclable wastes that can be resold economically (e.g. oils, steel, batteries) will be stockpiled separately from general waste for removal from site. Recyclable waste will be removed by a contractor to a recycling facility in Newman, where this is feasible.
- Recycling facilities will be provided in domestic and work areas.
- Domestic waste generated at the Robertson Range Operation will be stored in a landfill located on the eastern side of the northern waste rock landform, within one of the main waste dump areas. The facility will be actively managed with waste covered by a sufficient depth of soil to satisfy any Environmental Protection Act 1986 Part V licensing requirements when these are established, or if none apply to waste management, this facility will operate according to the Environmental Protection (Rural Landfill) Regulations 2002.
- The landfill design will adhere to the following basic parameters where possible; contaminated soils will be spread thinly (50-100mm thick) and will be watered down once a week with a water truck. Material will be scarified and tilled once a month. The landfill area will be sited away from water courses and will be developed on clay soils, where possible.

- Short-term, onsite storage facilities will be designed so as to minimise infiltration of water, formation of leachates, and distribution of litter by wind, water and animal foraging.
- Hazardous and oil based wastes will be transported to Newman for appropriate disposal, or bioremediated onsite.
- Treatment and disposal of sewage will be in accordance with the Health Act.
- All employees and contractors will comply with the following waste procedures.
- Littering will not be permitted.
- Rubbish containers will be carried in all vehicles and provided at all work sites.
- Where foodstuffs are being discarded, covered receptacles will be used to keep animals out.
- Litter and debris will be regularly removed to designated disposal areas.
- Sanitary facilities will be kept in a clean condition.
- Runoff from workshop areas likely to contain oils and solvents will be directed to an oil/water separator.
- As per the DoE standard no more than 100 used or new tyres will be stored on the site.
- Housekeeping inspections of facilities will be undertaken regularly, including the identification of any fire hazards.
- Induction training of the workforce will cover waste management.
- Surplus or waste chemicals and hydrocarbons or any associated contaminated soil, containers etc. are disposed of in an approved manner, including a possible bioremediation facility.
- Liquid effluent generated at the site, including oils and water from the workshop, will be managed in accordance with relevant legislation. Oil water separators will be incorporated into workshops and refuelling depots.
- Batteries and scrap metal will be recycled.
- Used tyres will be stored in accordance with Part 6 of the Environmental Protection Regulations 1997.
- Sewage and grey water from the mine operations will be treated on-site using an approved waste water treatment plant.
- Waste production will be audited periodically to identify new opportunities for reduction, re-use and recycling.

5.11.5 Performance Indicators

- Sewage discharged in accordance with statutory regulations.
- House keeping inspections undertaken.
- Recycling procedures implemented.
- Environmental induction provides information on waste management.
- Wastes disposed of and treated to comply with the Mines Safety and Inspection Act.

5.11.6 Monitoring

- Housekeeping inspections to be undertaken monthly by the Contractor Supervisor. This will include inspecting storage areas for leaking bunds, drums or containers and inventories of spill response equipment and materials.
- Annual monitoring / review of existing waste management procedures will be undertaken by the Environmental Officer.
- Wastewater will be monitored by the Environmental Officer.
- Details of quantities of recycled waste material (e.g. steel) will be recorded by the Environmental Officer.

5.11.7 Contingencies

- Incorrect waste disposal will be reported as an environmental incident within 24 hours by completing Incident/Non-conformance Report. Investigations will be undertaken as required.

5.12 HYDROCARBON CHEMICAL AND EXPLOSIVE STORAGE AND USAGE

5.12.1 Current Status

Development of the mine site will include installation of diesel generators and storage facilities, vehicle workshops and refuelling depots, an explosives magazine and a chemical store.

5.12.2 Potential Impacts

Hydrocarbons and chemicals that are not stored correctly with sufficient safety mechanisms represent a potential contamination threat to the environment. Corrosion and seal breakages can release contaminants into the soil and surface/groundwater system, and are difficult to treat once they have permeated to depth. Failsafe mechanisms must be installed to ensure that leakages are identified and remediated before contamination occurs.

Chemicals that are not labelled correctly represent an occupational health and safety hazard, and accurate MSDS (Materials Safety Data Sheets) records will be maintained.

Explosives are inherently unsafe and must be stored appropriately in an explosives magazine. Failure to adequately store explosives could result in an explosion that may create a safety hazard, contaminate the surrounding area and trigger a bush fire.

5.12.3 Objectives

- Minimise the impact of hydrocarbons/chemicals (solvents, cleaning fluids etc) on the local and regional environment through the appropriate use, storage, transport and disposal of hydrocarbons and chemicals and associated infrastructure.
- Ensure that hydrocarbon and chemical spills are properly contained, treated, transported and disposed of.
- Undertake construction and operation activities to ensure that the risk of hydrocarbon and chemical spills is minimised.
- Undertake construction and operation activities to ensure that the risk of explosion is minimised.

5.12.4 Implementation

Hydrocarbon and Chemical Management

- All chemicals will be approved for use by the Mine Manager prior to being transported to Robertson Range.
- Material Safety Data Sheets (MSDS) will be available for all chemicals used on site. Handling, use and storage of chemicals will be compliant with the relevant MSDS.
- Hydrocarbons and chemicals will be stored, used, transported and disposed in accordance with Dangerous Goods Regulations and DoIR guidelines.
- Hydrocarbons will be stored in accordance to Australian Standards for the Storage and Handling of Flammable and Combustible Liquids (AS 1940 – 1993) and will be segregated, where required, to ensure that incompatible classes of chemical are not stored together.
- Bunded and lined storage facilities will be signed, located away from watercourses, and a safe distance from infrastructure.

- All vehicle refuelling and maintenance will be conducted in contained areas with bunded floors to contain spills. If equipment needs refuelling or servicing outside of the designated area all relevant precautions should be taken to minimise the probability of hydrocarbon spill.
- Storage facilities will be equipped with adequate fire control equipment and spill response material/equipment.
- Hydrocarbons and chemicals will be transported to work sites by a service vehicle fitted with secondary containment equipment.
- Drums and containers on the service vehicle will be properly secured to restrict movement and spillage.
- The service vehicle will have a spill kit on board.
- Emergency Response Plans will be in place and suitable training will be undertaken to ensure swift and effective clean up in the event of contamination of surface and groundwater.
- Induction training of the workforce will cover handling and storage of hydrocarbons and chemicals and spill response procedures.
- All tanks and pipe work for chemicals and hydrocarbons are above ground.
- Vehicles and equipment on site will only be cleaned in designated wash down areas using biodegradable or quick break degreaser or detergents.

Disposal of Used Hydrocarbons and Chemicals:

- Used hydrocarbon containers will be adequately labelled and stored appropriately for future use or disposal.
- Empty drums and containers will be periodically removed from site and disposed or recycled according Waste Management strategies.
- Hydrocarbons and oily wastes (e.g. fuels, greases, de-greaser, emulsified oils and oily waste water) generated on site, will be captured and stored for removal from site by a licensed contractor for safe disposal or recycling.
- Storage facilities for hydrocarbons, oily wastes and chemicals will incorporate secondary containment to protect against failure of individual containers.
- Contaminated soil will be collected and disposed of at a licensed facility offsite, or bio-remediated onsite.
- Regular reviews of waste management practices and storage of hydrocarbons and chemicals will be undertaken.

Explosives Management

- The planned explosives magazine will be located a safe distance from other mine site facilities, and built/handled according to requirements of the Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.

5.12.5 Performance Indicators

Hydrocarbon and Chemical Management

- Containers clearly and appropriately labelled.
- Transport, storage, handling and disposal of hydrocarbons/chemicals/explosives on site comply with relevant legislation and DoIR guidelines.

- No accidental release of oily water from secondary containment areas into the environment.
- Servicing and maintenance of vehicles and equipment in accordance with management procedures.
- Waste generated from servicing and maintenance of vehicles and equipment stored and disposed of in accordance with waste management and hydrocarbon storage and spill procedures outlined in this document.
- No spills or environmental impacts associated with the use of hydrocarbons and the servicing and maintenance of vehicles and equipment.

Hydrocarbon and Chemical Spills

- Compliance with site Emergency Response Plan.
- Reporting, investigation and clean up of spills in a prompt and timely manner.
- Recording of known or suspected contaminated sites.

5.12.6 Monitoring

Hydrocarbon and Chemical Management

- Housekeeping inspections using an Environmental Inspection Report will be undertaken by the site Environmental Officer and Contractor Supervisor. This will include inspection of storage areas for leaking bunds, drums or containers, inventories of spill response equipment and materials and inspection of areas approved for minor maintenance and servicing of vehicles and equipment.

Hydrocarbon and Chemical Spills

- Weekly housekeeping inspections of waste management practices and storage of hydrocarbons and chemicals will be undertaken by the site Environmental Officer.

5.12.7 Contingencies

- In the event of a hydrocarbon or chemical spill, or unplanned explosion, emergency response procedures will be implemented immediately.
- All chemical and hydrocarbon spills exceeding 205 l will be reported to the DEC and DoCEP as required.
- Contaminated soil will be collected and disposed of at a licensed facility offsite. Alternatively, a designated site for bioremediation will be operated on site in accordance with the Department of Environment and Conservation: Bioremediation of hydrocarbon-contaminated soils in Western Australia October 2004. Contaminated soils will be spread thinly (50-100mm thick) and will be watered down once a week with a water truck. Material will be scarified and tilled once a month. The site will be sited away from water courses and will be developed on clay soils, where possible.
- All environmental non-conformances will be recorded and maintained in an Environmental Incident and Non-conformance Register. Management practices will be reviewed and updated accordingly.
- The site Environmental Officer will conduct an analysis of any non-conformances and adjust management practices to address root causes of the incident.

5.13 BUSHFIRE CONTROL

5.13.1 Current Status

The proposed development will occur over a sandy plain that is susceptible to bushfire. Fire scars are evident across a large portion of the project area.

5.13.2 Potential Impacts

The project area will be subject to increased risk of bushfire as a result of mining activities, transportation to site, and the increased human activity in the area. Uncontrolled bushfires have the potential to scar large areas of country beyond the extent of the project area, impacting native vegetation and fauna habitats. Although bushfires are a natural occurrence in the Pilbara, increased frequency resulting from human activity would be anomalous to the natural fire record.

Bushfires and smaller spot fires also present an occupational health and safety risk to site employees.

5.13.3 Objectives

- Prevent bushfires resulting from activities associated with FerrAus operations.

5.13.4 Implementation

- Deliberate starting of fires, other than in approved or designated areas will be prohibited.
- Employees and contractors will be required to attend an Environmental Induction prior to the commencement of work which will include bushfire prevention and emergency response procedure using National Fire Training modules.
- All site employees and contractors will be skilled in fire prevention and management.
- Select site personnel will undergo more advanced training in fire prevention and suppression.
- Fire suppression refreshment training will be undertaken at least 6 monthly or earlier if needs necessitate.
- Fuelling of vehicles will be carried out in designated areas away from vegetation;
- Fire suppression equipment will be kept on all mobile plant and equipment at fire risk locations.
- No controlled burning will take place unless directed or approved by the DEC.
- Diesel powered vehicles will be used on site, petrol fuel vehicles especially those fitted with catalytic converters (which operate at high temperatures) will be avoided to reduce the chance of fire.
- Fire safety inspections will be periodically undertaken by the site Environmental Officer.
- Accidental fires will be investigated using Incident/Non-Conformance Report and reported to the Mine Manager.
- Fire suppression equipment will be inspected on a regular basis and maintained in a fully operational condition.

- House keeping inspections will be undertaken on a regular basis, at least monthly, and records maintained.

5.13.5 Performance Indicators

- Fire fighting equipment present at stipulated locations on site.
- Fire suppression equipment maintained in proper working order.
- Frequency and severity of accidental fires reduced or negated.
- Details of fires, especially frequency and severity recorded.

5.13.6 Monitoring

- Housekeeping inspections and routine maintenance of fire fighting equipment will be undertaken by the site supervisor.
- All equipment that may cause fires will be inspected and potential fire hazards addressed. Pre-start checks are to be recorded on the appropriate daily inspection form.
- Records of fire training maintained.
- Fire suppression equipment inspections recorded.

5.13.7 Contingencies

- Immediate implementation of Emergency Response Plan in the event of fire.
- Evaluation conducted of employee performance of fire suppression at 6 monthly intervals and after the event of an outbreak of fire.

5.14 WEED AND PEST MANAGEMENT

5.14.1 Current Status

Two declared weed species potentially occur within the Pilbara: **Parkinsonia culeate* and **Salvinia molesta*.

Three general/environmental weeds have been recorded near Robertson Range: Buffel Grass (**Cenchrus ciliaris*); Ruby Dock (**Acetosa vesicaria*); and Bipinnate beggartick (**Bidens bipinnate*).

No general/environmental or declared weed species were recorded as occurring at the Robertson Range study site.

5.14.2 Potential Impacts

Pest species can have a marked impact on local flora and fauna through predation (Feral Cat), competition (House Mouse and Rabbit), overgrazing and land degradation (Rabbit, Donkey, Cow).

Environmental weeds (including those mentioned above) are highly invasive and lead to the displacement of native vegetation and the loss of habitat for fauna species. As no weed species were recorded within the project area, efforts should be made to ensure colonisation does not occur.

5.14.3 Objectives

- Prevent the colonisation of weed species in the project area.
- Prevent to propagation of pest species in the project area.

5.14.4 Implementation

Weeds

- Baseline surveys of undisturbed areas to be cleared will be undertaken to establish status of weed species.
- Disturbance to natural vegetation will occur only as authorised and limited, as far as practicable to limit invasion by introduced species.
- The site Environmental Officer will monitor and identify any new occurrences of weed species and implement management strategies to control potential outbreaks.
- Quarantine areas encompassing known infestation will be established and demarcated by the site Environmental Officer, location noted, advise to all employees and access prohibited until appropriate action for control/prevention is implemented.
- Weed dispersal will be controlled through establishment of weed hygiene procedures if weed outbreaks are identified.
- Provision of a guide to weeds and their management in Western Australia to all personnel.
- During mining activities, any locations of weed outbreaks will be reported to the site Environmental Officer.
- No plants or animals will be brought onto the project area by FerrAus/contractors.
- Earthmoving/mobile plant and construction equipment will be washed down and cleaned of all vegetative, soil and rock material, prior to mobilisation to the project

area. Weed hygiene certificates will be completed and recorded (see Appendix 2 for certificate).

- A weed control program will be implemented if weed species are found to have been introduced into the area due to FerrAus activities.
- Spot spraying of emergent weed species within project areas will be carried out to gradually deplete seed stocks and reduce or eliminate any new colonisation, generated by work activities.

Target Weed Species

- Weed species will have a suitable glyphosphate herbicide, e.g. Roundup, applied.
- Where practicable, the appropriate herbicide will be applied once plants are in full foliage and actively growing, and before seeding.

Pests

- Waste will be managed according to specified strategies to prevent propagation of pest species around the mine and camp areas.

5.14.5 Performance Indicators

- Baseline weed surveys completed.
- A significant flora and weed identification guide made available for all personnel.
- Weed hygiene procedures adopted.
- Compliance with contractual requirements.
- No persistent new introductions or spread of weeds.
- No increase in pest species number.

5.14.6 Monitoring

- At the completion of mining rehabilitation, weed infestation surveys will be commissioned by FerrAus using suitably qualified external consultants.
- The site Environmental Officer will be responsible for monitoring of weed species in progressively rehabilitated area, and implementation of management strategies.
- New weed colonies identified by site staff or the Environmental Officer will be monitored weekly during herbicide spraying to assess effectiveness of weed control measures.
- The site Environmental Officer will monitor presence of pest fauna species and determine if additional controls are necessary.

5.14.7 Contingencies

- New infestations of weeds or pests will be reported as an environmental incident.
- Weed management strategies will be implemented, including spraying of herbicides on target species.
- Additional hygiene control measures may be enforced if weed outbreaks occur.
- Fencing of rehabilitation areas may be erected if pest fauna species are impairing establishment of vegetation.

5.15 DUST

5.15.1 Current Status

A number of project activities at the mine site will contribute to elevated dust concentration in the immediate area. This includes mining, crushing, screening, stockpiling of ore and open cleared areas.

5.15.2 Potential Impacts

The lay down and loading areas will be unsealed and subject to dusting when dry. The degree of dust generated will depend on the moisture content of the ground surface during preparation and the climatic conditions. Dust will be generated during the construction period from the earthworks, stripping of the mine site, movement of vehicles and from exposed bare ground.

The mine site is isolated from settled areas, with the closest residences at Jigalong Aboriginal Community 25 km to the north east. The mine campsite will be several kilometres away, and is therefore unlikely to be effected by mine site dust. To ensure safe working conditions, standard dust suppression measures will be conducted at the mine site.

There are no sensitive ecological communities or water bodies in the area that could be influenced by dust settling.

Due to the location of the mine site, dust related issues are not considered a high priority impact.

5.15.3 Objectives

- Ensure that dust does not create any environmental or health problems cumulatively, or as a result of individual events.

5.15.4 Implementation

- Clearing will be minimised and where possible progressive rehabilitation of disturbed areas will be carried out.
- Unsealed, regularly trafficked roads such as access tracks, work areas and haul roads will be regularly watered by water carts, with vehicle speeds limited and access restricted where necessary. If required, an environmentally friendly chemical dust suppressant such as lignin will be used to treat the unsealed surface of the haul road.
- The crushing and screening plant at Robertson Range will be fitted with dust suppression and extraction equipment features that may include but are not limited to:
    - o containment apparatus on conveyor transfer points;
    - o belt scrapers on the conveyor belt;
    - o collection trays under the belt plough on the return belt;
    - o dust suppression sprinklers at transfer points and stockpiles;
    - o deluge sprays at the ROM area and the hopper; and
    - o if any infrastructure is required to be moved from its original position once the Project is operational, then dust control equipment will be reinstalled and operated according to the original plant specifications.

- Product and ROM stockpiles will be regularly monitored to determine whether there is significant fugitive dust and additional water will be applied as necessary.
- Staff who will be exposed to dusty conditions will be equipped with appropriate masks as required.

5.15.5 Performance Indicators

- No adverse health or environmental impact resulting from dust generation.

5.15.6 Monitoring

- Supervisors will monitor dust levels associated with mining, processing and track use. Formal monthly inspections will be made by the site Environmental Officer.

5.15.7 Contingencies

- Significant Aeolian erosive events or elevated dust levels will be reported in a Incident/Non-conformance Report Form.
- All staff are required to report adverse health resulting from elevated dust levels or lack of suitable protection.
- Where elevated dust levels have been reported, further dust suppression will be considered and implemented if necessary. Where appropriate this may include increased wetting, wind fencing, or use of chemical dust suppression.

5.16 NOISE

5.16.1 Current Status

Noise will be generated during the construction and operation of the Robertson Range Iron Ore project. As the project is not located near any townships or settlements, noise will not have any social impact near the mine site. It is not anticipated that there will be any environmental consequences related to noise.

5.16.2 Potential Impacts

Health and safety of staff is at risk due to high noise levels

5.16.3 Objectives

- Ensure that noise levels are minimised as feasible, and that there are no adverse impacts to human health or the environment.

5.16.4 Implementation

- Signage will be erected at appropriate locations on site to ensure personal wear appropriate protective equipment and adhere to occupational health and safety standards.
- Machinery will be regularly serviced to minimise noise generation.
- Installed equipment will be designed to meet occupational noise standards.
- Generators will be located in enclosed areas and at a sufficient distance from personnel areas to minimise sound disturbance.

5.16.5 Performance Indicators

- No complaints or adverse health resulting from high noise levels.

5.16.6 Monitoring

- Noise monitoring will be conducted as required.
- Any complaints related to noise levels or availability of protective equipment shall be immediately reported to a supervisor.

5.16.7 Contingencies

- In the event of noise complaints, noise levels will be monitored and appropriate remedial action will be taken where required.

5.17 VEHICLE/EQUIPMENT MAINTENANCE AND STORAGE

5.17.1 Current Status

A vehicle maintenance and refuelling depot and workshop facilities will be constructed at Robertson Range.

5.17.2 Potential Impacts

Impacts resulting from the vehicle maintenance and refuelling depot and workshop facilities related primarily to hydrocarbon and chemical spills, storage and management. Poorly managed facilities, or incorrect use of facilities could result in areas of soil and water contamination.

5.17.3 Objectives

- To limit impacts on the environment from vehicle/equipment maintenance, refuelling and associated infrastructure.
- Disposal of waste materials related to vehicle/equipment maintenance in a manner which limits impacts to the environment.

5.17.4 Implementation

- All vehicle refuelling and maintenance will be conducted in contained areas with bunded floors to contain spills.
- Equipment and procedures are used (e.g. vacuum pumps to remove oil, drip trays, etc.) to contain discharge and spillages when servicing equipment.
- If equipment needs refuelling or servicing outside of the designated area all relevant precautions should be taken to minimise the probability of hydrocarbon spill.
- Vehicles and equipment on site will only be cleaned in designated wash down areas using biodegradable or quick break degreaser or detergents.
- Any gases classed as ozone depleting substances will be managed to ensure they are not released to the environment.
- Used oil filters, batteries and other waste resulting from minor servicing and maintenance activities will be retained in the appropriate waste receptacles and disposed of in accordance with Waste management strategies.
- Waste oils/liquids, spills and soil contaminated from servicing and maintenance activities will be managed in accordance with the hydrocarbon and chemical spill management strategies outlined in this document.
- Oil/water separator facilities will be constructed in workshop areas.
- Waste oils from maintenance activities are captured and stored in bunded tanks and removed for safe disposal or recycling by an approved contractor.
- Hydrocarbons and oily wastes (e.g. fuels, greases, de-greaser, emulsified oils and oily waste water) generated on site, are captured and stored in bunded tanks to be either reused on site or removed off site for safe disposal or recycling.

5.17.5 Performance Indicators

- Servicing and maintenance of vehicles and equipment in accordance with management procedures.

- Waste generated from servicing and maintenance of vehicles and equipment stored and disposed of in accordance with waste management and hydrocarbon storage and spill procedures outlined in this document.
- No spills or environmental impacts associated with the servicing and maintenance of vehicles and equipment.

5.17.6 Monitoring

- Inspection of areas approved for minor maintenance and servicing of vehicles and equipment be undertaken by the Contractor Supervisor using an Environmental Inspection Report.

5.17.7 Contingencies

- Spills or other environmental impacts associated with minor servicing and maintenance of vehicles and equipment will be reported using Incident/Non-Conformance Report. Management practices will be reviewed and updated accordingly.
- Response procedures will be implemented as a result of any chemical or hydrocarbon spills.

5.18 SEWAGE

5.18.1 Current Status

Sewage and grey water from the mine operations will be treated on-site using an approved waste water treatment plant.

5.18.2 Potential Impacts

Impacts from Sewerage leakage could have detrimental effects on environmental heath and workplace hygiene.

5.18.3 Objectives

- To limit impacts on the environment from site sewerage disposal.

5.18.4 Implementation

A BioMAX model C50K Aerobic Treatment Unit will be installed, which will be fed from the plant, administration and mining contractor areas. The design of this unit is based on effluent that can be categorized as “Medium strength Domestic Sewage”, which is a combination of black water from toilet facilities (25 to 40% of the total loading) and grey water from showers, hand basins and laundry. The total flow in any 24 hour period is 50 000 L/day.

The BioMAX systems are designed to conform with the most stringent standards in Australia, as set down in the Specification for Aerobic Treatment Units (ATUs). The desirability of nutrient removal in a wastewater treatment system will vary depending on the characteristics of the receiving environment. In most applications the residual nutrient content in the effluent from a Bio MAX system will ‘feed’ the flora in the irrigation disposal field or be ‘taken up’ in the soil, substituting the application of chemical fertilisers to the lawn.

Almost complete nitrification takes place within the system. Total Nitrogen (TN) reduction achieved varies between 80 and 100%. With the use of Alum Dosing the Total Phosphorus (TP) level in the effluent is completely removed. The effluent is expected to be free from non-biodegradable solids and chemicals that can harm the microbial activity within the system.

As the quality of the reclaimable water produced through the BioMAX exceeds the World Health Organisation nominated standards or irrigation, the effluent will be approved for dripper irrigation.

5.18.5 Performance Indicators

- Treatment and disposal of sewerage is in accordance with management procedures.
- No spills or environmental impacts associated with the Treatment and disposal of sewerage products.

5.18.6 Monitoring

- Inspection of sewerage facilities and the waste water treatment plant will be undertaken by the Contractor Supervisor using an Environmental Inspection Report.

5.18.7 Contingencies

- Spills associated with sewerage control and disposal will be reported using Incident/Non-Conformance Report. Management practices will be reviewed and updated accordingly.
- Response procedures will be implemented as a result of any sewerage spill.

6.0 STAKEHOLDER CONSULTATION

Preliminary conversations have been had with EPASU, DIA, DMP and DEC Karratha. Below is a list of stakeholders that are involved in the consultation process (Table 6.1).

Table 6.1: Key Stakeholder Contacts

Stakeholder Group	Stakeholder Contact
Meekatharra Shire	Initial discussions only
DEC Karratha	Suzanne Roworthe (preliminary contact re: Part V licence at port)
DMP	Justin Robins
DEC EPASU	Tim Gentle (preliminary advice re: referral)
DIA – Aboriginal Lands Trust	Jaqueline Brienne (preliminary advice re: reserve requirements)
Landowners	Jigalong contacted.
Conservation Council of WA	Not contacted
Wildflower Society of WA	Not contacted
Native Title Claimants	Nyiyaparli
Jigalong Community Inc.	Various members of this community

7.0 AUDITING

Auditing processes assess compliance to performance criteria. Both internal and external auditing processes are included in this section.

Auditing procedures associated with mine closure and completion have not been included in this EMP.

7.1 INTERNAL AUDITS

Monitoring and reporting procedures have been described for individual environmental management issues in preceding sections, see section 4.2.1. Regular housekeeping, rehabilitation and site inspections, and record keeping procedures are also requirements of this environmental management plan.

7.2 EXTERNAL

External audits will be undertaken as required by regulators. This is likely to be on an annual basis by environmental officers from the Department of Industry and Resources. Where FerrAus has not fulfilled environmental obligations, an external party will be requested to conduct an environmental audit of the site, and make recommendations to regulatory agencies and the company for improvement of management procedures.

8.0 REVIEW AND REVISION

This management plan will be reviewed annually or at such time as the project scope changes. The revision status will be recorded as directed by FerrAus project management.

The review will seek to incorporate any new investigations, management information and working techniques.

The following aspects of the EMP will be addressed in the review process:

- Success of meeting targets and objectives for all project aspects.
- Compliance with / updates to Aboriginal Agreement.
- Adequacy of responses to environmental non-conformances.
- Effectiveness of management strategies.
- Effectiveness of reporting and monitoring procedures in identifying deficiencies in environmental management.
- Updates to management strategies based on identification of priority flora/fauna, or introduction of new pest/weed species in the project area.
- Updates of management strategies related to changes in project scope or key aspects.

If operational changes have been made to the EMP, DMP will be supplied with a draft version for review. Recommendations made by DMP will be discussed and implemented if required and final document submitted. Other regulatory agencies and/or NGO's may be contacted including DIA, DEC, DoW and indigenous groups depending on the scope of changes to the EMP.

The revision status of the EMP will be recorded in the "Document Status" table contained in the EMP.

9.0 REPORTING

An annual environmental report will be produced by FerrAus as required by DMP, outlining the following;

- Success of meeting targets and objectives of this EMP.
- Results of environmental/heritage surveys conducted.
- Success/progress of rehabilitation.
- Environmental incidents and non-conformances, and mitigative action taken.
- Changes in company policy or strategy towards the environment.
- Changes in project scope.
- Changes in landholder agreements.

This report will be made available to DMP and all other interested stakeholders (e.g. Jigalong Community Inc., DIA, DEC, DoW).

Annual and three monthly reports will be produced for the DoW outlining the quality and level of bore water utilised in the project. This will be a requirement for all 5c Licences under the Rights in Water and Irrigation Act 1914.

The timing and frequency of external audits may depend on environmental performance and rehabilitation success. The DEC and DMP will be notified as required in the following circumstances;

- Identification of rare/threatened flora and fauna on-site.
- Invasion of declared weed species into the project area.
- In the event of major chemical or hydrocarbon spills.
- Occurrence of fire on site.
- Salinification of ground or surface water.
- If environmental objectives have not been met.
- Where rehabilitation efforts have not been successful and additional planning is required.
- After major erosive events.

Additional reporting requirements will be satisfied by FerrAus as agreed with relevant regulatory bodies. The various environmental registers maintained by the company will be made available on request.

This page has been left blank intentionally

10.0 REFERENCES

Aquaterra, (2007). Robinson Range Dewatering Study, Report generated for FerrAus Limited.

Beard, J.S. (1975). Pilbara. Explanatory notes to Sheet 4, 1:1,000,000 Series Vegetation Survey of Western Australia. Perth, University of Western Australia Press.

Department of Industry and Resources. (2006). Guidelines for Mining in Arid Environments.

Department of Industry, Tourism and Resources. (2006). Mine Rehabilitation, Commonwealth of Australia.

Desmond, A., Kendrick, P. and Chant, A. (2003). Gascoyne 3 (GAS3 Augustus subregion). In: A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002 (eds J.E. May & N.L. McKenzie). Department of Conservation and Land Management, pp. 240-251

ecologia Environment (2007a). FerrAus Limited Robertson Range Biological Survey, developed from FerrAus limited.

ecologia Environment (2007b). FerrAus Limited Robertson Range Haul Road Biological Survey, developed from FerrAus limited.

Environmental Protection Authority (2002). Position Statement 3 – Terrestrial Biological Surveys as an Element of Biodiversity Protection. Environmental Protection Authority, Western Australia.

Environmental Protection Authority (2004a). Guidance for the Assessment of Environmental Factors No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. Environmental Protection Authority, Western Australia.

Environmental Protection Authority (2004b). Guidance for the Assessment of Environmental Factors No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Environmental Protection Authority, Western Australia.

Thackway, R. and Cresswell, I.D. (1995). An Interim Biogeographic Regionalisation for Australia. Australian Nature Conservation Agency, Canberra.

Van Vreeswyk, A.M.E.; Payne, A.L.; Leighton, K.A. and Hennig, P. (2004). An inventory and condition survey of the Pilbara region, Western Australia. Technical Bulletin No. 92, Department of Agriculture (Govt. W.A.), South Perth.

Williams, I.R. and Tyler, I.M. (1991). Robertson, Western Australia (2nd Edition) 1:250 000 Geological Series - Explanatory Notes. Geological Survey of Western Australia

APPENDIX 1

Table 1: Consequence Severity Table.

Level		Consequence & *Example*
1	Insignificant	No detectable impact on population.
		Individual mortality due to roadkill.
2	Minor	Short-term or local impact to population.
		Removal of a small proportion of habitat for a short period of time.
3	Moderate	Long-term detrimental, but recoverable, impact on population.
		Removal of a large proportion of habitat that will be rehabilitated as suitable habitat in the future.
4	Major	Long-term detrimental impact on the population, which may not be recoverable, and the population is threatened with extinction.
		Removal of habitat to the threshold required to maintain a viable population.
5	Catastrophic	Non-recoverable population decline leading to extinction.
		Excessive removal of habitat beyond the threshold required to maintain a viable population.

Table 2: Likelihood Ranking Table.

Level		Likelihood
A	Almost certain	The incident is expected to occur most of the time (*i.e.* every time).
B	Likely	The incident will probably occur in most circumstances (*i.e.* regularly, weekly).
C	Moderate	The incident should occur at some time (*i.e.* quarterly)
D	Unlikely	The incident could occur at some time during the life of the project.
E	Rare	The incident may occur only in exceptional circumstances and may never happen.

Table 3: Risk Matrix.

		Consequences				
		1	2	3	4	5
Likelihood		Insignificant	Minor	Moderate	Major	Catastrophic
A	Almost certain	S	S	H	H	H
B	Likely	M	S	S	H	H
C	Moderate	L	M	S	H	H
D	Unlikely	L	L	M	S	H
E	Rare	L	L	M	M	S

Where:

H	High impact	Senior management involvement and planning needed and DEC must be consulted with.
S	Significant impact	Senior management attention needed and DEC must be consulted with.
M	Moderate impact	Management responsibility must be specified.
L	Low impact	Manage by routine procedures.