WINGELLINA NICKEL PROJECT

SECTION 38 REFERRAL

SUPPORTING DOCUMENT

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1.0 INTRODUCTION

1.1 Purpose of Document

This document has been prepared to provide supporting information to the environmental Protection Authority (EPA) for the referral of the proposal under Section 38 (Part IV) of the *Environmental Protection Act 1986* (EP Act).

The completed S38 Referral form is attached to the cover letter addressed to the EPA.

1.2 The Proponent

The proponent for the Wingellina Nickel Project (the Project) is Hinckley Range Pty Ltd (Hinckley Range) a wholly owned subsidiary of Metals X Limited.

1.3 The Project

1.3.1 Location

The Project is located approximately 1,450 km east-northeast of Perth within the Shire of Ngaanyatjarraku in Western Australia (**Figure 1**). The Project is eight kilometres south-west of Surveyor Generals' Corner, the junction between WA, the Northern Territory (NT) and South Australian (SA), and adjacent to the Gunbarrel Hwy. The Project is located entirely on Exploration Licence E69/535 and Aboriginal Reserve 17614. The Reserve is leased for 99 years to the Ngaanyatjarra Land Council (NLC), and on granted Native Title Land which is managed for and on behalf of the Traditional Owners by the Ngaanyatjarra Council.

1.3.2 Project Characteristics

Hinckley Range proposes to develop the Project involving open pit mining of nickeliferous limonite ore and on-site processing using a high pressure acid leach (HPAL) process, to produce an intermediate mixed nickel-cobalt hydroxide product (**Figure 2**). The mine will produce approximately 40,000 tonnes (t) of nickel and 3,000 t of cobalt metal in concentrate per annum for 40 years. The processed nickel-cobalt hydroxide will be transported to overseas markets, via road and rail to the Port of Darwin or the Port of Adelaide. A summary of the key characteristics of the Project is presented in **Table 1**.

Table 1 Key Project Characteristics

Characteristic	Detail
General	
Location	Approximately 1,450 km east-northeast of Perth and 1,500 km south of Darwin. GDA94 MGA zone 52 coordinates are 495000 mE and 7119000 mN (refer to Figure 1.1)
Project life (mining)	40 years
Size of ore body	1.8 million tonnes (Mt) of nickel (Ni) metal and 139,000 tonnes (t) of cobalt (Co)
Proposed timing	Complete detailed design: Q2 2015

Characteristic	Detail
	Commence ground disturbance: Q2 2016 Commission process plant: Q4 2017 First shipment of concentrate: Q1 2018
Mining	
Average mining rate	4.3 Mtpa ore; approximately 2.15 Mtpa waste rock for years 1-20 and 7.4 Mtpa of waste rock for years 21-39
Mining method	Open pit with conventional load and haul methods
Nominal pit impact area	10 km x 0.6 km x 80 m average (up to 200 m) depth (initially as separate pits which will ultimately coalesce into 3 groups of pits in the North, Central and South Zones)
Operating hours	24 hours per day, 7 days per week, 365 days per year
Waste rock management	Combination of in-pit waste placement and conventional out-of-pit waste rock landform. Waste landform designed and constructed to blend in with the natural local relief. There is not considered to be any potentially acid forming material in the area.
Ore processing	
Process type	High pressure acid leach (HPAL)
Process design throughput rate	4.34 Mtpa
Process modules	ROM Pad, crushing, dewatering, process water storage and recycling, dirty water recycling and ore stockpiles. Calcrete plant, sulphuric acid plant, thickener, counter current direction tanks, water cooling towers, tailings neutralisation circuit, TSF, product filter and packaging process
Reagents	390,000 t/yr of elemental sulphur 860,000 t/yr of calcrete 35,000 t/yr of magnesium oxide
Water management	
Source(s)	Process supply water will be sourced from the Cobb Depression, located on tenement L69/19 (at application stage) and piped 100 km to the Project.
General	
Water usage	The raw water requirement for the processing plant is approximately 1200 cubic metres per hour (m^3/hour) Construction phase: to be calculated during DFS Mine, plant and accommodation village: 12 gigalitres per annum Dust suppression: to be calculated during DFS
Rate of abstraction	Subject to ongoing hydrogeological investigations

Characteristic	Detail
Dewatering discharge	All water discharge will be bound within the processing plant tailings. Approximately 200 m^3/hr of water will be able to be recovered and re-used from the TSF. All water dewatered from mining areas will be supplied to and used by the processing plant, reducing the demand from the borefields. Additional water which is unrecoverable will report to the TSF / WSF where it will either be re-used or evaporated.
Potable water	To provide potable water, bore water will be treated through two RO plants at the mine site (one at the accommodation village and one at the concentrator).
Supporting infrastructure and human resources	
Mine site	Workshops, hardstand areas, administration buildings, access roads, borefields, laboratory, processing plant, explosive storage magazine, waste landfill, fuel storage, water storage, septic waste treatment, communications systems.
Accommodation	Construction: 1500 Person accommodation village Operations: 500 Person accommodation village
Transport	Alternative options for the transport of the concentrate to include: • Via road to road to Impadna rail siding in the NT (450 km); or • Via road to Kulgera rail siding in the NT (500 km); or • Via road to Chandler Siding in SA (480 km). And then via rail from the Impadna/Kulgera/Chandler siding to the Port of Darwin or Adelaide (~1,100 km). Calcrete will be transported via road from the calcrete deposit to the mine site (22 km)
Electrical Power Operation	Average consumption: 38 MW Design capacity: 64 MW Electrical power for the operation will be generated in a cogeneration plant using steam produced in the sulphuric acid plant, and natural gas. The gas consumption rate will be 5.7 TJ/day under normal operation and approximately 13 TJ/day during acid plant outages. The HPAL processing plant is designed to operate at 50% capacity during acid plant outages. The Project will produce approximately 1.2 Mtpa of sulphuric acid from a sulphur burning acid plant.
General	
Electrical Power Start Up	Project start-up (accommodation and borefields): diesel generators. Operations: diesel generators will be used for plant start-up.
Electrical power	The borefield will be powered by remote gensets (diesel has been allowed for, however LPG options are to be investigated), and controlled via telemetry

Characteristic	Detail
borefield	controls at the plant site.
Workforce	450 person workforce, including both locally sourced and fly-in fly-out employees. Up to 1,500 people during construction.
Mine rehabilitation	
Pit	Abandonment bunds to be constructed around final pits.
Waste rock landforms	Sides 18 degree battered, covered with topsoil, deep ripped, revegetated
Supporting infrastructure	Removed where possible, cleared areas revegetated
Cleared areas	Covered with topsoil, deep ripped, revegetated
Monitoring	Rehabilitated areas monitored annually until completion criteria met
Estimated clearing for proposed infrastructure	
Waste Landforms	< 255 ha
Topsoil Storage Areas	124 ha (to allow for segregation of stockpiles)
TSF	1,185 ha
Water Storage	174 ha
Plant Area	106 ha
Airstrip	30 ha
Pits	488 ha
Haul /Access roads	85 ha (based on 25 m wide haul roads and includes existing cleared tracks).
Accommodation Village	23 ha
Total estimated clearing for proposed infrastructure (excluding borefield)	2,571 ha
Borefield and pipeline infrastructure	To be calculated after the final borefield for the Project is chosen.

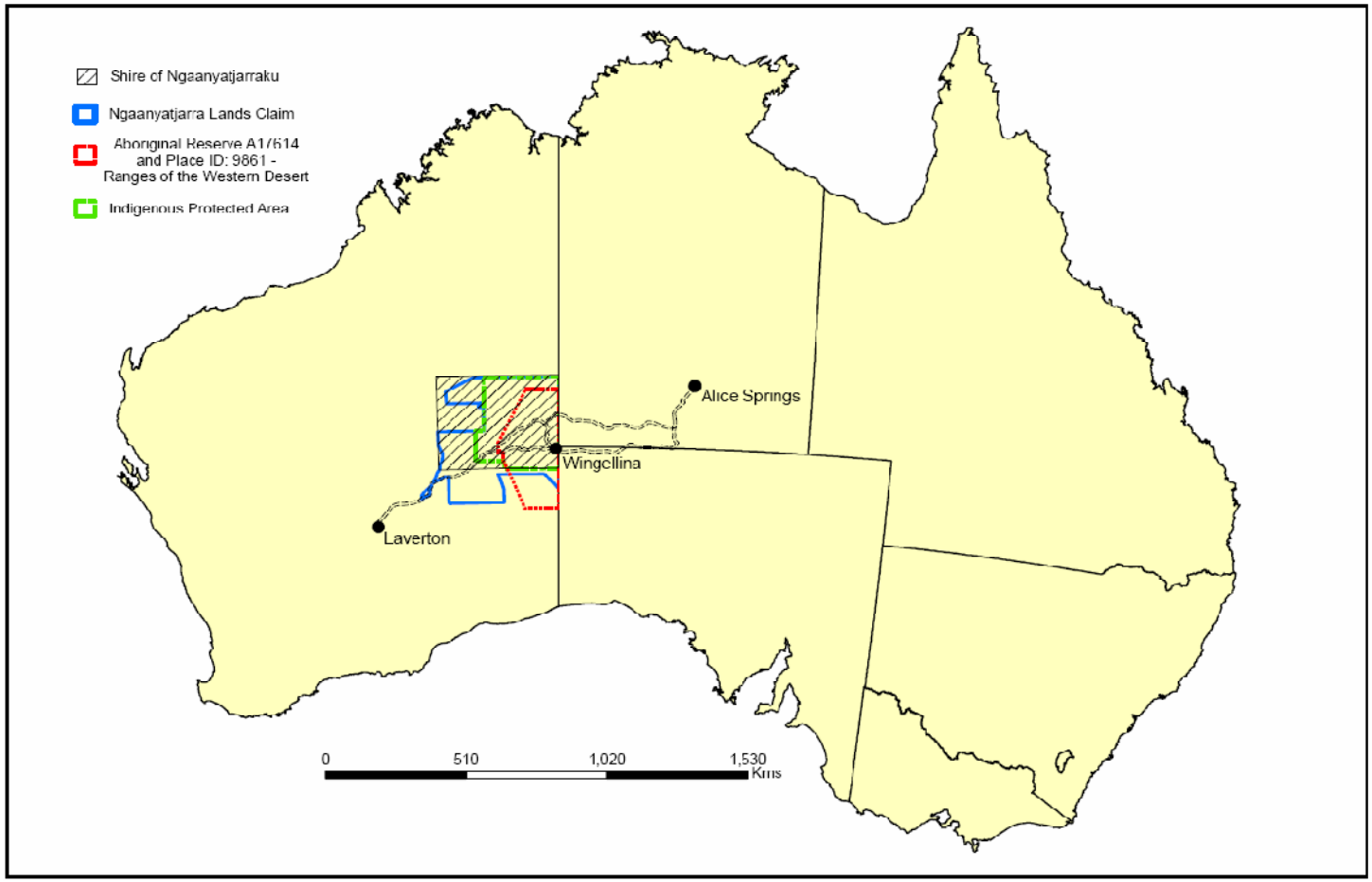

Figure 1 Location Plan for the Wingellina Project

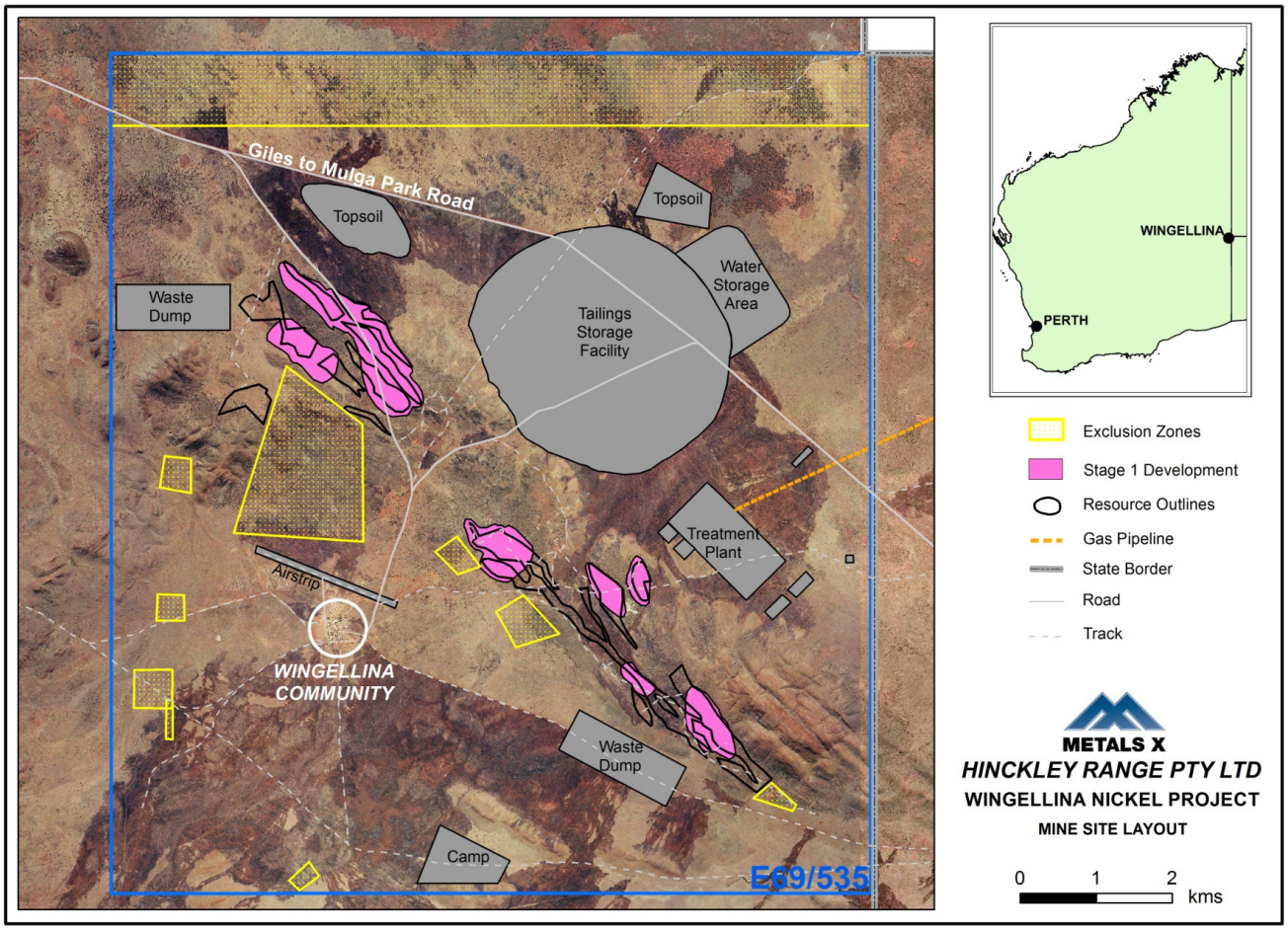

Figure 2 Project Layout

12 GL of process supply water is required each year and will be sourced from the Cobb Depression, located on tenement L69/19 (in application stage) and piped 100 km to the Project. Hinckley Range is also evaluating an alternative water source, located 100 km to the south of the Project area (Central Officer Basin).

Natural gas (for the power plant) will be sourced from an existing gas field and piped to the Project. The most likely gas field option is the operational Mereenie gas field in the Amadeus Basin located in the NT.

1.4 Approvals History

Hinckley Range has been progressing the environmental approvals of the Project since 2010. In November 2010, Hinckley Range referred an Environmental Scoping Document (ESD) for the Wingellina Nickel Project to the EPA. The basis of the 2010 referral was a commitment to relocate the existing township of Wingellina away from operations.

From the information provided in the ESD, the EPA determined the Project required environmental assessment at the level of a Public Environmental Review (PER), with eight weeks public review. The following key environmental factors identified:

- Aboriginal heritage,
- Air quality,
- Groundwater,
- Fauna and
- Decommissioning.

Subsequent to the ESD it has become clear that Hinckley Range had no certainty should the s38A approvals be subject to the relocation of the community due to the planning requirement around the relocation of the township. The approval processes and State Government support could potentially result in delays in mine development. In addition, the specialist impact assessments were also completed for air and noise, which indicated minimal impact on the township in its current location.

Based on this new information Hinckley Range requested the EPA to consider their PER, with the existing Wingellina community identified as a sensitive receptor.

The EPA confirmed this posed a significant change to the original referral, predominately due to the limited understanding of the impacts on the community and requested the Proponent recommence the referral process under Section 38 (Part IV) of the EP Act.

This document provides supporting information to the EPA for the S38 Referral.

Hinckley Range remains committed to the relocation of the community as detailed in the 2010 Mining Agreement between; Hinckley Range, the Traditional Owners and granted Native Title holders (see Section 3.3.3). Funding has been identified as part of the project feasibility and will be provided at a later date, once the State has confirmed the planning approval requirements to support the orderly development of a new community.

2.0 STAKEHOLDER CONSULTATION

The remote location of the Project and its proximity to aboriginal communities has emphasised the importance of regular and ongoing community based consultation with the Wingellina community. Stakeholder engagement has also been identified as being as equally important to ensure those individuals and organisations with broader interests in the project are given the opportunity to contribute to the development of the Project. Stakeholder and community consultation has been undertaken to date through formal meetings and briefings with government agencies, and community meetings with the Wingellina residents.

2.1 Consultation Outcomes

Stakeholders include indigenous groups; the Ngaanyatjarra Land Council Western Australia (NLC) and Anangu Pitjantjatjara Yankunytjatjara South Australia (APY). Engagement with these stakeholders is key for the identification, prioritisation and management of indigenous concerns regarding the development of the Project. These concerns have been resolved throughout the consultation process.

Hinckley Range has cultivated a very strong relationship with the Traditional Owners, which is evidenced by successfully negotiating the Mining Agreement (See Section 3.3.3).

The employment of a Project Liaison officer by Hinckley Range has ensured information is communicated to the community. Consultations have been undertaken in meetings over multiple days with legal, technical and anthropological representation provided by Ngaanyatjarra Council staff and consultants. This consultation to date has included discussions regarding the formation of a mining agreement, the scale and nature of the proposed mine, environmental risks and management, social impact assessment and general project requirements and details.

A summary of these and other consultation outcomes to date are provided in **Appendix 1**.

Consultation and engagement with the local community will be undertaken for the life of the Project, as will be the case with the shire council and government agencies.

3.0 EXISTING ENVIRONMENT

3.1 Physical Environment

3.1.1 Climate

Meteorological measurements were available from the Giles weather station 130 km to the NNW of the site and from an air quality grade meteorological station installed at the Project site.

The regional climate has been described by the Bureau of Meteorology (BoM) as dry, with hot summers and mild winters. Annual average rainfall is very low at 283 mm (Giles) with on average 48 days of rainfall, with this falling during the warmer months of the year; November to March. February is the wettest month with an average rainfall of 48.5 mm on five days.

January is the hottest month, with an average maximum temperature of 37.2 °C. By contrast winters are mild, with July average maximum and minimum temperatures being 19.9 °C and 6.8 °C respectively.

3.1.2 Regional Setting

The Project is located within the Central Ranges Bioregion of the Interim Biogeographic Regionalisation for Australia (or IBRA) (Thackway and Cresswell 1995). The Central Ranges includes three major components, or sub-regions; Mann-Musgrave (CR1), Wataru (CR2) and Everard (CR3). The Wingellina Project is located within the Mann-Musgrave subregion of the Central Ranges bioregion. The Mann-Musgrave subregion is located in WA and the southwest corner of the NT (Graham and Cowan 2001). This subregion is characterised by a high proportion of Proterozoic ranges (both volcanic and quartzites) and derived soil plains, interspersed with red Quaternary sandplains with some Permian exposure (Graham and Cowan 2001).

3.1.3 Geology

The ranges of the Musgrave Complex are composed of Middle Proterozoic igneous and metamorphic rocks, primarily gneiss, granite, gabbro and the associated weathering material. The Wingellina Hills consist of predominantly low, northwest-southeast trending ridges with occasional high steep hills and rocky outcrops. These hills are formed by the Wingellina Intrusion, a layered gabbro and ultramafic igneous complex. In places the gabbro forms rocky outcrops with bouldery scree on the steeper slopes.

The Musgrave Complex is an east-west trending structurally bounded mid–Proterozoic terrane approximately 130,000 km^2 in area. Within the Musgrave Complex, the high–grade metamorphic basement and the mid–Proterozoic Bentley Supergroup have been intruded by younger charnokitic granodiorite, adamellite and layered intrusions of the Giles Complex. The Giles Complex consists of a series of stacked sills and dykes of mafic, ultramafic and anorthositic composition that were intruded at successively shallower crustal levels.

In the Giles Layered complex, primary mineralisation occurs in three known styles:

- Primary (magmatic sulphide) nickel–copper–platinum group elements, such as at the Nebo and Babel discoveries of BHP Billiton (ex-WMC), near Jamieson;
- Secondary (oxide) nickel–cobalt mineralisation associated with the weathering of ultramafic rocks of the Giles Complex as at Wingellina; and
- Vanadium and titanium magnetite bands associated with the most fractionated and highly evolved portions of the gabbro–troctolite intrusions within the Jamieson Ranges.

Lateritic nickel-cobalt mineralisation is restricted to intrusions with substantial thicknesses of dunite and/or peridotite ultramafic. The formation of the Wingellina deposit is by deep oxide weathering of the dunite units of the Giles Layered Intrusive Complex. The weathering processes have resulted in the formation of extremely thick 50 to 200 m homogenous oxide layers of limonite (47% Fe_2O_3). The Wingellina nickel oxide mineralisation is a surficial, tropical laterite style of mineralisation developed over

an olivine–rich ultramafic stratigraphy. Development of this deposit within the Project is the focus of Hinckley Ranges' nickel–cobalt oxide strategy.

3.1.4 Soils

The morphological characteristics of the surface soil profiles exhibit a large degree of variation (Outback Ecology 2008a). The Project area exhibits a wide range of soil textures, ranging from sandy loam to light clay, with a slight increase in clay content with depth at most sites.

The structure of the soils within the Project area ranges from single grained soils separating into individual particles upon disturbance to well-structured soils with a range of different sized aggregates (Outback Ecology 2008a). Soil slaking and the potential for soils to disperse generally decreases with depth (Outback Ecology 200a). Overall, the majority of soils are partially dispersive.

No soils within the Project area are hard setting and no soil profiles contain physical restrictions to root growth.

The majority of soils in the mine site area are classed as moderately alkaline (Outback Ecology 2008a). Alkaline pH levels were common within all vegetation/landform complexes and all sites, excluding Site 7 (scrub hill slope) where pH was found to be neutral. The EC of soils within the study area varied little, ranging between 0.02 and 0.13 dS/m with all sites classed as non-saline, based on standard USDA and CSIRO categories (Outback Ecology 2008a).

The organic matter content of the soils within the Project is low, as is the case with concentrations of nitrogen, sulphur and phosphorus (Outback Ecology 2008a). Potassium levels were variable, ranging from 30 to 670 mg/kg (Outback Ecology 2008a). nutrients.

Variable levels of a number of metals are present in the soil of Project area. All materials sampled were below the detectable limit for As and Cd, however Cr, Cu, Pb, Ni and Zn were consistently detected at a reportable level (Outback Ecology 2008a).

The water holding characteristics of the sub-surface and soils indicates that while the water retention of the <4 mm fraction showed little variation, the capacity of the 'whole' soil (i.e. including coarse materials) to store and release water is quite variable and should be taken into account for the construction of waste rock landforms and their associated covers (Outback Ecology 2008a).

3.1.5 Groundwater

The greater Wingellina Nickel Project area is underlain by a series of groundwater basins, consisting of the Amadeus Basin, Canning Basin, the Musgrave Complex, the Officer Basin and the Gunbarrel Basin.

3.1.5.1 Mine Site

Groundwater at Wingellina mine site is likely associated with bedrock fractures or discontinuities (Coffey 2008). The water table elevation at the mine site ranges from

about 645 mAHD at the south-eastern end of the deposit to about 625 mAHD at the north-western end (Rockwater 2011a). The moderate salinity of the groundwater suggests that recharge occurs by the direct infiltration of rainfall. However, water levels do not appear to vary seasonally, despite a marked peak in rainfall during the summer months. This suggests that the recharge rate is likely to be low, or that the aquifer is permeable and able to recover fairly quickly following recharge events (Rockwater 2011a).

Results of water quality testing in 2008 indicated slight variation in pH which ranged from circum-neutral to alkaline (pH 6.8 – 8.7). The dissolved oxygen (DO) of the groundwater was low, ranging from 0.7 to 4.74 ppm which is often the case with deep aquifers (Outback Ecology 2008). The temperature of the groundwater was consistent, ranging from 25 to 28°C.

3.1.5.2 Borefield

The Cobb Depression is a shallow, finger-like trough of Phanerozoic sediments that extends eastward from the Canning Basin onto the Proterozoic basement of the Musgrave Complex (Rockwater 2013). The trough is at least 10 km wide and contains a consistent sequence of variably clayey, coarse-grained sediments (Rockwater 2013). Based on groundwater investigations the Cobb Depression can supply the Project for 40 years at 280 L/s. Approximately 12 GL/yr of water is required for construction and operations of the Project.

An alternative borefield (the Central Officer Basin) underlays the Gunbarrel Basin and contains strata of Late Proterozoic age (Rockwater 2008). Groundwater investigations completed by Rockwater in 2012 indicate the Central Officer Basin has the potential to supply water to the Project for approximately 37 years at a rate of 380 L/s.

3.1.6 Surface Water

The Project lies in the northern part of the Warburton drainage basin which is a large, internally-draining basin of about 340,000 km^2 encompassing the southern Gibson Desert and northern Great Victoria Desert in central Australia. Due to the region's arid climate, predominant low relief and extensive cover of aeolian sand, surface water flows occur only after particularly large rainfall events and appear to be limited to rocky ranges which generate run-off (Rockwater 2010).

The 2010 surface water assessment identified three sub-catchments that have the potential to impact the mining area. These sub-catchments are defined by the Hinckley Range and Wingellina Hills, and a small range of hills running in a north-west direction through the Project area.

Six minor ephemeral drainage lines intercept the Project (mine) area.

Clearly defined drainage channels are generally restricted to the flanks of the catchments where there is sufficient run-off and relief to generate confined surface water flows (Rockwater 2010).

3.2 Biological Environment

3.2.1 Vegetation and Flora

3.2.1.1 Mine Site

Nine broad floristic formations and 13 vegetation communities were identified in the mine site area (**Figure 3**). The condition of these formations ranges from good to excellent to pristine condition, with localised areas that were more degraded (Outback Ecology 2009, 2011a).

No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) have been identified within the mine site area, nor are they considered likely to occur.

A total of 324 species have been identified in the area, representing 45 families and 130 genera. No Declared Rare Flora listed under the WC Act or Threatened species listed under the EPBC Act have been identified during desktop studies and surveys of the mine site area. Four Priority species defined under the WC Act have been recorded in the area: Nine introduced species were recorded within the mine site area.

3.2.1.2 Borefield – Cobb Depression

A terrestrial flora, vegetation and fauna desktop study over the Cobb Depression borefield study area (L69/19) was completed in April 2008, followed up with a level 1 flora and vegetation survey in May 2013.

Eight broad vegetation associations were identified as occurring within L69/19.

Searches conducted of both the WA DEC's Threatened Ecological Communities Database and the Commonwealth EPBC Act 1999 Protected Matters Database, provided no listings of known occurrences of Threatened or Priority Ecological Communities within a 100 km radius of the northern borefield study area (Outback Ecology 2008c).

Vegetation condition in the Study area ranged from Very Good to Excellent (Outback Ecology 2013b).

A total of 126 flora species (including subspecies and variants) from 30 families and 69 genera were recorded from within the Study area (Outback Ecology 2013b). Three introduced species were identified in the area (*Cenchrus ciliaris* [Buffel Grass], *Citrullus colocynthis* [Camel Melon] and *Portulaca oleracea* [Purslane]), although none of these are Declared Plants under the *Agriculture and Related Resources Protection Act 1976* (Outback Ecology 2013b).

No Threatened Flora species as listed under the EPBC Act 1999, or Threatened Flora species listed under the WC Act were recorded within E69/2453 (Outback Ecology 2013b). The field survey conducted in the borefield area identified only one Priority species in E69/2453 (*Calotis latiuscula* – P3) (Outback Ecology 2013b).

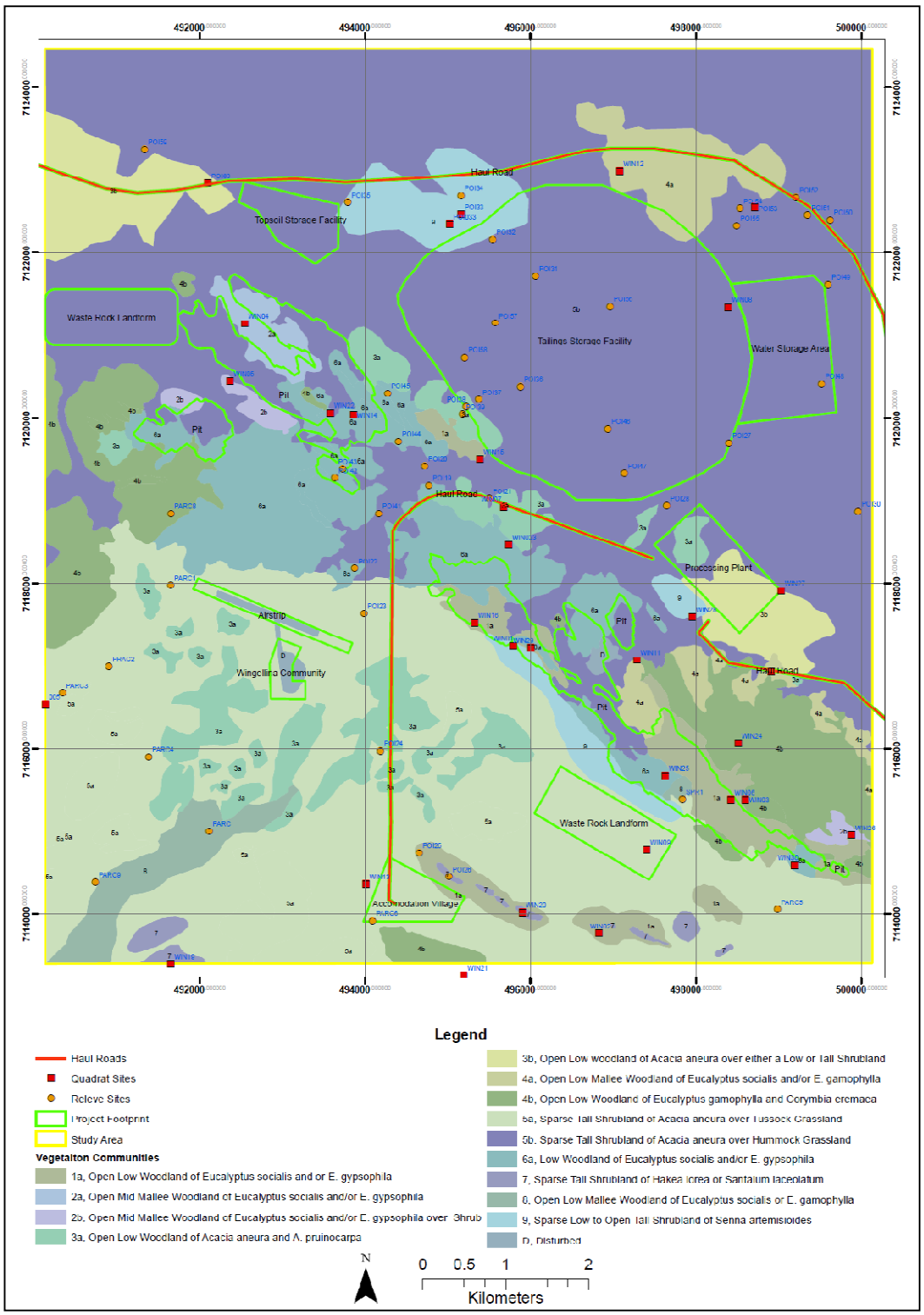

Figure 3 Vegetation Map of the Wingellina Mine Site Area

3.2.1.3 Alternative Borefield – Central Officer

Six vegetation communities were mapped and described for this area (refer to **Appendix 2**). No vegetation communities which fitted descriptions of TECs or PECs in Western Australia were identified during a desktop study or field surveys. The vegetation in the alternative borefield area was rated as excellent to pristine in condition (Outback Ecology 2011b).

An alternative borefield area coincides with an 'at-risk' ecosystem, the Mirramiratjarra dune field (Outback Ecology 2008b). The Mirramiratjarra dune field is considered unique for its dune formation, vegetation and drainage system (Outback Ecology 2008b).

A total of 163 taxa from 32 families and 87 genera were identified during flora and vegetation surveys (Outback Ecology 2011b). No DRF listed under the WA *Wildlife Conservation Act 1950*, or TF species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the South Australian *National Parks* and *Wildlife Act 1972* (WC Act) or the Northern Territory's *Territory Parks and Wildlife Conservation Act 2000*, were recorded within the area during surveys. Five priority species were recorded within the alternative borefield area and access track. One weed of significance, *Cenchus ciliaris* (Buffel Grass), was recorded during the May 2011 Outback Ecology survey, and was again recorded during the March 2012 survey, along with *Acetosa vesicaria* (Ruby Dock).

3.2.2 Terrestrial Fauna

3.2.2.1 Mine Site

Six broad fauna habitats were identified within the mine site. These habitats are considered to be widely represented throughout the surrounding region (Outback Ecology 2009).

One vertebrate fauna species of conservation significance was recorded within the mine site area during the 2008 fauna survey; the Australian Bustard (*Ardeotis australis*) listed as a Priority 4 species under the Department of Environment and Conservation (DEC) Priority Species List (Outback Ecology 2009).

A Short Range Endemic (SRE) invertebrate survey was completed as part of the terrestrial fauna assessment in April 2008, with specimens of scorpions, mygalomorph spiders, pseudoscorpions and snails collected. All species collected have habitat represented outside of the Project area.

3.2.2.2 Borefield – Cobb Depression

A terrestrial flora, vegetation and fauna desktop study over the borefield study area was conducted in April 2008, followed by a level 1 vegetation, flora and fauna assessment of the borefield and pipeline route in 2013.

A total of five broad fauna habitats were identified within the proximity of the borefield study area, comprising:

- Dense Mulga Woodland;
- Dune Field;

- Hummock Grassland;
- Tussock Grassland; and
- Mulga-Mallee over Hummock Grassland (Outback Ecology 2013c).

During the level 1 fauna survey 46 species were recorded, with three of these being conservation significant:

- Brush-tailed Mulgara (*Dasycercus blythi*) - Listed as Vulnerable (VU) by the EPBC at and Priority 4 by the DEC;
- Major Mitchell's Cockatoo (*Lophocroa leadbeateri*) - Listed as Schedule 4 by the WC Act; and
- Australian Bustard (*Ardeotis australis*) - Listed as Priority 4 by the DEC (Outback Ecology 2013a).

3.2.2.3 Alternative Borefield – Central Officer

A total of six broad fauna habitats were identified within the alternative borefield area.

A total of 359 vertebrate fauna species were identified by the 2008 desktop study as potentially occurring in the alternative borefield and pipeline area, with 60 species recorded during the 2011 field survey (Outback Ecology 2012b).

During the 2011 field survey, three vertebrate species of conservation significance (i.e. species that are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 2002* (EPBC Act) and/or the Western Australian *Wildlife Conservation Act 1950* (WC Act), or are on the WA DEC Priority Fauna list) were recorded:

- The Western Long-eared Bat (*Nyctophilus major tor*): Listed as Priority 4 by the DEC;
- The Australian Bustard (*Ardeotis australis*): Listed as Priority 4 by the DEC; and
- The Rainbow Bee-eater (*Merops ornatus*): Listed as Migratory by the EPBC and S3 by the WC Act (Outback Ecology 2012b).

Although no burrows of any of the species targeted were found in the area of proposed disturbance for the borefield, motion-sensor cameras captured two records of Brush-tailed Mulgara (*Dasycercus cristicauda*) at the northern end of the alternative borefield access track. This confirms the presence of this species within L69/12, and may have implications for future management of the Project and/or the Wingellina Nickel Mine in general (Outback Ecology 2012b).

3.2.3 Subterranean Fauna

3.2.3.1 Mine site

Taxa from four different phyla; Arthropoda, Annelida, Nematoda and Rotifera, were identified, with the greatest diversity displayed within the Arthropoda (Outback Ecology 2008b). While the phyla recorded were consistent with those found in other stygofauna communities in WA, the specimens collected from the mine site area were not stygobitic (true stygofauna), the exception being the copepod nauplius which was located at the Inco bore and probably affected by the presence of the town landfill (Outback Ecology 2008b). The invertebrates collected were either terrestrial forms that ended up in the

groundwater, or they were stygoxenes, invertebrates that live in both surface and groundwater (Outback Ecology 2008b). Stygoxenes are not obligate subterranean fauna (stygobites) and do not rely on subterranean habitats for their survival (Outback Ecology 2008b). The Acarina, Collembola and larval dipterans were all stygoxenes collected from Wingellina in April 2008 (Outback Ecology 2008b)

3.2.3.2 Borefield – Cobb Depression

A pilot stygofauna survey was undertaken at the borefield area in January 2013 (Outback Ecology 2013a). Troglofauna were not actively sampled during the pilot survey because previous desktop and survey results demonstrated that the Wingellina area has limited potential for hosting troglofauna species (Outback Ecology 2013a).

Only one common stygofauna species (*Enchytraeidae* OES 18) was found in the Cobb Depression, which occurs in both surface and subterranean aquatic systems (freshwater and marine), or semi-aquatic and terrestrial habitats (Outback Ecology 2013a).

3.2.3.3 Alternative Borefield – Central Officer

No stygofauna species were collected from the alternative borefield area during the 2013 subterranean pilot survey (Outback Ecology 2013a).

3.3 Social Environment

3.3.1 Aboriginal Heritage

In July 2001 Traditional Owners from the Project area, in company with anthropologists from the Ngaanyatjarra Council, marked out nine ethnographic heritage exclusion zones in which access by exploration personnel is forbidden. In October 2006 an additional exclusion area was delineated within the area of E69/535.

In 2007 an archaeological survey identified 35 archaeological sites within the Project area which include a variety of artefact scatters, quarries and knapping areas, and sites containing grindstones and stone structures (Artefaxion Pty. Ltd. 2007).

3.3.2 Native Title Agreement

Hinckley Range (through Metals X) signed a mining agreement in June 2010 with the Traditional Owners and granted Native Title holders of the Wingellina Project area through their representative bodies;

- The Yarnangu Ngaanyatjarraku Parna Aboriginal Corporation,
- The Ngaanyatjarra Land Council (Aboriginal Corporation), and
- The Ngaanyatjarra Council (Aboriginal Corporation).

The agreement provides consent for the grant of a mining lease and subsequent mining operations over the project which, subject to other regulatory approvals, allows the Wingellina Nickel-Cobalt Limonite Project to be advanced to development and production.

This landmark agreement is the first mining agreement to be successfully negotiated in the Ngaanyatjarra Lands and Aboriginal Reserves. While the details of the agreement

remain confidential, the agreement includes cash payments as project milestones are met, a gross royalty interest and employment and training initiatives for the local people that are in line with similar agreements made in recent times.

3.3.3 Land Use

Hinckley Range purchased the project tenement (E69/535) from Acclaim in 2006. A number of abandoned small scale chrysoprase pits are found throughout the Project area. No current mining activity or other activities from other sectors is being undertaken in the Project area.

The physical local land use around Wingellina is generally limited to hunting of both native and feral animals, gathering bush tucker and cultural ceremonies. There is no pastoral activity within 100 km of the Project area.

3.3.4 Demographic Profile

3.3.4.1 Aboriginal Communities

The Project is situated within the Shire of Ngaanyatjarraku and is approximately 720 km south west of Alice Springs and approximately 1,400 km north-east of Perth. There are ten established Aboriginal communities within the Shire of Ngaanyatjarraku with Warburton being the largest with approximately 400 people. Other local communities include Kalka, Pipalyatjarra, Blackstone, Jamieson and Giles.

The Irrunytju Aboriginal community is located at the former Wingellina exploration camp and is locally known as the Wingellina Township. The majority of residents are Pitjantjatjara speakers.

3.3.4.2 Population

The population of the Shire of Ngaanyatjarraku in a 2006 Census was 1,336 people of which 87 % or 1,162 identified as Indigenous. Wingellina's population ranges from 60 to 100 people – 60 people who are generally permanently resident and an additional 40 people who are occasionally resident in the community (URS 2012).

Population data for Ngaanyatjarraka, excluding Warburton, is provided in **Table 2**. The data shows the population is relatively young, with the median age of 30 (URS 2012).

Table 2 Population Data for the Shire of Ngaanyatjarraku, Excluding Warburton (URS 2012)

	Indigenous persons/ households with Indigenous persons(a)	Non-Indigenous persons(b)/ other households	Total
Total number of persons	641	110	761*
Percentage of total population	84.2%	14.5%	
Median age of persons	27	47	30
Median individual income ($/weekly)	190	929	214
Median household income ($/weekly)	517	1,122	777

	Indigenous persons/ households with Indigenous persons(a)	Non-Indigenous persons(b)/ other households	Total
Median housing loan repayment ($/monthly)	0	0	0
Median rent ($/weekly)	13	0	10
Average number of persons per bedroom	1.5	1.1	1.4
Average household size	4.2	1.5	3.3

* Note: 12 not stated (3 male, 9 female)

3.3.4.3 Economic Activity

Economic activity in the region is dominated by community service provision and infrastructure maintenance (URS 2012).

Of the 341 people who are in the labour force in the Ngaanyatjarra Shire (excluding Warburton), the majority of both Aboriginal and non-Aboriginal employees are employed in the community services sector. Hinckley Range has provided opportunities for casual employment for a number of people in the area to assist with field work during the exploration and feasibility stage of the project (URS 2012).

Being a typical remote Aboriginal community, Wingellina offers few opportunities for full-time employment (URS 2012).

3.3.4.4 Income

The median weekly income for Aboriginal people in the Ngaanyatjarra Shire, excluding Warburton, was $190 in comparison to $929 for non-Aboriginal people. This is below what is considered the poverty line in Australia, which is $341.31 per week (including housing costs) for a single person receiving maximum welfare payments (URS 2012).

3.3.4.5 Housing

During consultations conducted in 2011, 48 structures were counted within Wingellina within an area approximately 0.5 square km^2. The Aboriginal Lands Trust owns 35 of these dwellings, which are leased to the WA Department of Housing for public housing. The majority of the houses were built in the 1980s and 1990s and are in a poor state of repair, some with broken doors and windows and cracked walls (URS 2012).

3.3.4.6 Infrastructure

An overview of Infrastructure within the township of Wingellina follows:

- Roads are unsealed, both within and outside Wingellina.
- A community power station consisting of four diesel generators with a capacity of 400kw.
- Water is supplied from three bores although one is currently being treated following contamination and is not able to be used. A rubbish tip is operated some 1,000 m north-east of the community.
- An unsealed, well compacted airstrip is located immediately adjacent to and north of the community.
- The community is connected to the fibre-optic telecommunications network.

A number of community facilities are made available to residents of Wingellina, including a health clinic, community office, store and school.

Most infrastructure at Wingellina is reasonably old and/or in poor condition (URS 2012).

Infrastructure and the quality and availability of water at the existing Wingellina community site were raised as issues during consultations with the Shire of Ngaanyatjarraku. Specifically four issues were highlighted:

1. The existing water supply is problematic;
2. Water reticulation infrastructure did not meet current standards, specifically environmental health standards;
3. Inefficient effluent disposal; and
4. Poor quality of major infrastructure largely through neglect (URS 2012).

The primary difficulty in installing adequate sewerage and water reticulation is the siting of the community on very hard calcrete which makes excavation challenging (URS 2012).

3.3.4.7 Health

The primary health conditions treated at the Wingellina Health Clinic were chronic diseases – diabetes, chronic renal (kidney) disease, cardiovascular disease, and respiratory diseases. Mental health issues were also identified as a problem in Wingellina (URS 2012).

Poor nutrition, inactivity and high rates of smoking were seen to be the main contributing factors in the chronic disease conditions seen in Wingellina. Respiratory disease is also worsened by the lack of sealed roads through most communities (URS 2012).

4.0 POTENTIAL ENVIRONMENTAL IMPACTS

The 2010 ESD identified five key environmental factors (aboriginal heritage, air quality, groundwater, fauna and decommissioning) and eight other environmental factors (surface water, greenhouse gases, vegetation, light pollution, conservation areas, soil quality, noise and visual amenity), to be addressed in the PER. No new factors have been identified in this referral.

Potential impacts for each of these factors are summarised in the sub-sections below, and are addressed in **Appendix 3**.

4.1 Flora and Vegetation

Over the last 3 years, a number of flora and vegetation studies and assessments have been undertaken in the mine site area and both borefield areas, allowing for a more accurate understanding of the vegetation communities and species that occur there.

From these studies it was determined that no threatened flora species or DRF were found in the Project areas (Outback Ecology 2011b). Priority species were identified in the Project areas, although there is limited likelihood that these species will be impacted by the construction and operation of the Project (Outback Ecology 2011).

The project will require the progressive clearing of an estimated 2,571 ha of native vegetation at the mine site (Outback Ecology 2011b). This clearing will only have a localised impact (Outback Ecology 2011b).

Vegetation clearing to establish the borefield and associated access track is expected to be minimal, mainly consisting of a small cleared area (approximately 25 m^2 for each bore hole) and linear infrastructure corridors (Outback Ecology 2011a).

Groundwater drawdown from pit dewatering is not expected to impact surrounding vegetation communities as drawdown will be minimal (Rockwater 2011a).

Other impacts to flora and vegetation, such as; fire, dust deposition along haul roads, unauthorised clearing and weed growth can be managed by the implementation of appropriate management procedures and controls, such as the development of a Weed Management Plan.

4.2 Fauna

Existing threats to terrestrial vertebrate fauna identified within the project area include (NLWRA, 2008):

- Feral predators (foxes and cats);
- Grazing pressure;
- Changed fire regimes;
- Vegetation fragmentation;
- Alterations to hydrology;
- Potential to increase populations of introduced species; and
- Secondary impacts for example vehicle strike.

The project will improve this situation through a feral animal control program and implementation of fire control program during the operation of the mine.

The potential impacts of the Project to terrestrial fauna could be expected to be associated with:

- Direct clearance or disturbance of fauna habitat;
- Reduced connectivity of fauna populations, and/or isolation of local habitats;
- Impacts to Conservation Significant species;
- Alterations to hydrology;
- Effects of light and dust, including toxicity associated with metals in dust;
- Effects of noise;
- Potential to increase populations of introduced species; and
- Secondary impacts, such as off-road vehicles exacerbating erosion and harming flora and fauna.

From the impacts above, the main impact on vertebrate fauna is from habitat loss. Surveys indicate these habitats are well represented outside of the Project area (Outback Ecology 2009). As such the Project is considered unlikely to have a significant impact on vertebrate fauna species, including conservation significant species, within the Project area.

Recent fauna studies and assessments have allowed for a more accurate understanding of the fauna species that may occur or have been found to occur within the Project area.

No critically important habitat areas or World Heritage Properties, Ramsar Wetland or Nationally Important Wetland sites are located in the vicinity of the Project (Outback Ecology 2009), and will therefore not be impacted by the Project.

A number of conservation significant species were observed in the Project areas. This may have implications for future management of the Project and/or the Wingellina Nickel Mine in general (Outback Ecology 2012b).

The construction and operations of mine site Project area or the water supply borefield will not result in a loss of biodiversity or subterranean fauna (Outback Ecology 2011c, 2013a).

4.3 Groundwater

Management of groundwater is a significant environmental aspect of the Project. Groundwater is currently only used in the region for domestic purposes by the Wingellina Township. There is the potential for groundwater impacts from abstraction of groundwater from the future borefield and from dewatering of the orebody.

Recent groundwater investigations at the mine site area indicate dewatering rates will be low therefore groundwater drawdown will be minimal (Rockwater 2011a). The north-western and south-eastern pits, which are the deepest, will experience groundwater drawdowns of up to 2 m extending up to 1 km from the pit margins, but elsewhere the drawdowns will be more restricted (Rockwater 2011a).

The Cobb Depression aquifer will be used as the Project water source. Groundwater investigations indicate the aquifer has the greatest potential to supply process water over the life of the mine compared to other aquifers, including the Officer Basin (Rockwater 2013). Groundwater modelling indicates pumping Project supply water from the Cobb Depression aquifer will result in groundwater drawdown concentrated around bores, therefore impacts to groundwater will be localised Basin (Rockwater 2013).

The Project has the potential to impact upon subterranean fauna (see **Section 4.2** above).

The Project has the potential to impact on groundwater by contamination through seepage from the TSF. The risk of potential seepage is considered low based on the average depth of the watertable in the Project area being between 30 to 50 mbgl and the abundance of clays throughout the highly-weathered profile of the orebody.

4.4 Aboriginal Heritage

The Project will not impact upon any ethnographic sites. The Project will now impact upon two archaeological sites located to the north of the central pits. Approval will be sought under Section 18 of the *Aboriginal Heritage Act 1972* to clear the two archaeological sites.

4.5 Air Quality

Modelling of fugitive dust and emissions has been undertaken recently on the mining and processing activities associated with the Project (Loyd George 2013). Major sources of atmospheric emissions will be the 4,400 tpd acid plant, fugitive dust from the mining operations and waste and tailings storage facilities and to a lesser extent, emissions from power generation.

Modelling indicates that during start up and normal operations the process plant will comply with appropriate NEPM criteria for SO_2, NO_x, PM_{10} (**Table 3**) at the existing Wingellina townsite, 3km south of the process plant.

Table 3 National Environmental Protection Measure - Air Quality Standards and Goals

Pollutant	Averaging Period	Maximum Concentration		Goal
		(ppm)	($\mu g/m^3$)	Maximum allowable exceedances
Nitrogen Dioxide	1-hour	0.12	246	1 day a year
	1-year	0.03	62	None
Sulphur Dioxide	1-hour	0.20	570	1 day a year
	1-day	0.08	228	1 day a year
	1-year	0.02	60	None
Particles as PM_{10}	1-day	-	50	5 days a year

Particulate levels from the mining and tailings are predicted to be below the criteria at Wingellina and the proposed accommodation village for PM_{10} and $PM_{2.5}$. Maximum 24-hour PM_{10} levels are 46% of the NEPM standard with 24-hour and annual $PM_{2.5}$ concentrations at 39 and 74% of their respective reporting standards.

4.6 Noise

An assessment of environmental noise, using SoundPLAN 7.2 computer modelling (with CONWAVE algorithms selected), has been undertaken in accordance with EPA Draft Guidance Statement No.8: Guidance for Environmental Noise (2007) (Loyd George 2013).

The predictive modelling considered the following operational activities:

- Noise from mobile plant during the construction phase of the project;
- Noise from mobile plant and processing plant during full operation; and
- Airblast and ground-borne vibration from blasting.

The worst-case operational scenario was considered in the noise modelling, with all plant operating simultaneously and the wind is blowing toward the receiver.

Based on the modelling output, the project is compliant with regulations at all recognised sensitive receivers.

Hinckley Range will ensure that noise emissions, both individually and cumulatively, meet the assigned noise levels required under the *Environmental Protection (Noise) Regulations 1987* and do not adversely impact on sensitive receptors.

4.7 Other Impacts

4.7.1 Surface Water

In 2011 a Surface Water Management Assessment was undertaken to:

- Identify catchment areas and natural water courses likely to impact the pits and mining infrastructure.
- Hydrological analyses to estimate peak flows of 2, 5, 10, 20, 50 and 100 year average recurrence interval (ARI) rainfall events from all catchment areas that are likely to adversely impact the mine pits and infrastructure locations.
- Surface water hydraulic analyses at critical locations and sections where natural water courses approach the pits and infrastructure.
- Concept designs and recommendations of perimeter levees and drains in order to prevent flooding during the 1 in 100 year ARI flow event at the mine pit and infrastructure locations and create efficient drainage for the normal annual flows.
- Recommendations for floodways and culverts at the internal road network system where warranted.
- Comments on provisional requirements for pollution trap locations if warranted.

The construction of the mine site Project infrastructure is not expected to result in significant impacts to surface water flow in the area. The Project will impact upon six ephemeral drainage lines and will result in the localised disruption to surface water flow.

If managed appropriately the Project (mine site) is not expected to result in significant impacts to surface water quality and surface water flows in the mine site Project area or surrounds. Installation of culverts (of nominal diameter 450 mm) and floodways (length from 25 – 55 m) at 13 road crossings (Rockwater 2011c) will ensure maintenance of existing flows.

The development of haul roads to the chosen rail siding, the calcrete deposit, and development of water and gas pipelines and service roads will impact on the surface environment and consequently surface water flow. Further investigations will be undertaken to assess the potential impacts that support infrastructure will have on drainage lines and water catchment areas and the potential risks to the Project from flooding.

4.7.2 Soil

Issues requiring consideration during Project development include:

- Topsoil and subsoil / overburden management;
- The poor structural stability (slaking and dispersion) of some ‘surface’ soils;
- The physical / chemical characteristics of deeper regolith materials; and
- The use of appropriate type and volumes of materials for the construction of waste rock landforms and their associated covers.

To allow for the development of appropriate measures to manage the above issues, the following studies and investigations will be undertaken:

- Iinvestigations into waste rock and low-grade samples were classified as non-acid forming. These findings will be verified with additional samples via a focussed programme of sampling and testing.
- Given the abundance of clays throughout the highly-weathered profile, some mined materials are likely to be prone to erosion if not appropriately managed. Erosive materials are to be identified so that they can be appropriately managed.
- Physically-stable materials will be required for construction of TSF embankments, ROM pad, fixed-plant and road foundations, and final rehabilitation of landforms. Suitable materials will be identified and strategically placed for construction and rehabilitation purposes.
- The basic plant-growth properties of mined materials including pH and salinity will be assessed.

4.7.3 Hazardous Substances and Wastes

Hinckley Range proposes to undertake an assessment of liquid and solid waste generation and management. At this point, storage and use of hazardous materials, and the generation and disposal of wastes both on-site and off-site is expected to result in negligible environmental impacts.

4.7.4 Visual Amenity

An assessment of visual impacts was undertaken using a photo montage technique from critical viewsheds which determined minimal visual impact on the landscape from the project development (Outback Ecology 2012a). The project is adjacent to Hinckley Range which provides a natural barrier for visual impact. The Project is not expected to result in visual impacts to the landscape.

4.7.5 Light

A Visual Impact Assessment (VIA) and Social Impact Management Plan undertaken in 2012, did not consider light impacts on the natural and social environment of the Project area. However, lighting from the Project is not expected to result in significant impacts to light-sensitive fauna or the visual amenity of nearby communities.

Potential impacts during operations include behavioural changes in light sensitive fauna, particularly bats. While recent studies indicate there is bat habitat in the Project area, none of the bat species observed was of conservation value and none are likely to occur (Outback Ecology 2009, 2012b). Further, there is likely substantial additional habitat in the surrounding area.

Light impacts to the Wingellina community will occur due to its close proximity to the Project. However, light emissions from the Project will be reduced by the Wingellina Hills acting as a natural barrier. Through the implementation of appropriate lighting design light impacts will also be managed:

- Directing light towards construction and operations areas;
- Installing light shields; and

- Using minimal illumination levels to light up areas.

4.7.6 Greenhouse Gases

A Greenhouse Emission Estimation, prepared by Greenbase in 2011, calculated total emissions for the 20 year lifetime of the Project, including all activities, as approximately 5.9 million tonnes CO2-e (Greenbase 2011). The CO2-e emissions during normal operation for Wingellina are estimated to be 499.3 kt per year with 95% certainty that the actual emissions will be between 540.3 kt and 458.6 kt (Greenbase 2011).

Estimates were based on the following activities:

- Ore processing;
- Electricity production;
- Sulphur transport;
- Mixed hydroxide precipitate transport;
- Calcrete mining and transport operations;
- Other materials transport; and
- Miscellaneous (clearing, diesel generator and pumping for water supply) (Greenbase 2011).

The greenhouse gas (GHG) emissions from the Project will be reduced by project design to the minimum practicable for economic production (Greenbase 2011). The impact of GHG emissions from the Project is expected to be minimal.

4.7.7 European Heritage

A search of the Register of National Estate and heritage database held by the Heritage Council of Western Australia did not find any heritage sites within the vicinity of the Project area.

4.7.8 Social Impacts

The current living conditions at the Wingellina Township are poor with widespread poverty. The township has lacked development and maintenance received by other communities in the area for many years.

The mining operation will not impact negatively upon the social values of the Wingellina Community nor other communities in the region. Instead the Project will provide a number of opportunities:

- Training and employment opportunities for the Wingellina community in an area virtually devoid of employment opportunities;
- Business development opportunities for the Wingellina community;
- Aboriginal heritage sites are protected and able to be accessed by Aboriginal people of the area;
- Aboriginal cultural awareness of the Hinckley Range workforce is increased;
- Community members able to participate in environmental management activities;
- Economic contribution to the community by the mine workforce;

- Social and sporting occasions between mine workforce and community;
- Improvement to infrastructure, with the supply of potable water supply, and power to the Wingellina community; and
- Roads being sealed and/or better maintained (URS 2012).

These benefits are expected to positively impact on health and amenity of the existing community of Wingellina.

5.0 REFERENCES

Artefaxion Pty. Ltd. (2008) *Archaeological Survey of Tenement E69/535, Irrunytju Community, Ngaanyatjarra Lands*, Report prepared for Irrunytju Community and Metals X Limited, March 2008.

Coffey (2008) *Wingellina Project Phase 1 Feasibility Study*, July 2008.

Graham, D., & Cowan, M,. (2001) *A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Central Ranges 1 (CR1 - Mann-Musgrave Block subregion)*, Department of Environment and Conservation, Western Australia.

Lloyd George (2013) *Wingellina Nickel Project Air Quality Assessment*, July 2013.

Greenbase (2012) *Greenhouse Emmission Estimation and Reporting Advice for Wingellina Nickel Project*, January 2011.

Outback Ecology. (2008a) *Wingellina Nickel Project, Baseline Soil Survey*, Unpublished report prepared for Metals X Limited, August 2008.

Outback Ecology. (2008b) *Wingellina Nickel Project, Flora and Fauna Desktop Study of tenement L69/12*, May 2008.

Outback Ecology Services (2008c) *Wingellina Nickel Project, Flora and Fauna Desktop Study of Tenement E69/2453* (now L69/13) for Metals X limited May 2008

Outback Ecology. (2009) *Wingellina Nickel Project, Terrestrial Fauna Assessment*, Unpublished report prepared for Metals X Limited, April 2009.

Outback Ecology. (2011a) *Level 1 Flora and Vegetation Assessment of the Wingellina Borefield (L69/12)*, Unpublished report prepared for Metals X Limited, July 2011.

Outback Ecology. (2011b) *Level 2 Flora and Vegetation Assessment of the Wingellina Mine*, June 2011.

Outback Ecology. (2011c) *Wingellina Nickel Project, Subterranean Fauna Assessment*, September 2011.

Outback Ecology. (2012a) *Wingellina Nickel Project, Visual Impact Assessment,* September 2012.

Outback Ecology. (2013a) *Wingellina Nickel Project, Supplementary Report: Wingellina Borefields Subterranean fauna Assessment*, May 2013.

Outback Ecology (2013b) *Wingellina Nickel Project Level 1 Terrestrial Flora and Vegetation Survey of the Cobb Depression Borefield and Pipeline Route*, May 2013

Outback Ecology (2013c) *Wingellina Nickel Project Level 1 Terrestrial Fauna Assessment of the Cobb Depression Borefield and Pipeline Route*, May 2013

Rockwater Pty Ltd. (2010) *Broad-scale Hydrological assessment, Wingellina Mine*, Unpublished report prepared for Metals X Limited.

Rockwater Pty Ltd. (2011a) *Wingellina Nickel Project - Results of Permeability Testing and Numerical Modelling of Mine Dewatering Rates*, Unpublished report prepared for Metals X Limited, April 2011.

Rockwater Pty Ltd. (2011b) *Wingellina Nickel Project – Central Officer Basin Groundwater Investigation 2010 – 2012, Bore Completion, Test-pumping and Flow Modelling Report,* December 2012.

Rockwater (2011c) *Wingellina Nickel Laterite Project Surface Water Management Assessment*, March 2011.

Rockwater Pty Ltd. (2013) *Wingellina Nickel Project, Cobb Depression Groundwater Investigation. Bore Completion, Test-pumping and Flow Modelling Report*. January 2013.

SEWPac (2013) *Ranges of the Western Desert, Laverton - Warburton Rd, Warburton via Laverton, WA, Australia,* accessed 8 July 2013, from: http://agencysearch.australia.gov.au

URS (2012) *Wingellina Nickel Project - Social Impact Analysis and Management Plan*, January 2012.