## **Referral of proposed action**

Propos	sed
action	title:

Yangibana Rare Earths Project

## 1 Summary of proposed action

#### 1.1 Short description

Hastings Technology Metals Limited (Hastings) proposes to develop the Yangibana Rare Earths Project (the Proposal), located approximately 270 km east-northeast of Carnarvon, in the Upper Gascoyne region of Western Australia (WA). The Proposal will involve mining ferrocarbonatite-magnetite-rare earth bearing dykes. Proposal activities include construction, mining, processing, decommissioning and rehabilitation of a rare earth mine, and associated infrastructure. The Proposal is expected to have a mine life of approximately seven years.

1.2	Latitude and longitude		Latitude	Longitude
	Polygon enclosing entire	Point	degrees minutes seconds	degrees minutes seconds
	referral area. Points are listed	1	-23:54:44.60 S	116:05:52.08 E
	in a clockwise order.	2	-23:54:09.76 S	116:06:12.24 E
		3	-23:52:05.05 S	116:07:43.68 E
		4	-23:50:13.59 S	116:10:00.12 E
		5	-23:49:55.34 S	116:11:04.92 E
		6	-23:49:55.34 S	116:12:05.04 E
		7	-23:51:28.62 S	116:14:34.44 E
		8	-23:52:33.70 S	116:16:00.12 E
		9	-23:52:55.30 S	116:17:04.92 E
		10	-23:52:55.30 S	116:18:05.04 E
		11	-23:55:22.83 S	116:19:00.12 E
		12	-23:56:27.74 S	116:19:23.52 E
		13	-23:57:10.08 S	116:19:23.16 E
		14	-23:58:00.01 S	116:18:21.24 E
		15	-23:58:00.01 S	116:17:30.12 E
		16	-24:00:09.29S	116:14:32.28 E
		17	-24:05:07.08 S	116:16:54.48 E
		18	-24:05:32.82 S	116:17:01.32 E
		19	-24:05:44.55 S	116:17:00.60 E
		20	-24:05:49.77 S	116:16:59.16 E
		21	-24:05:54.56 S	116:16:56.64 E
		22	-24:05:58.63 S	116:16:53.04 E
		23	-24:06:02.09 S	116:16:47.64 E
		24	-24:06:06.84 S	116:16:37.02 E
		25	-24:06:02.48 S	116:16:34.68 E
		26	-24:04:24.56 S	116:16:15.24 E
		27	-24:03:56.66 S	116:15:30.06 E
		28	-24:02:53.77 S	116:13:42.24 E
		29	-24:02:49.66 S	116:13:36.84 E
		30	-24:02:46.39 S	116:13:33.06 E
		31	-24:02:20.58 S	116:13:14.52 E
		32	-23:59:36.38 S	116:13:32.88 E
		33	-23:58:21.50 S	116:14:06.36 E
		34	-23:56:27.52 S	116:15:56.16 E
		35	-23:53:60.00 S	116:16:59.88 E
		36	-23:52:59.98 S	116:15:20.52 E

37	-23:52:09.91 S	116:12:1.023 E
38	-23:50:53.80 S	116:10:0.120 E
39	-23:52:55.45 S	116:07:43.68 E
40	-23:53:02.72 S	116:07:37.92 E
41	-23:54:42.84 S	116:06:03.06 E
42	-23:54:48.27 S	116:05:57.48 E
43	-23:54:44.60 S	116:05:52.08 E

#### 1.3 Locality and property description

The Proposal is located approximately 270 km east-northeast of Carnarvon and approximately 100 km northeast of Gascoyne Junction in the Gascoyne Region of Western Australia (WA) (Figure 1).

1.4	Size of the development footprint (hectares)	Approximately 1,000 Ha within a development envelope of 12,098 Ha.
1.5	Street address of the site	Wanna Station, Cobra-Gifford Creek Road, West Lyons River

#### 1.6 Lot description

The Proposal is located entirely on the Wanna pastoral lease. Land tenure for the Proposal has been obtained under the *Mining Act 1950* (WA). Details of tenure and associated areas are provided in Table 1.

Lease	Grant Date	Holder(s)	Area (Ha)
G09/13	Pending	Gascoyne Metals Pty Ltd (70%), Mojito Resources Limited (30%)	277.20
G09/14	Pending	Gascoyne Metals Pty Ltd	286.08
G09/16	Pending	Yangibana Pty Ltd	389.83
G09/XX^	Pending	Yangibana Pty Ltd	629.50
L09/66	6-May-2016	Gascoyne Metals Pty Ltd	108.13
L09/67	8-Dec-2015	Gascoyne Metals Pty Ltd	6.79
L09/70	11-Dec-2015	Gascoyne Metals Pty Ltd	25.26
L09/71	11-Dec-2015	Gascoyne Metals Pty Ltd	5.65
L09/78*	Pending	Gascoyne Metals Pty Ltd	82.00
L09/79	Pending	Gascoyne Metals Pty Ltd	34.01
L09/80*	Pending	Gascoyne Metals Pty Ltd	232.87
M09/157	1-Jul-2015	Gascoyne Metals Pty Ltd	289.00
M09/158	1-Jul-2015	Yangibana Pty Ltd	535.00
M09/159	1-Jul-2015	Gascoyne Metals Pty Ltd (70%), Mojito Resources Limited (30%)	1,469.83
M09/160	17-Nov-2015	Gascoyne Metals Pty Ltd	234.17
M09/161	25-Feb-2016	Gascoyne Metals Pty Ltd (70%), Mojito Resources Limited (30%)	313.10
M09/162	25-Feb-2016	Yangibana Pty Ltd	47.95
		Total Proposal Tenement Area (Ha)	4,966

#### **Table 1: Proposal Tenement Details**

Note: \* Tenement L09/78, L09/79 and L09/80 will require re-alignment due to stakeholder and hydrological considerations, therefore areas provided in the above table may change.

^ Submission of application for two general purpose tenements is proposed.

#### 1.7 Local Government Area and Council contact (if known)

The Proposal is located in the Shire of Upper Gascoyne: 4 Scott Street Gascoyne Junction WA 6705 Phone: (08) 9943 0988 Chief Executive Officer: John McCleary Shire President: Cr Lachlan McTaggart

#### 1.8 Time frame

Subject to regulatory approvals, construction is expected to begin in June 2018, with the first export of rare earth concentrate expected in 2020. The operational phase of the Proposal is approximately seven years.

1.9	Alternatives to proposed action	X	No Yes, please also complete section 2.2
1.10	Alternative time frames,		No
	locations of activities	Х	Yes, you must also complete Section 2.3.
1.11	Commonwealth, State or Territory assessment		No
		Х	Yes, please also complete section 2.5
1.12 Component of larger action		Х	No
			Yes, please also complete section 2.7
1.13	Related	Х	No
actions/proposals			Yes, provide details: N/A
1.14	Australian Government	Х	No
	funding		Yes, please also complete section 2.8
1.15	Great Barrier Reef	Х	No
Marine Park			Yes, please also complete section 3.1 (h), 3.2 (e)

## 2 Detailed description of proposed action

#### 2.1 Description of proposed action

#### Land Tenure

The Proposal is located within eighteen tenements (Table 1) comprising a total area of 4,966 Ha. The disturbance footprint is approximately 1,000 Ha within a development envelope of 12,098 Ha. Figure 2 presents the tenement boundaries, development envelope and proposed site layout.

The underlying land tenure is pastoral lease, with the Proposal overlying Gifford Creek and Wanna Stations (both stations are owned by the same leaseholder, Mr Bill Biggs and were previously the one Wanna Station).

Recently the combined Tiin-Mah Warriyangka, Tharrkari, Jiwarli submitted a native title claim (WC2016/003) (WAD464/2016) over the Proposal area and beyond. Hastings will negotiate a mining agreement with the Native Title holders.

#### Mineral Resource

There are four deposits (Yangibana North, Yangibana West, Bald Hill and Fraser's) within the Proposal area containing economic quantities of rare earth elements (REE) in a monazite ore. The monazite is rich in REE, of which neodymium, praseodymium, dysprosium and europium are most valuable. These elements are primarily used in the industrial metals markets for the production of magnet and advancing technologies in electric vehicles, wind turbines, robotics, and digital devices, to name a few.

#### Mining

The ore bodies will be mined using conventional open pit methods of drill and blast, load and haul. Proposed depths of open pits range from 70 metres below ground level (mBGL) at Bald Hill, and 95 mBGL at Yangibana and Fraser's. The largest pit will be Yangibana, which comprises of two deposits - Yangibana North and Yangibana West.

Deposits will require dewatering prior to mining. Depth to groundwater within deposits ranges from 6 mBGL to 30 mBGL. Groundwater will likely be abstracted via groundwater production bores, and where possible from in-pit sumps, into transfer dams prior to being distributed to different storage locations around the Proposal for use in ore processing, dust suppression and potable water uses.

Mine waste rock will be generated throughout the mining phase of operations. The ratio of ore to waste rock will vary depending on the deposit and the depth of mining, with less waste rock produced with depth. The proposed annual mining rate is approximately 8 million tonnes per annum (Mtpa), of which 1 Mtpa will be ore. Four Waste Rock Landforms (WRLs) will be constructed adjacent to the source open pit. WRLs will be reshaped during the rehabilitation phase of the operation to meet final landform design parameters. The proposed maximum height of WRLs is up to 30-40 metres above the natural surface.

#### Processing

#### Beneficiation

The initial phase of processing occurs within the beneficiation plant. This consists of conventional processes to remove economic materials and increase the REE concentrations. This process includes:

- Crushing circuit;
- Grinding in SAG mill and/or ball mill;
- Flotation circuit to produce a mineral concentrate; and
- A regrind mill.

The beneficiation mineral concentrate will represent approximately 3% of the incoming ore mass. The remaining 97% comprising barren material, which will be disposed of in Tailings Storage Facilities (TSFs). The beneficiation concentrate will undergo further processing in the hydrometallurgical plant.

Key reagents used in the beneficiation process include:

- Sodium hydroxide;
- Sodium silicate; and
- Fatty acid collector.

#### Hydrometallurgy

The hydrometallurgical plant will continue processing the concentrate to remove residual materials such as iron, phosphate, aluminium, uranium and thorium (and their decay products) and produce a mixed rare earth carbonate. The process includes:

- Acidification and roasting of the mineral concentrate to crack the mineral structure;
- Water leaching to bring metals into solution;
- Purification and ion exchange to remove impurities;
- Precipitation of rare earths carbonate product; and
- Neutralisation of waste streams prior to disposal in a TSF.

Approximately 12 - 13,000 tpa of mixed rare earth concentrate will be produced.

The key reagents required for the hydrometallurgical plant include:

- Sulphuric acid;
- Ammonium or sodium bicarbonate;
- Quick lime slaked to hydrated lime;
- Limestone;
- Magnesium oxide; and
- Sodium hydroxide (caustic soda).

The process water generated from the hydrometallurgical plant cannot be reused in the plant due to reagent solutes, and as such disposal of this water (~480,000 m<sup>3</sup>/annum) to an evaporation pond will be required (Figure 2).

#### **Tailings Disposal and Storage**

The three separate processing tailings streams will be disposed in distinct TSFs. Table 2 summarises chemical and physical characteristics, source and disposal location of each tailings stream. Table 3 summarises the TSF design features.

Processing source	Tailings mass (%)	Annual rate (tpa)	Physical processing	Chemical properties	Radionuclide concentration	Disposal
Beneficiation	95.0%					
1. Rougher circuit	91.0%	932,100	Crushed and milled ore, flotation	Trace flotation reagents; pH 10-11.5	<1 Bq/g (head of chain)	TSF 1
2. Cleaner circuit	4.0%	37,200	Crushed and milled ore, flotation	Trace flotation reagents; pH 10-11.5	~ 7 Bq/g (head of chain)	TSF 2
Hydrometallurgical	5.0%	56,000	Acid Heating Water leach Neutralisation and waste removal Thickening	Trace sulphuric acid; U and Th; Iron phosphates Aluminium; Gypsum Metal hydroxides; pH 7-8	~24 Bq/g (head of chain)	TSF 3
TOTAL	100%	1,025,300			•	•

Table 2: Source	Disposal	and	General	Characteristics	of	Tailings	Streams
Table 2. Source,	Dispusai	anu	General	Characteristics	U	rannys	Sucams

#### Table 3: Summary of Proposed TSF Design Features

Design feature	TSF1	TSF2	TSF3	
Proportion of tailings	91%	4%	5%	
Maximum height (m)         6 metre perimeter embankments;           Tailings stack 15 metres		6 metre perimeter embankments	6 metre perimeter embankments	
Area (Ha)	100 Ha	7 Ha	11 Ha	
Number of cells	1	1	1	
Construction	Downstream perimeter embankment raising	Downstream perimeter embankment raising	Downstream perimeter embankment raising	
Discharge method         Single point Central Thickened Discharge (CTD)		Perimeter spigots	Perimeter spigots	
Lining	Proof compacted basal clayey sand layer	HDPE / other and compacted clayey sand	HDPE / other and compacted clayey sand	
Encapsulation	Nominal capillary break / erosion protection; growth medium (soil and rock armour)	HDPE / compacted clayey sand base; HDPE / Compacted Clay Liner (CCL) engineered capping with growth medium (soil and rock armour). Design in accordance with IAEA safety standards to provide safe containment of NORM for periods beyond the extent of institutional control	HDPE / compacted clayey sand base; HDPE / CCL engineered capping with growth medium (soil and rock armour). Design in accordance with IAEA safety standards to provide safe containment of NORM for periods beyond the extent of institutional control	
Leak detection Downstream groundwater monitoring bores		Downstream groundwater monitoring bores	Downstream groundwater monitoring bores; Underdrain detection between compacted clay and HDPE liners with sump	

#### Support Infrastructure

#### Power Supply

Anticipated annual power requirement across mining, processing and support infrastructure will be 12 Megawatt (MW). Power requirements to the processing plant and associated infrastructure are anticipated to be in the order of 10 MW per annum, predominantly supplied through solar energy, with five diesel generator sets providing approximately 20% of power supply. Power supply for the accommodation facilities will be supplied by diesel generator sets located adjacent to the accommodation facilities.

#### Water Supply

An estimated annual water demand for the Proposal of up to 2.5 gigalitres (GL) per year, the majority of which will be supplied by groundwater. Mine dewatering will supply all water requirements initially, however, a borefield will also be developed to meet water demands. Water reuse will occur within the processing plant (TSF1 and TSF2 decant water) and for dust suppression from the washdown pad. The majority of the water demand will occur from ore processing, with minor volumes required for dust suppression, fire protection, equipment washdown and potable uses across the Proposal. Raw water will undergo necessary treatment through a Reverse Osmosis (RO) plant to meet potable water quality parameters.

#### Other Infrastructure

Access to the Proposal will be via the Cobra-Gifford Creek Road. Works to upgrade some sections of Shire of Upper Gascoyne roads (Cobra - Diary Creek Road) will be required to establish a safe and reliable route for transport of reagents, fuel and other consumables to site, and transport of concentrate to port for export. Existing facilities at the port will be utilised and transport from port will occur on container ships via existing ship loading facilities and shipping lanes.

An aerodrome and accommodation facilities will be located approximately 10 km south-southwest of the Processing Plant. In accordance with Civil Aviation Safety Authority's *Manual of Standards Part 139 - Aerodromes*, the aerodrome will have a Code 3C runway, 30 m wide and 1,800 m long (Commonwealth of Australia 2012). The accommodation facilities will allow for an estimated peak workforce of up to 200 people during construction, and 180 people during operations. Single storey accommodation blocks are proposed, with laundry, mess and recreational facilities.

Additional infrastructure includes a landfill for putrescible and industrial waste, contaminated waste facility, sewage treatment plant, water transfer infrastructure, communications tower, power infrastructure, bulk diesel tank farm and an explosives magazine.

#### Rehabilitation and Closure

The final Proposal disturbance footprint will be approximately 1,000 Ha. The majority of this land disturbance is associated with mining landforms, including final voids, WRLs and TSFs, which will become permanent features of the post-mining landscape.

Land disturbance will be progressively rehabilitated, where possible. Proposal areas with industrial land use will be decommissioned, assessed for any residual soil / water impacts and undergo remediation where required. Mining landforms will undergo earth works to meet final landform design criteria, including placement of any covers or encapsulation. Disturbed areas of the Proposal will have growth medium replaced (where applicable) to enable revegetation with local provenance species relevant to pre-disturbance land type.

A Preliminary Mine Closure Plan will be developed for the Proposal. Revisions of the Mine Closure Plan will be based on consultation and feedback from both the EPA and DMP, as well as other key stakeholders, and updated with information of relevant studies and engineering designs. **Attachment A** outlines preliminary closure considerations for TSF2 and TSF3.

#### 2.2 Feasible alternatives to taking the proposed action

There are no feasible alternatives to taking the proposed action.

The target REE are associated with monazite occurring within the ferro-carbonatite dykes. The monazite contains elevated concentrations of naturally occurring thorium and uranium, and therefore the ore is classified as a radioactive material (>1 Bq/g). The beneficiation process removes the monazite with the concentrate and the resulting tailings are therefore not classified as radioactive (<1 Bq/g). Consideration was given to constructing a single TSF to dilute the total concentration of radionuclides, however, levels of radionuclides could not be reduced to less than 1 Bq/g. Therefore, in order to minimise the quantity of tailings defined as radioactive, three TSFs will be required. TSF1 will contain 91% of tailings at less than 1 Bq/g and therefore not be classified as radioactive material. TSF2 and TSF3 will contain tailings above 1 Bq/g (7 Bq/g and 24 Bq/g respectively), and therefore be subject to a higher level of management.

#### 2.3 Alternative locations, time frames or activities that form part of the referred action

During the Pre-Feasibility Study an options study was undertaken with up to six locations and two designs considered for a TSF. The location of the processing plant and associated TSFs were guided by:

- Location of the resource;
- Economics of ore haulage from four open pits located over approximately 7 km;
- Geotechnical study outcomes for landform stability and seepage analysis;
- Surface water drainage patterns;
- Cultural heritage surveys;
- Wind direction; and
- Pastoralist consultation.

Disposal of all three tailings streams in one TSF has also been considered. However, radionuclide concentrations will still be elevated and thus require a higher level of management. Given that over 90% of tailings are benign and not considered radioactive, the costs associated with disposal are significantly reduced if they are disposed in a separate TSF.

Backfilling of the mine pits has also been considered. The target ore body continues at depth. The depth of the pits is based on economic considerations. Market demand for REE is predicted to increase in the future, therefore the depth at which the target resource can be mined may increase in the future. Backfilling will potentially sterilise future reserves.

#### 2.4 Context, including any relevant planning framework and state/local government requirements

The proposed action has been considered in context of the relevant commonwealth and state legislation (Table 4).

The Proposal requires assessment and approval under the Part IV of the *Environmental Protection Act 1986* (WA) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth). As such assessment under the bilateral agreement will be sought.

#### Table 4 Key Legislation for the Proposal

Legislation	Government Department	Aspect
State Legislation		
Aboriginal Heritage Act 1972	Department of Aboriginal Affairs	Ethnographic and archaeological
Agricultural and Related Resources Protection Act 1976	Department of Agriculture and Food	Invasive weeds and pest animals
Bush Fires Act 1954	Department of Fire and Emergency Services	Wild fire control
Contaminated Sites Act 2003	Department of Environment Regulation	Management of contaminated lands
Dangerous Goods and Safety Act 2004	Department of Mines and Petroleum	Dangerous Goods management
Environmental Protection Act 1986	Environmental Protection Authority	Environmental impact assessment
Environmental Protection Act 1986	Department of Environment Regulation	Prescribed premises
Health Act 1911	Department of Health	Sewage treatment facilities
Heritage of Western Australia Act 1990	Heritage Council of Western Australia	Non-indigenous heritage
Local Government Act 1995	Shire of Upper Gascoyne	Buildings
Local Government (Miscellaneous Provisions) Act 1960	Shire of Upper Gascoyne	Community issues / resources / facilities
Mining Act 1950	Department of Mines and Petroleum	Land tenure, environmental management
Mines Safety and Inspection Act 1994	Department of Mines and Petroleum	Personnel safety on mine sites, NORM, radioactive waste management, radiation safety
Occupational Safety and Health Act 1984	Department of Commerce	Occupational safety and health
Radiation Safety Act 1975	Radiological Council	Radiation safety
Rights in Water and Irrigation Act 1914	Department of Water	Water exploration and abstraction
Soil and Land Conservation Act 1945	Department of Agriculture and Food	Protection of soil resources
Waterways Conservation Act 1976	Department of Water	Protection of surface and groundwater
Wildlife Conservation Act 1950	Department of Parks and Wildlife	Protection of indigenous wildlife, including items of state significance
Commonwealth Legislation		·
Australian Radiation Protection and Nuclear Safety Act 1998	Australian Radiation Protection and Nuclear Safety Agency	Health and safety, and protection of the environment in relation to radiation
Customs (Prohibited Exports) Regulations 1958	Immigration and Border Protection	Export of materials containing radioactive materials
Environment Protection and Biodiversity Conservation Act 1999	Department of the Environment and Energy	Matters of National Environmental Significance
National Greenhouse and Energy Reporting Act 2007	Department of Climate Change	Greenhouse gas emissions

Legislation	Government Department	Aspect
Native Title Act 1993	Native Title Act Tribunal	Rights and interests of Aboriginal people or Torres Strait Islanders in relation to land or waters
Protection of Moveable Cultural Heritage Act 1986	Department of Communications and the Arts	Protection of moveable cultural heritage

The Proposal is located in a remote area of the Shire of Upper Gascoyne. The primary economic activity in the Shire is pastoralism with a small amount of tourism. The area is characterised by a small, sparsely distributed population. The nearest town to the Proposal, Gascoyne Junction, is approximately 150 km away with a population of approximately 100 people. The coastal town of Carnarvon is the nearest regional centre, approximately 270 km from the proposed action with a resident population of approximately 6,140.

#### 2.5 Environmental impact assessments under Commonwealth, State or Territory legislation

The Proposal will undergo environmental impact assessment under Part IV of the *Environmental Protection Act 1986* (WA). In January, Hastings will submit a referral under the *Environment Protection Act 1986* (WA) to the Office of the EPA for consideration concurrently with the submission of this referral to the Department of the Environment and Energy.

The proposed action has not previously been assessed at the Commonwealth level.

#### 2.6 Public consultation (including with Indigenous stakeholders)

Hastings follows a Stakeholder Engagement and Communications Plan, which ensures that relevant stakeholders have been identified, consulted regarding the Proposal development, and potential issues raised by stakeholders are identified at an early stage. Hastings is committed to establishing long-term stakeholder and community relationships. Hastings values input from the community and is keen to identify and address any concerns a member of the public may have regarding the implementation of the Proposal.

Substantial consultation with state regulatory agencies and the community has been undertaken in the preparation and finalisation of the referral documents. A community forum was held at Gascoyne Junction to discuss environmental aspects of the Proposal to interested members of the community. Hastings will continue to engage relevant stakeholders and involve them during Proposal development, construction and operations for the life of the mine. Decommissioning and closure aspects are also actively discussed with relevant stakeholders during the planning phase.

Recently the combined Tiin-Mah Warriyangka, Tharrkari, Jiwarli submitted a native title claim (WC2016/003) (WAD464/2016) over the Proposal area and beyond. Hastings has built a good relationship with the Traditional Owners, and will continue to consult with Traditional Owners on all relevant aspects of the Project.

Prior to the native title claim, Hastings worked closely with the Traditional Owners to survey the majority of areas planned for disturbance to identify significant heritage sites. As a result of the surveys, Hastings has designed its infrastructure to avoid impacts to sites of cultural significance.

Hastings will continue to work closely with native title claimants to complete surveys and negotiate the necessary Indigenous Land Use Agreements.

#### 2.7 A staged development or component of a larger action

Not applicable – this Proposal is not part of a staged development or component of a larger action.

#### 2.8 Related actions

Not applicable – this Proposal does not have related actions.

## **3 Description of environment & likely impacts**

#### 3.1 Matters of national environmental significance

#### 3.1 (a) World Heritage Properties

#### Description

The Proposal is located over 300 km from the closest World Heritage Property at Shark Bay near Denham, Western Australia. No impact to a World Heritage Property is expected.

#### Nature and extent of likely impact

No direct or indirect impacts.

#### 3.1 (b) National Heritage Places

#### Description

The Proposal is located over 300 km from the closest National Heritage Place at Shark Bay near Denham, Western Australia. No impact to a National Heritage Place is expected.

#### Nature and extent of likely impact

No direct or indirect impacts.

#### 3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

#### Description

The Proposal is located over 600 km from the closest Wetland of International Importance at Eighty Mile Beach, Western Australia. No impact to a Wetland of International Importance is expected.

#### Nature and extent of likely impact

No direct or indirect impacts.

#### 3.1 (d) Listed threatened species and ecological communities

#### Description

Biological assessments included desktop studies and field surveys, completed over the broader Yangibana tenement area (55,000 Ha) referred to as the "study area" which encompassed and extended beyond the proposed development envelope of 12,098 Ha.

An EPBC Act Protected Matters search, conducted in February 2015 for the study area with a 30 km buffer, reported two threatened species: One terrestrial flora species (*Pityrodia augustensis*) and one terrestrial fauna species (Northern Quoll, *Dasyurus hallucatus*). In preparing this referral (November 2016) an updated search was conducted using the same coordinates and buffer for the study area. In addition to the two threatened species listed above, four fauna species have been added, including two birds (Curlew Sandpiper, *Calidris ferruginea*; Night Parrot *Pezoporus occidentalis*) and two mammals (Ghost Bat, *Macroderma gigas*; Pilbara Leaf-nosed Bat, *Rhinonicteris aurantia* (Pilbara form)). The EPBC listed (Vulnerable) Yinnetharra Rock Dragon (*Ctenophorus yinnietharra*) was not reported on the Protected Matters search, however it was recorded on the WA Department of Parks and Wildlife (DPaW) database search, and for completeness is discussed in this section.

Flora and fauna assessments, including subterranean fauna and short range endemic species, were conducted by Ecoscape Australia in 2015. Attachment B presents the flora and vegetation report (Ecoscape Australia 2015a), and Attachment C1 (Ecoscape Australia 2015b) and Attachment C2 (Ecoscape Australia 2015c) present the terrestrial fauna and subterranean fauna reports, respectively.

#### Flora and Vegetation

Despite extensive survey efforts, no threatened flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were found within the study area (Ecoscape Australia 2015a).

It is considered highly unlikely that the proposed action will have a significant impact on threatened flora species or threatened ecological communities.

#### Terrestrial Fauna and Short Range Endemics

No threatened fauna species listed under the EPBC Act were found within the study area (Ecoscape Australia 2015b and 2015c).

It is considered highly unlikely that the proposed action will have a significant impact on threatened fauna species or their habitat.

#### **Threatened Ecological Communities**

No nationally listed Threatened Ecological Communities exist within the footprint of the proposed action (Ecoscape Australia 2015a).

#### Nature and extent of likely impact – EPBC listed threatened species

#### Pityrodia augustensis

Given the species was not found within the study area, it is unlikely that the proposed action will have any impact on *Pityrodia augustensis*.

#### Curlew Sandpiper (Calidris ferruginea)

The Curlew Sandpiper was not found within the study area. It is a marine migratory species and may pass over the Proposal region on its way to and from the northern coast of Western Australia to south-east Australia (DoE 2014).

Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, although they have less often been recorded inland, around ephemeral and permanent lakes and waterholes.

Curlew Sandpipers forage on mudflats and nearby shallow water. The species does not breed in Australia. They generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (DoE 2014).

As the Proposal area does not contain foraging or roosting sites suitable for the species, it is considered highly unlikely that the proposed action will have any impact on *Calidris ferruginea*.

#### Night Parrot (Pezoporus occidentalis)

The Night Parrot was not found within the study area. There is a record of an uncertain sighting from 1967 to the north of the Wanna Station lease (*NatureMap*, DPaW 2007-2015 in Ecoscape Australia 2015b), therefore the study area is considered to be within the potential range of movements for this nomadic species. There is no indication that the habitat is suitable for foraging, as neither *Triodia* nor chenopods were observed within any of the vegetation types identified by Ecologia (2014) (in Ecoscape Australia 2015b).

It is considered unlikely that the proposed action will have any impact on Pezoporus occidentalis.

#### Northern Quoll (Dasyurus hallucatus)

The Northern Quoll was not found within the study area. Some suitable habitat is present within the study area, however the species is not expected to occur due to the distance from known populations. There is a very low possibility of its presence as no records exist of the species south of the Hamersley Range (Ecoscape Australia 2015b).

It is considered highly unlikely that the proposed action will have any impact on Dasyurus hallucatus.

#### Ghost Bat (Macroderma gigas)

The Ghost Bat was not found within the study area. Regional populations of the Ghost Bat are centred on maternity roosts that are genetically isolated from each other. Survival is critically dependent on finding natural roosts in caves, crevices, deep overhangs, and artificial roosts such as abandoned mine adits (Hall *et al.* 1997 in Ecoscape Australia 2015b).

*NatureMap* (DPaW 2007-2015 in Ecoscape Australia 2015b) and literature records (Armstrong & Anstee 2000; Douglas 1956 in Ecoscape Australia 2015b) exist from the Barlee Range north of the study area, but none further southwest. The study area is possibly within dispersal range for the Barlee Range population, however no suitable roosting sites exist within the study area (Ecoscape Australia 2015b).

It is considered unlikely that the proposed action will have any impact on Macroderma gigas.

#### Pilbara Leaf-nosed Bat (Rhinonicteris aurantia)

The Pilbara Leaf-nosed Bat was not found within the study area. Some good quality foraging habitat is present within the study area after rainfall events and when conditions are favourable, however the species' range is generally considered to be contracting northward and therefore the Pilbara Leaf-nosed Bat is unlikely to occur within the study area (Ecoscape Australia 2015b).

It is considered unlikely that the proposed action will have any impact on Rhinonicteris aurantia.

#### Yinnietharra Rock Dragon (Ctenophorus yinnietharra)

Yinnietharra Rock Dragon was not found within the study area. The known distribution is very limited, consisting of various sites separated by less than 30 km on both sides of the Gascoyne River on Yinnietharra Station, and another locality about 90 km to the northwest on the Lyons River/Minnie Creek (Ecoscape Australia 2015b).

The species generally occurs in tall open shrublands and granite outcrops, which can be separated by stony flats with sparse Acacia shrubs. The species also appears to be restricted to rocks of one origin: Archean gneissic biotite granites and granodiorite (Cogger et al. 1993; DoE 2015b in Ecoscape Australia 2015b). The association of the Yinnietharra Rock Dragon with Archaean granites was inferred from a small sample of localities (Ecoscape Australia 2015b).

The proposed action is approximately 45 km east along the Lyons River from the Minnie Creek locality, and about 70 km north of the nearest of the Gascoyne River localities. The study area includes outcropping rock units described as gneiss, biotite and granodiorite, which are mapped as Paleoproterozoic rather than Archaean.

The level of knowledge and previous surveys in the region is very low. Ecoscape Australia (2015b) considers it reasonably likely that *Ctenophorus yinnietharra* occurs in the study area; however, targeted searches within suitable habitat within the study area failed to record this species.

Given the species was not found within the study area, it is unlikely that the proposed action will have any impact on *Ctenophorus yinnietharra*.

#### 3.1 (e) Listed migratory species

#### Description

The EPBC Act Protected Matters search identified six migratory bird species as potentially occurring within the study area:

- Fork-tailed Swift (Apus pacificus);
- Barn Swallow (*Hirundo rustica*);
- Grey Wagtail (Motacilla cinereal);
- Yellow Wagtail (*Motacilla flava*);
- Curlew Sandpiper (Calidris ferruginea) likely impact detailed in section 3.1d; and
- Oriental Plover (Charadrius veredus).

#### Nature and extent of likely impact

#### Fork-tailed Swift (Apus pacificus)

The Fork-tailed Swift is a highly nomadic species, occurring over dry and open inland plains, but also more broadly over a wide variety of land and marine habitats. In Western Australia, the Fork-tailed Swift is considered uncommon to moderately common near the north-west, west and south-east coasts. It is common in the Kimberley and rare or scarce elsewhere (Johnstone and Storr 1998 in Ecoscape Australia 2015b).

Extensive fauna survey efforts found no sightings of this species, however, there are scattered records in the region with the closest being 13 km south-west of the study area. The species is likely to occur intermittently in the study area as a seasonal visitor to forage, but is not expected to utilise the habitats within the study area.

It is considered highly unlikely that the proposed action will have any impact on Apus pacificus.

#### Barn Swallow (Hirundo rustica)

The Barn Swallow was not found within the study area. It is a marine migratory species.

Barn Swallows breed in the northern hemisphere, with small numbers being regular non-breeding migrants to northern Australia. The species arrive in northern Australia in September to October and depart in April (DoE 2015).

Their habitat is the air above open vegetated areas including farmland and native grasslands, as well as over open water such as billabongs and creeks. Barn Swallows are aerial insectivores. The species often perch on bare branches or wires, and gather in flocks during the day, and roost at night perched in vegetation, usually tall wetland grasses.

In Western Australia, the species has been recorded at scattered sites in coastal and sub coastal areas in the Pilbara Region and Kimberley from Exmouth to Kununurra (DoE 2015).

It is considered highly unlikely that the proposed action will have any impact on Hirundo rustica.

#### Grey Wagtail (Motacilla cinereal)

The Grey Wagtail was not found within the study area. It is a marine migratory species.

The Grey Wagtail is a rare non-breeding summer visitor to northern Australia. The species has a strong association with water, even in the non-breeding habitats. They inhabit natural water courses, and artificial wetlands, such as sewage treatment plants. All confirmed Australian records being associated with water (DoE 2015).

It is considered highly unlikely that the proposed action will have any impact on Motacilla cinereal.

#### Yellow Wagtail (Motacilla flava)

The Yellow Wagtail was not found within the study area. It is a marine migratory species.

The Yellow Wagtail is a regular but uncommon non-breeding wet season visitor to northern Australia, including the Pilbara and Kimberley. It is a vagrant in the Gascoyne Region (DoE 2015). Birds are generally seen singly or in small groups. Larger flocks of up to 50 individuals have been recorded.

Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water (DoE 2015). Habitats include open areas with low vegetation such as grasslands, pastures; damp open areas such as muddy or grassy edges of wetlands, rivers, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.

It is considered highly unlikely that the proposed action will have any impact on Motacilla flava.

#### **Oriental Plover (Charadrius veredus)**

The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the northwest Western Australian coast, between Exmouth Gulf and Derby. The species has also been recorded further inland on the 'black soil' plains of northern Western Australia (DEE 2016).

Upon arrival in Australia, Oriental Plovers spend a few weeks in coastal habitats before dispersing further inland (Murlis *et al.* 1988 in Ecoscape Australia 2015b). Thereafter they are found to inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse and interspersed with hard, bare ground (Storr 1980 in Ecoscape Australia 2015b), or open areas that have been recently burnt (Chatto 2003 in Ecoscape Australia 2015b).

No Oriental Plovers were recorded within the study area, however suitable habitat occurs within the study area and in the broader region (Ecoscape Australia 2015b).

It is considered unlikely that the proposed action will have any impact on Charadrius veredus.

#### 3.1 (f) Commonwealth marine area

#### Description

No adverse impacts predicted on Commonwealth marine area.

#### Nature and extent of likely impact

No direct or indirect impacts.

#### 3.1 (g) Commonwealth land

#### Description

No adverse impacts predicted on Commonwealth land.

#### Nature and extent of likely impact

No direct or indirect impacts.

#### 3.1 (h) The Great Barrier Reef Marine Park

#### Description

The Proposal is not located within, or in the vicinity of, the Great Barrier Reef Marine Park.

#### Nature and extent of likely impact

No direct or indirect impacts.

#### 3.1 (i) A water resource, in relation to coal seam gas development or large coal mining development

#### Description

The Proposal does not involve development of coal seam gas or coal mining.

#### Nature and extent of likely impact

No direct or indirect impacts.

## 3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a) Is the proposed action a nuclear action?	No		
	action?	Х	Yes (provide details below)

As defined in clause 22(1)(e) of the EPBC Act and clauses 2.02(1)(c) and 2.02(2) of the EPBC Regulations 2000 (Cwth), the proposed action may be considered a nuclear action due to TSF2 and TSF3 being considered "large scale facilities for the disposal of radioactive waste". It is noted that the original intent of s22 of the EPBC Act was to consider uranium mining and other nuclear related activities. It was not necessarily intended for non-uranium mining such as mineral sands and rare earth projects.

The Proposal will process ore that contains naturally occurring uranium (U) and thorium (Th) with average concentrations of 27 parts per million (ppm) and 450 ppm, respectively. The ore is defined as radioactive material as it contains radionuclides above 1 Bq/g. Consequently, a radiological assessment of the Proposal and three radiation studies have been undertaken:

- 1. Baseline Radiation Report (Radiation Professionals 2016a; Attachment D1)
- 2. Radiation Waste Characterisation Report (Radiation Professionals 2016b; Attachment D2)
- 3. Radiation Impact Assessment Report (JRHC Enterprises 2016; Attachment D3)

The studies show that radiological impacts of the Proposal are very low.

The waste characterisation study reports that radionuclides concentrate in different process streams, particularly the beneficiation regrind and flotation circuit, and the hydrometallurgical circuit. Tailings will be disposed into three distinct TSFs, each with different U and Th concentration ratios relative to the ore. Tailings in TSF1 will be <1 Bg/g and will not be classified as radioactive material. TSF2 and TSF3 will have average activities of 7 Bq/g and 24 Bq/g, respectively. Both of these tailings streams will be classified as radioactive material. They represent less than 9% of the tailings generated by the ore processing plant. Therefore, TSF2 and TSF3 will trigger the "nuclear action" criteria specified in the EPBC Act.

Health and safety (including radiation protection) is regulated by the WA Department of Mines and Petroleum (DMP) Resources Safety Branch and the Radiological Council (WA). Under the Mine Safety and Inspection Act 1994 and Radiation Act 1975, the DMP and Radiological Council require proactive management and monitoring of NORM. The DMP are familiar with REE processing (Lynas - Mt Weld) in Western Australia and they are therefore capable of managing this Proposal under existing policy and legislation to ensure that there is no radiation risk.

Potential impacts to the public, the surrounding environment and the workforce have been assessed.

To manage potential impacts, the following draft management plans (subject to approval by the DMP and Radiological Council) have been developed:

- Radiation Waste Management Plan (Attachment E1)
- Radiation Management Plan (Attachment E2).

Beyond the operational phase of the Proposal, the WA DMP Resources Safety Branch approves and regulates the design, construction, operation and decommissioning of TSFs, and the WA DMP Environment Branch approves and regulates the rehabilitation and closure management of TSFs. Mine closure planning occurs during all phases of the Proposal, and as such preliminary closure considerations for TSF2 and TSF3 are outlined in Attachment A. The MCP will be approved by DMP and OEPA, and updated during the life of the mine and prior to decommissioning of the operation.

3.2 (b)	Is the proposed action to be taken by	Х	No	
	the Commonwealth or a Commonwealth agency?		Yes (provide details below)	
	If yes, nature & extent of likely impact on the whole environment			
	No direct or indirect impact.			
<b></b>			Γ	
3.2 (c)	Is the proposed action to be taken in a Commonwealth marine area?	Х	No	
			Yes (provide details below)	
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))			
	No direct or indirect impact.			
		1		
3.2 (d)	Is the proposed action to be taken on Commonwealth land?	Х	No	
			Yes (provide details below)	
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))			
	No direct or indirect impact.			
		1		
3.2 (e)	Is the proposed action to be taken in the Great Barrier Reef Marine Park?	Х	No	
			Yes (provide details below)	
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))			
	No direct or indirect impact.			

Х

#### 3.3 Description of the project area and affected area for the proposed action

#### 3.3 (a) Flora and fauna

#### Flora

The flora and vegetation assessment (Ecoscape 2015a), which incorporated targeted conservation significant flora searches, was conducted to:

- comply with an EPA Level 2 flora and vegetation survey;
- EPA (2004) Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessments in Western Australia; and
- EPA (2002) Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.

A total of 472 vascular flora taxa were recorded in the Study Area (55,000 Ha). No threatened flora listed under the EPBC Act (Cwth) and *Wildlife Conservation Act 1950* (WC Act) (WA) were recorded in the study area. Eight priority flora listed under the WC Act were recorded in the study area:

- Acacia curryana (listed as Priority 1 (P1) taxon by DPaW);
- Rhodanthe frenchii (P2);
- Solanum octonum (P2);
- Wurmbea fluviatilis (P2);
- Gymnanthera cunninghamii (P3);
- Sporobolus blakei (P3);
- Goodenia berringbinensis (P4); and
- Goodenia nuda (P4).

The proposed action will impact upon two priority flora species, namely Acacia curryana and Rhodanthe frenchii.

58 taxa were recorded as having significant range extensions or filling substantial range gaps in species distribution. Additionally, one undescribed species (*Elacholoma sp.* 'Showy Flowers') was recorded in the study area but outside the Proposal development envelope. The proposed action will not impact this species.

Twenty-four introduced species (weeds) were recorded within the study area. Of these, *Argemone ochroleuca* (Mexican Poppy) and *Datura leichhardtii* (Thornapple) are Declared Pests listed under the *Biosecurity and Agriculture Management Act 2007* (WA).

Attachment B presents the Flora and Vegetation Biological Assessment report.

#### Terrestrial Fauna and Short Range Endemics

The fauna survey (Ecoscape 2015b) comply with the Office of the Environmental Protection Authority (OEPA) requirements for environmental surveys and reporting in Western Australia, as outlined in the following guidelines:

- EPA (2002) Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection;
- EPA (2004) Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia;
- EPA (2009) Guidance Statement No. 20: Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia;
- EPA & DEC (2010) Technical Guide Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, and
- Department of Environment Water Heritage and the Arts (2009) *Matters of National Environmental* Significance. Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999.

A total of 134 vertebrate fauna species were recorded in the study area (55,000 Ha) over the two phases of assessment, which consisted of 20 species of mammal (12 species of non-volant mammals, eight species of bat), 85 species of bird, 25 species of reptile and four species of amphibian.

One species of conservation significance was recorded in the study area: *Sminthopsis longicaudata* (Longtailed Dunnart; listed as a Priority 4 species by DPaW).

In addition, *Falco hypoleuca* (Grey Falcon; listed as a Schedule 1 species under the WC Act) was recorded 3.5 km south of the study area, but within the area of the proposed southern access road.

Historic mounds of the *Pseudomys chapmani* (Western Pebble-mound Mouse; listed as a Priority 4 species by DPaW) were recorded throughout the study area. Based on the guide for the indication of presence and activity of the Western Pebble-mound Mouse, all mounds were older than 50 years, indicating no recent or current occupation of this species within the study area.

The study area was characterised by five habitat types, namely rocky plain (includes undulating hills and lower hillslopes), sandy plain, granite outcrop, major river and minor creek line. Of these, the rocky plain is the most widespread habitat type, followed by sandy plain. The remaining three habitats, granite outcrops, major river and minor creek line were recorded from isolated areas of smaller extent. All habitat types were also recorded from the wider region and are not thought to be unique to the study area.

#### Short Range Endemic Fauna

Overall, 935 specimens belonging to 24 species in seven Short Range Endemic (SRE) groups were collected. Pseudoscorpions and terrestrial slaters were most diverse with six and five species, respectively. Spiders, scorpions and centipedes were represented by three species each, and centipedes and snails were present with two species. In total, 27 taxa were recorded from groups that support SRE species. No SRE species of conservation significance were recorded within the study area.

Thirteen potential SRE species were recorded within the study area consisting of:

- Spiders:
  - o Aname sp. B19
  - o Synothele sp. B14
  - o Aganippe sp. B21
- Scorpions:
  - o Lychas 'hairy tail group'
  - o Lychas 'multipunctatus group'
- Pseudoscorpions:
  - o Beierolpium 8/2 sp.
  - o Beierolpium 8/3 sp.
  - o Linnaeolpium sp. B04
- Slaters:
  - o Acanthodillo sp. B16
  - o Buddelundia sp. B59
  - o Buddelundia sp. B60
  - o Cubaris sp. B07
- Centipedes:
  - Cryptops sp.

Three potential SRE species occur within the development envelope:

- Linnaeolpium sp. B04
- Beierolpium 8/3 sp.
- Aname sp. B19

The habitat of these species is associated with the dendritic pattern of surface hydrology and groundwater dependent ecosystems, which provide shade, leaf litter and moisture. This is comparison to the surrounding flat, sparsely vegetated plains and slightly elevated hills, which the majority of the disturbance footprint overlies. The proposed action is unlikely to have a significant impact on the potential SRE species.

Attachment C1 presents the Terrestrial Fauna Biological Assessment report.

#### Subterranean Fauna

The subterranean fauna assessment (Ecoscape 2015c) complied with the OEPA requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2013) Environmental Assessment Guideline (EAG 12) for Consideration of subterranean fauna in environmental impact assessment in Western Australia;
- EPA (2002) Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3;
- EPA (2008) Guidance Statement No. 33: Environmental Guidance for Planning and Development, and
- EPA (2003) Guidance Statement No. 55: Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process.

A DPaW listed Priority Ecological Community (PEC) occurs within the study area, and the development envelope intersects the northern portion of this PEC. The PEC is listed as:

Priority 1 (P1) Gifford Creek, Mangaroon, Wanna calcrete groundwater assemblage type on Lyons palaeodrainage on Gifford Creek, Lyons and Wanna Stations.

DPaW refer to the PEC as the "Gifford Creek Calcrete PEC", which comprises unique assemblages of invertebrates (stygofauna) that have been identified in the groundwater calcretes.

Stygofauna and troglofauna have been found within the proposed deposits in the development envelope. However, the proposed deposits cover a total of approximately 101.5 Ha of the mapped PEC, which equates to only 0.034% of the total PEC area. In total, 236 stygofauna specimens from four families representing 10 species were recorded from eight drill holes in the study area:

- Ameiridae gen. nov. sp. B04
- Diacyclops cockingi
- Diacyclops humphreysi
- Orbuscyclops westaustraliensis
- Areacandona sp. BOS550
- Paramelitidae sp.
- Enchytraeus sp. 1 (PSS) Pilbara
- Phreodrilidae with dissimilar ventral chaetae
- Phreodrilus peniculus
- Nematoda sp.

Of the stygofauna recorded during the survey, at least three taxa are likely to be of conservation concern. The records were made from three locations within the development envelope but will not be mined (i.e. prospects that are not economically feasible for mining).

In addition, 11 troglofauna specimens from five orders representing at least five separate species were recorded from six drill holes in the development envelope:

- Troglarmadillo sp. B60
- Projapygidae sp. B19
- Trinemura sp. B29
- Geophilida sp.
- Scutigerella sp. B09.

All of the troglofauna records are likely to be of conservation concern.

Habitat analysis indicated that there is no obvious link between the calcrete habitats of the PEC and the occurrence of subterranean fauna in the Proposal area. Geological drill logs and datasets have shown that calcrete is not present within the mineral exploration areas of the Proposal, indicating that subterranean fauna habitat is not typical of that recorded from PEC calcrete areas, although it may overlap and be representative of that on the fringes of the Gifford Creek PEC.

Additional subterranean fauna surveys within the study area and within the broader PEC area have found that a greater diversity and abundance of stygofauna species is represented within the calcretes of the PEC (pers. comm. Stuart Halse, Bennelongia, 18 November 2016).

Pit dewatering studies are currently underway. However, early indications (pers. comm. Rob Garnham, Groundwater Resource Management, 18 November 2016) support the conceptual hydrogeology assessment (Global Groundwater 2016) indicating fractured rock aquifers occur within the resource areas and are not interconnected with the PEC calcrete aquifers.

Attachment C2 presents the Subterranean Fauna Biological Assessment report.

#### 3.3 (b) Hydrology, including water flows

#### Hydrogeology

The Proposal water demands are 2.5 GL/annum. Pit dewatering is expected to meet the majority of the Proposal water requirements although a supplemented borefield may be required during certain phases of the operation. The study area is not characterised by regional aquifers, rather aquifers are likely to be present within:

- superficial strata, where sufficiently thick and saturated; and
- in basement rocks, where fractured or weathered.

These aquifers will in general be isolated and effectively disconnected from each other. Some degree of hydraulic connection will occur locally depending on geological structure, weathering, landscape position and aquifer geometry (Global Groundwater 2016).

The permeability of the basement rocks will be very low although some zones of very high permeability will occur. Permeability in basement rocks will be very high in the vicinity of bedding planes and fractures from faulting, folding, intrusives and where solution cavities and channels have developed in ironstone veins. Large cavities were identified as a significant feature of the mineralised zone at depth at a deposit within the development envelope. Permeability may also be relatively high where quartzose saprolite has developed at the base of the weathered sections of granitic rocks above fresh granitic basement. However, these zones of high permeability will likely account for only a comparatively small part of the area (Global Groundwater 2016).

Within the study area the aquifers will be mostly unconfined with confined conditions occurring locally:

- Superficial aquifers: Generally unconfined but confined groundwater will be present locally where the aquifer is overlain by low permeability units such as clayey sections of calcrete or alluvium.
- Fractured rock aquifers: Often unconfined but a degree of confinement can occur where clayey weathered basement rock overlies either more sandy weathered strata above the fresh basement rocks or fractures within the basement rocks. This can often be the case in granitic basement rocks. Weathering in granites is noted as occurring in the tenement area but does not appear ubiquitous.

Water levels have been recorded, in open and often angled drill holes, between 6 and 35 mBGL within the study area. There is a trend with shallowest water levels (generally <10 mBGL) closest to the drainage lines, increasing with distance from the drainage lines and up catchment where water levels are often 15 to 23 mBGL (Global Groundwater 2016).

The nature of rainfall in the region produces periods of high runoff to creeks and rivers. This in turn produces sporadic recharge to permeable units (e.g. permeable alluvium and calcrete along the drainages or where fractured basement rocks contact surface drainage lines, in areas where the runoff is concentrated). Groundwater recharge by direct infiltration of rainfall over the superficial units or fractured outcropping rocks will likely be minor (Global Groundwater 2016).

Attachment F presents the Conceptual Hydrogeological Appraisal report.

#### Hydrology

The study area is located within the Gascoyne River catchment. The Lyons River, a tributary of the Gascoyne River, is associated with the southern portion of the study area, and flows in a north-westerly direction. The Edmund River, a tributary of the Lyons River, traverses the western edge of the study area and flows in a southerly direction. Both rivers are considered to be ephemeral, and only flow after rainfall. Semi-permanent ponds occur along their length. Several tributaries of these rivers traverse the study area: Yangibana and Fraser Creeks are the main tributaries of the Lyons River, which occur within the study area and flow in a southerly direction.

A detailed hydrological model has been developed for Fraser, Yangibana and Gifford Creeks, as well as the Lyons River adjacent to the study area, to assess flood conditions that will likely impact on the proposed mine infrastructure (JDA 2016). The detailed model allowed for accurate delineation of flood extent, depth, flow rates and velocities, which will be used to inform mine design. Based on JDAs assessment (2016) a combination of diversion channels, floodways and culverts are required to mitigate impacts associated with surface water flows in specific areas of the Proposal.

Attachment G presents the Preliminary Hydrology Assessment.

#### Water quality

Groundwater salinity is variable and values derived within the study area range from about 600 to 2,800 mg/L Total Dissolved Solids (TDS). Uranium and thorium is present in groundwater within areas to be mined at concentrations of 0.014 – 0.016 and <0.001, respectively. Uranium is also present in the groundwater of a number of pastoral bores at concentrations, ranging from 0.004 to 0.079 mg/L, that sometimes exceed the Australian Drinking Water Guidelines (>0.017 mg/L).

#### 3.3 (c) Soil and Vegetation characteristics

<u>Soils</u>

Two predominant soil types have been mapped within the Proposal development envelope area, both of low fertility:

- Hill soils associated with the granite low hills and rises of the site. Soil depths vary from shallow near hill tops (adjacent to rock outcrops or more sloping hills) to 40-50cm on lower hill flanks. Hill Soils are dark brown sandy duplex soils and con be divided into an A and B horizon that overlies a C horizon of decomposing granite. The Hill Soil has a neutral to slightly acidic pH, very low salinity levels (ECi<0.02dS/m) and a maximum exchangeable sodium percent (ESP) of 4.7%.
- 2. Plain soils associated with the low relief areas and flood plains of the drainage lines. A thin surface sandy loam topsoil overlies a silty loam subsoil. These soils are located in areas of recent deposition and will be influenced by the nature and frequency of past flooding events, and the character of the contributing catchment. The Plain Soils tend to be shallow (<30cm), but the depth of refusal and hence the reported soil depth is a function of the clay hardpan encountered. The Plain Soil is a dark brown sandy loam over clay loam. The soil has a massive structure (i.e. weak), strongly alkaline, saline (ECi 5 0.55 9.35dS/m), and sodic (ESP 2.85 33.96%).</p>

Attachment H presents the Soil Assessment report.

#### Vegetation

The study area is located within the Gascoyne IBRA region that consists of three major subregions; Ashburton, Augustus and Carnegie (Thackway & Cresswell 1995 in Ecoscape 2015a). The majority of the study area is included in the Augustus subregion, described in the 2002 Biodiversity Audit of Western Australia's 53 Biogeographical Subregions (Desmond et al. 2001 in Ecoscape 2015a) as:

Rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys. Also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margin of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers. Although the Gascoyne River System provides the main drainage of this subregion, it is also the headwaters of the Ashburton and Fortescue Rivers. There are extensive areas of alluvial valley-fill deposits. Mulga woodland with Triodia occur on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by Mulga parkland. A desert climate with bimodal rainfall. The subregional area is 10,687,739 Ha.

Twenty vegetation types were recorded from the study area, with the following twelve vegetation types found within the development envelope:

- 1. AcAc: Acacia curryana, Senna artemisioides subsp. helmsii and Eremophila exilifolia mid sparse shrubland over Aristida contorta and Eriachne pulchella subsp. dominii low grassland
- 2. AcAsCc: Acacia citrinoviridis and Eucalyptus victrix low open woodland over Acacia sclerosperma subsp. sclerosperma and A. cuthbertsonii subsp. cuthbertsonii tall sparse shrubland over \*Cenchrus ciliaris and \*C. setiger mid tussock grassland
- 3. AcEt: Acacia cyperophylla var. cyperophylla low open woodland over Eragrostis tenellula, Eragrostis cumingii and Eriachne aristidea low tussock grassland

- 4. **ApSgAc:** Acacia pruinocarpa and Grevillea berryana low open woodland over Senna glutinosa subsp. x *luerssenii* and *Eremophila phyllopoda* subsp. *obliqua* mid sparse shrubland over Aristida contorta and Eriachne pulchella subsp. *dominii* low grassland
- 5. AtGc: Acacia tetragonophylla, Dodonaea petiolaris and Eremophila latrobei subsp. latrobei mid open shrubland over Gomphrena cunninghamii, Aristida contorta and Cymbopogon ambiguus low open forbland/grassland
- 6. **AxEcAc** Acacia xiphophylla, A. synchronicia and A. macraneura low open woodland over Eremophila cuneifolia, Senna artemisioides subsp. oligophylla, S. glutinosa subsp. x luerssenii mid open shrubland over Aristida contorta and Enneapogon caerulescens low sparse tussock grassland
- 7. **EcBp:** *Eremophila cuneifolia* and *Scaevola spinescens* mid sparse shrubland over *Brachyachne prostrata* and *Sclerolaena eriacantha* low sparse grassland/chenopod shrubland
- 8. **EcMgCc:** *Eucalyptus camaldulensis* mid woodland over *Melaleuca glomerata* and *Acacia coriacea* subsp. *pendens* tall shrubland over \**Cenchrus ciliaris* mid tussock grassland
- 9. **EeAc:** *Eremophila exilifolia, Acacia tetragonophylla* and *A. kempeana* mid open shrubland over *Aristida contorta* and *Eriachne pulchella* subsp. *dominii* low sparse tussock grassland
- 10. **EpAc:** Eremophila phyllopoda subsp. obliqua, Acacia tetragonophylla and Senna artemisioides subsp. helmsii mid open shrubland over Aristida contorta, Eriachne pulchella subsp. dominii and Portulaca oleracea low grassland/forbland
- 11. **EvCc:** *Eucalyptus victrix* and *Acacia citrinoviridis* mid open forest over \**Cenchrus ciliaris* and \**C. setiger* mid tussock grassland
- 12. **Mp:** *Maireana ?polypterygia, Lawrencia densiflora* and *Eremophea spinosa* low open chenopod shrubland/forbland

None of the mapped vegetation types are restricted to the proposed development footprint. Vegetation type EpAc has the highest proportion of its extent within the proposed development footprint (60%), followed by EeAc (20%) and AxEcAc (12%). All other vegetation types are less than 6%.

One vegetation type (EcMgCc) represents a Groundwater Dependent Ecosystem (GDE), and vegetation types EvCc, AcEt and AcAsCc may represent GDEs. The GDEs are characterised by *Eucalyptus camaldulensis* and *Eucalyptus victrix*. These known and potential GDE vegetation types are located outside the Proposal development envelope except where linear infrastructure crosses the Lyons River and its tributaries.

No Threatened Ecological Communities (TEC) were recorded within the study area, and none are listed for the Gascoyne bioregion.

Attachment B presents the Flora and Vegetation Biological Assessment report.

#### 3.3 (d) Outstanding natural features

There are no outstanding features located within or near the Proposal area. The closest outstanding natural feature is Mount Augusta, located approximately 70 km southeast of the Proposal.

#### 3.3 (e) Remnant native vegetation

The vegetation condition recorded from 103 floristic quadrats ranged from Poor to Excellent within the study area (Ecoscape Australia 2015a; **Attachment B**). The majority of sites (~71%) were in Excellent condition. Completely Degraded areas occurred on tracks that intersect the study area. In general, riparian vegetation types associated with drainage lines were in lesser condition than more upland sites due to impacts from weed infestations and grazing by cattle and other hooved mammals.

#### 3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

The bulk of the Proposal area is characterised by subdued topography with broad open flats and occasional rounded granitic hills, with elevations to about 350 m AHD (Australian Height Datum). The drainage lines in the area of the granitic rocks form a dendritic pattern and are located within generally broader more gently sloping areas of alluvial deposition.

#### 3.3 (g) Current state of the environment

The historical land use has been pastoral, and evidence of degradation along drainage lines occurs where hooved mammals and weeds are present. Other minor areas are classified as degraded from pastoral activities and exploration tracks and pads (to be rehabilitated at completion of exploration programme). Despite this, the majority (~71%) of the study area is in Excellent condition with native vegetation largely intact.

Twenty-four introduced plant species exist in the study area:

- Acetosa vesicaria (Ruby Dock)
- Argemone ochroleuca (Mexican Poppy)
- Asphodelus fistulosus (Onion Weed)
- Bidens subalternans var. simulans
- Cenchrus ciliaris (Buffel Grass)
- Cenchrus setiger (Birdwood Grass)
- Chenopodium murale (Nettle-leaf Goosefoot)
- Citrullus lanatus (Pie Melon)
- Cucumis myriocarpus (Prickly Paddy Melon)
- Cuscuta planiflora
- Cynodon dactylon (Couch)
- Datura leichhardtii (Native Thornapple)
- Echinochloa colona (Awnless Barnyard Grass)
- Eragrostis amabilis (Awnless Barnyard Grass)
- Flaveria trinervia (Speedy Weed)
- Lolium multiflorum (Italian Ryegrass)
- Lysimachia arvensis (Pimpernel)
- *Malvastrum americanum* (Spiked Malvastrum)
- Setaria verticillata (Whorled Pigeon Grass)
- Sisymbrium erysimoides (Smooth Mustard)
- Sisymbrium orientale (Indian Hedge Mustard)
- Sonchus oleraceus (Common Sowthistle)
- Tribulus terrestris (Caltrop)
- Vachellia farnesiana (Mimosa Bush)

Two species are listed as Declared Pests under the WA *Biosecurity and Agriculture Management Act 2007* (BAM Act): *Argemone ochroleuca* (Mexican Poppy); and *Datura leichhardtii* (Native Thornapple) are classified as C3 (management) for the Upper Gascoyne. Under the BAM Act, C3 organisms should have some form of management applied that will alleviate the harmful impact, reduce the numbers or distribution, or prevent/contain the spread of the pest.

None of the introduced species recorded in the study area are included on any of the weed lists maintained by the DEE, nor Weeds Australia.

Only one introduced species, *Malvastrum americanum* (Spiked Malvastrum), rates above 'moderate' according to the Weed Prioritisation Process for DPaW (WA) Midwest rankings summary (2013). The Spiked Malvastrum is classified as 'very high'.

The Protected Matters search indicated the likely presence or habitat of the following invasive exotic vertebrates (one bird and eight mammals):

- Columbia livia (Domestic pigeon)
- Mus musculus (House mouse)
- Oryctolagus cuniculus (Rabbit)
- Camelus dromedaries (Camel)
- Felis catus (Cat)
- Capra hircus (Goat)
- Equus asinus (Donkey)
- Canis lupus familiaris (Domestic dog)
- Vulpes vulpes (Fox)

One species of introduced fish (Blue Tilapia; *Oreochromis mossambicus*) was recorded in the Lyons River. Feral dogs (*Canis lupus familiaris*) are prevalent in the area.

#### 3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

There are eight Western Australian listed Commonwealth Heritage Places in the Upper Gascoyne LGA:

- 1. Cobra Station Homestead, Cobra Mount Augustus Rd, Bangemall via Gascoyne Junction, WA, Australia: Indicative Place on the Register of the National Estate.
- 2. Fossil Hill, Bidgemia Station, WA, Australia: Registered Place on the Register of the National Estate.
- 3. Indigenous Place, Mount Augustus National Park, WA, Australia: Registered Place on the Register of the National Estate.
- 4. Indigenous Place, Waldburg Station via Gascoyne Junction, WA, Australia: Registered Place on the Register of the National Estate.
- 5. Kennedy Range Area, Gascoyne Junction, WA, Australia: Registered Place on the Register of the National Estate.
- 6. Mount Augustus Area, Mount Augustus via Gascoyne Junction, WA, Australia: Registered Place on the Register of the National Estate.
- 7. Nundigo Well and Stockyard, Landor Station via Meekatharra, WA, Australia: Indicative Place on the Register of the National Estate.
- 8. Top Camp Unconformity, Ashburton Downs Station, via Paraburdoo, WA, Australia: Indicative Place on the Register of the National Estate.

There are no Commonwealth Heritage Places within or immediately surrounding the study area. The Mt Augustus Area is the nearest listed Commonwealth Heritage Place, which is located approximately 70 km from the proposed action.

#### 3.3 (i) Indigenous heritage values

Hastings works closely with the Traditional Owners (Tiin-Mah Warriyangka, Tharrkari, Jiwarli) to identify indigenous heritage values. The majority of the areas to be disturbed by the proposed action have been surveyed. All surveys conducted to date have met requirements of the *Aboriginal Heritage Act 1972* (WA). One site of heritage significance is listed on the (WA) Department of Aboriginal Affairs register, however other sites have been identified during the surveys (**Figure 3**). The majority of sites of heritage significance occur outside the development envelope and are closely associated with the Lyons River. A 150 m exclusion buffer will be placed on both sides of Lyons River and Frasers Creek, at the request of the Traditional Owners, except where a road already crosses both the Lyons River and the Frasers Creek (**Figure 3**).

The proposed action will avoid impact to all known indigenous heritage values.

#### 3.3 (j) Other important or unique values of the environment

There are no national parks, conservation areas or wetlands of international significance within the study area or immediate surrounds.

#### 3.3 (k) Tenure of the action area (e.g. freehold, leasehold)

The Proposal development envelope sits within mining, general purpose and miscellaneous tenements issued (or pending) under the *Mining Act 1978* (WA). Details of tenements are provided in Section 1.6 of this referral document.

The underlying land tenure is pastoral leasehold land: Wanna and Gifford Creek Stations.

#### 3.3 (I) Existing uses of area of proposed action

The Proposal occurs within the Wanna Station and Gifford Creek Station pastoral leases. Historically the Gascoyne Bioregion has been used extensively for grazing of sheep, goats and cattle on pastoral stations. The Rangelands-Taking the Pulse Report (DoE 2008 in Ecoscape Australia 2015a) describes the Gascoyne bioregion as being grazed at between 70-80 % from 1992 to 2005.

Current pastoral practices on Wanna Station and Gifford Creek Station pastoral leases are trending towards grazing of cattle.

#### 3.3 (m) Any proposed uses of area of proposed action

The proposed uses of area of the proposed action is mining, which will co-exist with pastoral uses. All activities of the proposed action will be undertaken in accordance with Commonwealth and State Government regulatory frameworks, and in consultation with stakeholders.

## **4** Environmental outcomes

#### Matters of National Environmental Significance

Based on environmental studies conducted to-date (summarised in Section 3.3 and detailed in the respective reports), there will be no potential impacts to Matters of National Environmental Significance protected by the EPBC Act, including:

- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of international importance;
- The Commonwealth marine environment;
- World Heritage properties; and
- National Heritage places.

Hastings has a high level of confidence that this conclusion will be met.

#### Nuclear Action

The Yangibana Rare Earth Project is defined as a "nuclear action" under the EPBC Act due to the establishment and operation of TSF2 and TSF3 which will be used for the disposal of tailings from the processing plant cleaner circuit and hydrometallurgical circuit, respectively. Both tailings streams will contain radionuclide concentrations greater than 1 Bq/g. Each TSF will be designed to specific criteria and operate under approved management plans and existing state regulatory framework.

The radiological assessment has shown that impact will be low.

## **5 Measures to avoid or reduce impacts**

Hastings has considered the potential risks and impacts as a result of the proposed nuclear action. In doing so, Hastings has:

- Conducted baseline studies (Baseline Radiation Report: Attachment D1);
- Conducted waste characterisation studies (Radiation Waste Characterisation Report: Attachment D2);
- Conducted a radiation impact assessment (Attachment D3);
- Conducted an environmental risk assessment for the Proposal, including impacts to environmental receptors from the presence of TSF2 and TSF3 (Attachment I); and
- Developed measures to mitigate these risks to as low as reasonably acceptable (ALARA).

Hastings has a high level of confidence that radiological impacts will be low. Management measures to ensure this outcome are:

- Radiation Waste Management Plan (Attachment E1); and
- Radiation Management Plan (Attachment E2).

An Environmental Management System (EMS) and Safety Management System (SMS) will be implemented to manage all environmental and safety aspects of the Proposal. The above-listed Management Plans relevant to the proposed nuclear action with form a component of the EMS and SMS.

## 6 Conclusion on the likelihood of significant impacts

### 6.1 Do you THINK your proposed action is a controlled action?

X

No, complete section 6.2

Yes, complete section 6.3

#### 6.2 Proposed action IS NOT a controlled action.

Consideration of risk from the storage of radionuclides in TSFs at levels >1 Bq/g have been assessed and mitigated to ALARA.

#### 6.3 Proposed action IS a controlled action

#### Matters likely to be significantly impacted

	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
Х	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

# 7 Environmental record of the person proposing to take the action

		Yes	No
7.1 C n	Does the party taking the action have a satisfactory record of responsible environmental nanagement?		
F	Provide details		
F e r	Hastings has undertaken mineral exploration activities in Western Australia, focusing on rare earth minerals, under the <i>Mining Act 1978</i> (WA), since 2011. Hastings has a very good elationship and track record with the WA Department of Mines and Petroleum with respect to exploration activities undertaken to date.	x	
T b r	The Yangibana Rare Earths Project will be the first mining and processing operation conducted by Hastings Technology Metals Limited, and as such relationships with state and federal egulatory agencies have been established during the stakeholder engagement for this Proposal.		
7.2 F p r	Provide details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:		
() () a	a) the person proposing to take the action, or b) if a permit has been applied for in relation to the action - the person making the application.		х
Ν	Not applicable		
7.3 lí c f	f the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework and if and how the ramework applies to the action.		
F C a	Hastings Environmental Policy ( <b>Attachment J</b> ) is the overarching document that describes Hastings' approach to environmental management. Hastings executive management team are committed to demonstrating a high level of performance to the satisfaction of our stakeholders as the company transitions from exploration to mining activities.		
V ii r n c c c	With regard to the proposed action, comprehensive environmental studies and environmental mpact assessments have been undertaken. An environmental risk assessment has been undertaken to identify potential risks and mitigation of activities that result in an inherent high isk. Management plans have been developed to detail actions to mitigate risks. Some nanagement actions are being implemented during the definitive feasibility study phase (i.e. TSF design criteria), while others are applicable to other phases. The development of the EMS aligned with ISO 14001) and associated procedures in preparation for the construction and operations phases is underway.	×	
7.4 H	las the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?		
F	Provide name of proposal and EPBC reference number (if known)		Х
Ν	Not applicable		

### 8 Information sources and attachments

(For the information provided within this Referral)

#### 8.1 References

Brad Goode and Associates (2016). *Report of an Aboriginal Heritage Survey for the Yangibana Mining Project*, unpublished report prepared for Hastings Technology Metals Limited, December 2016. **Attachment K**.

Commonwealth of Australia. Manual of Standards Part 139 – Aerodromes. Version 1.8: February 2012.

DoE (2014). Consultation Document on Listing Eligibility and Conservation Actions – *Calidris ferruginea* (curlew sandpiper).<u>http://www.environment.gov.au/biodiversity/threatened/nominations/comment/curlew-sandpiper</u>

DoE (2015). Draft referral guideline for 14 birds listed as migratory species under the EPBC Act Appendix A <u>http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds</u>

Ecoscape Australia (2015a). Yangibana Project Biological Assessment: Flora and Vegetation, unpublished report prepared for Hastings Technology Metals Limited, December 2015. Attachment B.

Ecoscape Australia (2015b). Yangibana Project Biological Assessment: Terrestrial Fauna, unpublished report prepared for Hastings Technology Metals Limited, December 2015. Attachment C1.

Ecoscape Australia (2015c). Yangibana Project Biological Assessment: Subterranean Fauna, unpublished report prepared for Hastings Technology Metals Limited, September 2015. Attachment C2.

JDA (2016). *Preliminary Hydrology Assessment*, unpublished report prepared for Hastings Technology Metals Limited, December 2016. **Attachment G**.

Global Groundwater (2016). Yangibana Rare Earth Project – Conceptual Hydrogeological Appraisal, unpublished report prepared for Hastings Technology Metals Limited, November 2016. Attachment F.

Landloch (2016). *Yangibana Project Soil Assessment*, unpublished report prepared for Hastings Technology Metals Limited, November 2016. **Attachment H**.

JRHC and Associates (2016). Impact Assessment Report, unpublished report prepared for Hastings Technology Metals Limited, December 2016. **Attachment D3**.

Radiation Professionals (2016a). Baseline Radiation Report unpublished report prepared for Hastings Technology Metals Limited, November 2016. **Attachment D1**.

Radiation Professionals (2016b). Waste Characterisation Report unpublished report prepared for Hastings Technology Metals Limited, November 2016. **Attachment D2**.

Note: All unpublished reports pertaining specifically to the Project area are not currently available to the public.

#### 8.2 Reliability and date of information

Biological assessments undertaken by Ecoscape Australia were conducted in 2015, and impact assessments completed in 2015 and 2016. All assessments met relevant EPA guidance statements, and methodologies are presented in each report. Additionally, any constraints and limitations have been outlined.

Radiation assessments were conducted throughout 2016, and meet requirements of the DMP (2010) NORM guideline.

Aboriginal heritage surveys have been conducted in 2015 and 2016 and meet the requirements of the WA Department of Aboriginal Affairs (2013) *Aboriginal Heritage Due Diligence Guidelines*.

Hydrology, hydrogeology, and soils assessments where undertaken in 2016. All studies meet general requirements specified in the DMP (2016) *Guideline for Mining Proposals in Western Australia* and the joint DMP and EPA (2015) *Guidelines for Preparing Mine Closure Plans.* All reports detail constraints and limitations in carrying out the assessments.

#### 8.3 Attachments

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the locality of the proposed action (section 1)	$\checkmark$	Figure 1 and Figure 2 in referral
	GIS file delineating the boundary of the referral area (section 1)	$\checkmark$	Attachment L
	figures, maps or aerial photographs showing the location of the proposed action in respect to any matters of national environmental significance or important features of the environments (section 3)	~	Figure 3 in referral
lf relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)		Not applicable at this stage
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	~	Attachment I: Risk Assessment – Radionuclides (preliminary consideration of inherent risks and mitigation to reduce risk to ALARA)
	copies of any flora and fauna investigations and surveys (section 3)	~	Attachments B, C1, C2
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3) conclusions in the referral (section 3 and 4)	~	Attachments D1, D2, D3, F, G, H
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)	~	Attachment K

## 9 Contacts, signatures and declarations

Proposed	Vangihana Pare Earths Project
action title:	Tangibana Nare Lartins Project

#### 9.1 Person proposing to take action

Name and Title:	Mr Charles Tan
Organisation: Trust deed:	Hastings Technology Metals Limited Not Applicable
<u>ACN</u> / ABN:	122 911 399
Postal address:	c/o Wave International 306 Murray Street Perth, WA 6000
Telephone:	(02) 8268 8689
Email:	charles.tan@hastingstechmetals.com.au
l qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act	Not Applicable
I would like to apply for a waiver of full or partial fees under	Not Applicable

Declaration:

regulation 5.21A of the EPBC Regulations

on: I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.

I understand that giving false or misleading information is a serious offence.

I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature:

aullanso

Date: 15/12/2016

#### 9.2 Designated proponent

Name of proposed Dr Lara Jefferson proponent:

ACN / ABN: 122 911 399

Postal address: Hastings Technology Metals Limited

c/o Wave International

306 Murray Street

Perth, WA 6000

Telephone: 0477 340 613

Email: lara.jefferson@enperitus.com.au

proposed proponent:

Declaration by the I LARA JEFFERSON, the proposed proponent, consent to the proposed designation of myself as the proponent for the purposes of the action described in this referral.

Signature:

high

Date: 15/12/2016

Declaration by the I CHARLES TAN, the person proposing to take the action, consent person proposing to to the proposed designation of LARA. TEFFERSON...... as proponent for the take the action: purposes of the action described in this referral.

Signature: Faulton Sel Date: 15/12/2016

#### Person preparing the referral information (if different from section 9.1) 9.3

Name: Dr Lara Jefferson and Ms Emma Ryan-Reid

Title: Environmental Manager

Organisation: Hastings Technology Metals Limited

122 911 399 ACN / ABN:

Postal address: c/o Wave International 306 Murray Street Perth, WA 6000

> Telephone: 0477 340 613

> > lara.jefferson@enperitus.com.au Email:

Declaration: I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.

I understand that giving false or misleading information is a serious offence.

Signature: L. Jep Date: 15/12/16 Emma Ryou L. 15/12/16



FIGURE 01

YANGIBANA RARE EARTHS PROJECT **CLIENT: HASTINGS** 

**PROJECT LOCATION** 

ecoscape

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50

PROJECTION: TRANSVERSE MERCATOR

@ A4

SCALE: 1:35,000,000

DATUM: GDA 1994 UNITS: METER



REV

Λ

PROJECT NO: 3402-15

AUTHOR

SB

APPROVED

JN

DATE

13/12/2016







