



**Koolan Island Iron Ore
Mine and Port Facility
Project**

**Significant Fauna Species
Management Plan**

2012



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1.0 INTRODUCTION

The Koolan Island Iron Ore and Port Facility Significant Fauna Species Management Plan is a requirement of Condition 9 of Ministerial Statement 715. This plan was first produced for Aztec Resources during 2006 by Ecologia Environment (Ecologia). The 2006 version is superseded and requires review every 4 years as per condition 9-2 of Ministerial Statement 715.

Mount Gibson Iron Limited (Mount Gibson) owns and operates the iron ore mine on Koolan Island in the Kimberley region of Western Australia. Koolan Island is located approximately one kilometre from the mainland and 130 kilometres north of Derby (Figure 1).



Figure 1: Location of Koolan Island in Western Australia

Construction for the operation began in June 2006, with mining commencing in 2007. Ministerial Statement 715 gives project approval subject to a number of conditions, including Condition 9 which pertains to “Conservation of Significant Flora and Fauna”.

Condition 9-1 states “Prior to ground-disturbing activities, the proponent shall commence staged pre-land clearing surveys of the areas to be disturbed for conservation-significant fauna species, namely:

- *Ramphotyphlops yampiensis* (Yampi Blind Snake)
- *Erythrotriorchis radiatus* (Red Goshawk)

- *Dasyurus hallucatus* (Northern Quoll)
- *Macroderma gigas* (Ghost Bat)
- *Rhinonictoris aurantia* (Orange Leaf-nosed Bat)
- *Hipposideros stenotis* (Northern Leaf-nosed Bat)
- Short range endemic invertebrate fauna, including the land snails *Kimboraga koolanensis* and *Amplirhagada astuta*”.

Condition 9-2 states “Prior to ground-disturbing activities in a particular staged area to be cleared, the proponent shall prepare a Significant Species Management Plan for conservation-significant fauna species recorded during the staged pre-land clearing surveys required by condition 9-1.”

In 2006 the Significant Fauna Species Management Plan was prepared for species listed in the Ministerial Statement based on the results of the Terrestrial Vertebrate Fauna Assessment and pre-clearance surveys conducted in July 2004 and January 2006 (Ecologia 2005a, 2006a). A separate management plan was developed for the Northern Quoll and Stygofauna.

The Significant Fauna Species Management Plan is required to be reviewed and revised at intervals not exceeding four years (Condition 9-3). This plan has been reviewed to comply with this condition. Since the development of the initial plan (Ecologia 2006b) several additional pre-clearance fauna surveys have been completed on Koolan Island. Information gathered from these surveys has been incorporated into this revised management plan which has resulted in changes to the management strategy.

2.0 OBJECTIVE

The objective of the Significant Fauna Species Management Plan is to maintain the abundance, diversity, geographic distribution, conservation status and productivity of flora, at species and ecosystem levels, through the avoidance or management of adverse impacts and improvement in knowledge.

3.0 REGIONAL INFORMATION

Koolan Island is one of the largest of the many islands comprising the Buccaneer Archipelago located in the Kimberley region of Western Australia. The Buccaneer Archipelago consists of some 800 to 1, 000 rocky islands with small embayments and beaches and is extremely diverse, with coral reefs, algal flats and shallow sandy banks with extensive seagrasses. This area has a tropical, sub-humid climate with an annual rainfall of about 850 mm. The ‘wet’ season usually occurs between December and April.

Koolan Island lies on the coastal interzone of the Northern Kimberley and Dampierland biogeographic region as described in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995).

4.0 HERITAGE STATUS

The Australian Heritage Council determined the West Kimberley be placed on the National Heritage List in August, 2011. The area was recognized for its rich living Aboriginal culture,

pastoral and pearling traditions and its dramatic landscapes of great biological richness, with important geological and fossil evidence of Australia's evolutionary history.

Koolan Island is located within the boundaries of the West Kimberley and has, therefore, been included in that heritage listing.

5.0 MINING HISTORY

Koolan Island was mined by BHP between 1965 and 1993. During this period approximately 68 million tonnes of high-grade haematite (67% Fe) ore was extracted from five pits, crushed and shipped from a wharf facility. Decommissioning of the mine in 1993 included removal (some *in situ* burial) of infrastructure associated with BHP's operations, rehabilitation of cleared areas by moonscaping, and the construction of a channel to allow sea water flooding of the Main Pit.

6.0 EXISTING ENVIRONMENT

6.1 CLIMATE

The Buccaneer Archipelago experiences a tropical, sub-humid climate with an annual rainfall of about 850 mm. The 'Wet' season usually extends from December to April, although most rain falls in January, February and March. Little or no rain falls between May and November. The annual mean daily maximum temperature is 31.1 °C, with an annual mean daily minimum of 26.0 °C. The hottest months are November and December, whilst the coolest is July (Bureau of Meteorology 2005; based on data 1974-1992). Evaporation is low, at a daily average of 7.5 mm per year (Ecologia 2005a).

6.2 TOPOGRAPHY AND LANDFORMS

Koolan Island has an area of 2, 580 hectares and is located one kilometre from the mainland. It has a Proterozoic sandstone lithology that is expressed in rugged slopes, ridges and uplands mantled with rock scree and shallow skeletal soils. The coast is steep with narrow gullies and frequent embayments, but few beaches (Ecologia 2005a).

6.3 GEOLOGY

Koolan Island consists of a series of Lower-Proterozoic sediments of the Kimberley Group. The sediments are characterized by tight, asymmetrical folds, striking northwest-southwest, broadly along the long-axis of the island. Sandstones, quartzite with lesser phyllites and schists are the dominant geology. The folding on Koolan Island results in three major structural elements: South Syncline, Central Anticline and North Syncline.

Pentecost Sandstone forms the majority of the outcrop on the island. This formation is a thinly bedded, intercalated sequence of sandstone and siltstone with minor phyllite. The Pentecost Sandstone is underlain by Elgee Siltstone, a sequence of predominantly mudstones and shales. The Elgee Siltstone is underlain by Warton Sandstone, a unit of interbedded quartzite and siltstone.

6.4 GROUNDWATER AND SURFACE WATER

There are three broad hydrogeological provinces, which correspond to the three main structural geological elements. The central anticline separates the two fresh groundwater

regions on the island: the Southern Syncline and the Northern Syncline. Depth to groundwater aquifers is on average 200 m below ground level. These aquifers experience a recharge of approximately 100,000 (Northern Syncline) and 700,000 (Southern Syncline) kL/year.

The Southern Syncline aquifer can be subdivided into two zones: the interland zone (or water supply area) and the orebody zone. The orebody aquifer is on the southern limb of the Southern Syncline and has been exposed in the Main Pit. This aquifer was originally only in hydraulic connection with the sea along strike to the west, however, excavation and push-back of the hanging wall has resulted in hydraulic connection with the sea through the wall. The orebody aquifer remains hydraulically isolated from the water supply aquifer by a low permeability Pentecost Formation and an indurated zone at the base of the orebody.

There are no known permanent surface waterbodies on Koolan Island, although ephemeral pools and streams are present during and immediately after the wet season.

6.5 BIOLOGICAL ENVIRONMENT

Due to its mining history, Koolan Island is one of the most studied islands in the Buccaneer Archipelago.

In 1995 the Department of Conservation and Land Management (now DEC) undertook a biological inventory of Koolan Island. During this time a comprehensive list of flora and fauna was assembled (McKenzie *et al.* 1995). The purpose of this study was to establish a baseline data set for comparison to future survey work and to gauge the effectiveness of rehabilitation following the BHP mine closure in 1993.

Between October 2003 and July 2004 Ecologia conducted five vegetation and flora surveys and a terrestrial vertebrate fauna assessment on Koolan Island as part of a feasibility assessment of the viability of the proposed iron ore mining and processing operations. These surveys included detailed site/association assessments, broad-scale vegetation mapping and targeted surveys for Declared Rare Flora (DRF), Priority Flora, Declared Plants, vertebrate fauna, conservation significant fauna species, communities and habitats. These studies were incorporated into the Environmental Referral Document (ERD) (Ecologia 2005b) for the project and the Significant Flora and Fauna Species Management Plans for Koolan Island.

Ministerial Statement 715 outlines the requirement to conduct surveys for conservation significant flora and fauna prior to clearing on Koolan Island. Pre-clearance surveys have been implemented by Ecologia in 2006 and 2007, and MBS Environmental in 2008 to 2012.

The results of all these studies have been combined to provide a single dataset of flora and fauna on Koolan Island and are summarised in Sections 6.6 and 6.7.

6.6 FLORA AND VEGETATION

6.6.1.1 Vegetation

Koolan Island is located in the Fitzgerald Botanical District of the Kimberley region of Western Australia (Beard 1979). The vegetation of Koolan Island has been classified into six broad community types (Ecologia 2005c):

- Open woodland of *Eucalyptus* species over *Corymbia* species over mixed herb/soft grass/*Triodia* cover accounts for most of the island. This unit is further divided into three sub units:
 - *Eucalyptus miniata* Woodland/Open Woodland along stony ridge crests.
 - *Eucalyptus miniata/Corymbia cadophora* Woodland along moderate depth gullies.
 - Very open woodland: scattered trees over sparse low shrubs, herbs and grasses on coastal slopes.
- Rainforest/vine thicket is present in limited areas.
- Woodland *Callitris extipulata* forest within deep gullies.
- Mangroves extensively at the tidal zone in narrow strips.
- Beaches.
- Previously disturbed/rehabilitated vegetation.

6.6.1.1.1 Open Woodland of Eucalyptus Species over Corymbia Species

The majority of the island is vegetated by open woodland in which *Eucalyptus miniata* occurs as a taller canopy, with the lower bloodwoods *Corymbia confertiflora* and *Corymbia cadophora* subsp. *cadophora* occurring at variable densities below with a mixed herb ground cover.

6.6.1.1.2 Rainforest/Vine Thicket

Very small areas of rainforest or vine thickets occur in limited locations. Rainforest and vine thickets intergrade into *Callitris columellaris*¹ forest described in Section 6.6.1.1.3.

6.6.1.1.3 Woodland Callitris columellaris Forest

The *Callitris columellaris*¹ forest is restricted to the more deeply incised gullies, occurs in sporadic stands. Hence the total area encompassed is relatively small (Ecologia 2005c).

6.6.1.1.4 Mangroves

Mangroves occur extensively at the intertidal zone but are largely restricted to narrow strips of vegetation, with only a few of the larger inlets supporting substantive areas.

6.6.1.1.5 Beaches

There are twelve small beaches that predominantly occur adjacent to mangrove communities but with some mobile sands. The overstorey consists of scattered shrubs and the rest of the complex is mainly comprised of grasses and creepers.

6.6.1.1.6 Previously Disturbed/Rehabilitated Vegetation

Areas previously disturbed during BHP's mining from 1965 until 1993 on the island consist of rehabilitated areas of open to moderately dense *Acacia* dominated shrublands and non-rehabilitated areas consisting of a variable overstorey with predominantly introduced shrubs, herbs and grasses. Ecologia (2005c) recorded that both disturbed vegetation types were

¹ Foot note: * *Callitris intratropica* R.T.Baker & H.G.Sm. is now known as *Callitris columellaris* F.Muell.

atypical of the local provenance vegetation communities across the island and the Kimberley region.

6.6.1.2 Flora

A total of 629 flora taxa (including subspecies, variations, affinities and hybrids) have been recorded on Koolan Island during surveys conducted up until 2009 (Ecologia 2004, 2005c, 2006c, 2007a; MBS 2008a, 2009a). The most numerous represented families are:

- Poaceae (77 species).
- Fabaceae (105 species).
- Euphorbiaceae (32 species).

Twenty six families were represented by a single species. The most numerous represented genus is *Acacia*, with 33 species, many of which were recorded in rehabilitation areas.

6.6.1.3 Flora and Vegetation Communities of Conservation Significance

No plant taxa gazetted as Declared Rare Flora pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950 Western Australia (WC Act)* have been recorded on Koolan Island. No plant taxa listed as “Threatened” pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) (EPBC Act)* have been recorded on Koolan Island.

Four species of Priority flora have been surveyed on Koolan Island including:

- *Gymnanthera cunninghamii* (P3).
- *Phyllanthus aridus* (P3).
- *Stackhousia clementii* (P3).
- *Brachychiton xanthophyllus* (P4).

Three of these species are listed in the Ministerial Statement 715 requiring targeting during pre-clearance surveys. These include:

- *Gymnanthera cunninghamii* (P3).
- *Phyllanthus aridus* (P3).
- *Brachychiton xanthophyllus* (P4).

Stackhousia clementii has been recently listed as a Priority 3 species (FloraBase 2012) and is described in the subsections below.

Other species of interest listed in Ministerial Statement 715 include *Eucalyptus kenneallyi* (P1) which has potential to occur and *Corymbia* aff. *cadophora* which may have been previously recorded on Koolan Island by Ecologia during 2003-2004 (Ecologia 2005c). Positive identification of *Corymbia* aff. *cadophora* was not achieved due to the lack of reproductive material at the time (Ecologia 2005c). Subsequent surveys have not recorded this species.

There are no vegetation communities that are considered Threatened Ecological Communities pursuant to Schedule 2 of the EPBC Act or according to the Department of Environment and Conservation (DEC).

6.6.1.4 Weeds

Weed surveys have been conducted on Koolan Island during 1993, 2003-2004 and 2006 to 2012 (Keighery *et al.* 1995; Ecologia 2004, 2005c, 2006c, 2007a; MBS 2008a, 2009a, 2010a, 2011a, 2012a). From the surveys conducted up until 2009, 80 weed species have been recorded. Many of the introduced species occur in the old settlement where former gardens and ornamental plants that were planted prior to 1993. The weed species of greatest environmental concern identified during weed surveys include three Declared Plants listed by Department of Agriculture and Food Western Australia (DAFWA) (2011) under the *Agriculture and Related Resources Protection Act 1976 (ARRP Act)*:

- *Jatropha gossypifolia* (Bellyache Bush) (Declared).
- *Cryptostegia madagascariensis* (Rubber Vine) (Declared).
- *Senna alata* (Candle Bush) (Declared).

6.7 TERRESTRIAL FAUNA

6.7.1.1 Fauna Habitat

A variety of fauna habitats exist on Koolan Island. Vegetation units described in Section 6.6.1.1 correspond to landscape features such as ridges, gullies and beaches and each supports a complex suite of fauna.

Across Koolan Island there are also a variety of critical habitats that are key resources for conservation significant fauna. These are typically sparse or limited micro-habitats such as vine thickets, deep humid caves, water ways or tall woodlands with standing or fallen hollow timber. These habitats provide essential niche micro-environments that particular species may specifically require for survival or refuge, feeding or breeding.

6.7.1.2 Fauna

Surveys conducted on Koolan Island up to 2009 have recorded three amphibians, 24 mammals (including 17 bat species), 44 reptiles and 151 birds (Ecologia 2005a, 2006a, 2007b; MBS 2008b, 2009b). These surveys, and other historical surveys, have recorded A number of conservation significant fauna species, including:

- Northern Quoll (*Dasyurus hallucatus*) Schedule 1 - Endangered (*WC Act* and *EPBC Act*).
- Gouldian Finch (*Erythrura gouldiae*) Schedule 1 - Endangered (*WC Act* and *EPBC Act*) and Priority 4 (DEC).
- Red Goshawk (*Erythrotriorchis radiatus*) Schedule 1 - Vulnerable (*WC Act* and *EPBC Act*).
- Orange Leaf-nosed Bat (*Rhinonictes aurantia*) Schedule 1 - Vulnerable (*WC Act*).
- Short range endemic land snail (*Amplirhagada astuta*) Schedule 1 - Vulnerable (*WC Act*).
- Short range endemic land snail (*Kimboraga koolanensis*) Vulnerable (IUCN)
- Northern Leaf-nosed Bat (*Hipposideros stenotis*) Priority 2 (DEC).

- Yampi Blind Snake (*Ramphotyphlops yampiensis*) Priority 2 (DEC).
- Eastern Curlew (*Numenius madagascarensis*) Schedule 1 - Vulnerable (DEC).
- Ghost Bat (*Macroderma gigas*) Priority 4 (DEC) and Vulnerable (IUCN).
- Grey Falcon (*Falco hypoleucos*) Schedule 1 - Vulnerable (DEC).
- Peregrine Falcon (*Falco peregrinus*) Schedule 4 - Other Specially Protected Fauna (DEC).
- Saltwater Crocodile (*Crocodylus porosus*) Schedule 4 - Other Specially Protected Fauna (DEC).
- Eastern Reef Egret (*Egretta sacra*) Schedule 3 - Migratory (*WC Act* and *EPBC Act*)

Eight of these are identified in Ministerial Statement 715.

6.7.1.3 Introduced Fauna

Four feral mammal species and six introduced invertebrate species have been recorded historically on Koolan Island (McKenzie *et al.* 1995):

- Dog (*Canis familiaris*) - a single animal in 1990.
- Goat (*Capra hircus*) - a feral population of approximately 120 in the mid-1980s.
- Guinea Pig (*Cavia porcellus*) - pets, no feral population recorded.
- European Rabbit (*Oryctolagus cuniculus*) - pets, no feral population recorded.
- Singapore Ant (*Monomorium destructor*) - believed to have been accidentally introduced in a cargo container, this species is considered to be well established on Koolan Island and is not regarded as a reportable species (G. Pratt and M. Widmer pers. comm.).
- Snail (*Prosopeas achatinaceum*) - recorded during a snail survey in 2005 (Slack-Smith 2006). This snail had not previously been recorded in Australia and is known from the Indonesian Archipelago and numerous Pacific Islands. It has not been recorded during any subsequent pre-clearance fauna surveys or biennial snail surveys (Slack-Smith 2006, 2008; Slack-Smith and Whisson 2010; MBS 2012c).
- Earthworm (*Dichogaster bolau*).
- Centipede (*Scolopenda morsitans*) commonly recorded during fauna pre-land clearance surveys.
- Slug (*Laevicaulis alte*) recorded in waste water irrigation areas and the old townsite.

6.7.1.4 Conservation Significant Fauna Species

6.7.1.4.1 Yampi Blind Snake (*Ramphotyphlops yampiensis*)

Description

Very little is known about this species of blind snake. The species is only known from one specimen found on Koolan Island in 1966 (McKenzie *et al.* 1995) and no habitat data was recorded. Taking its shape and form into consideration, it is most likely very similar to other species belonging to the *Ramphotyphlops* genus. *R. yampiensis* is listed as Priority 2 on the DEC Priority Fauna List. A description is provided in Table 1.

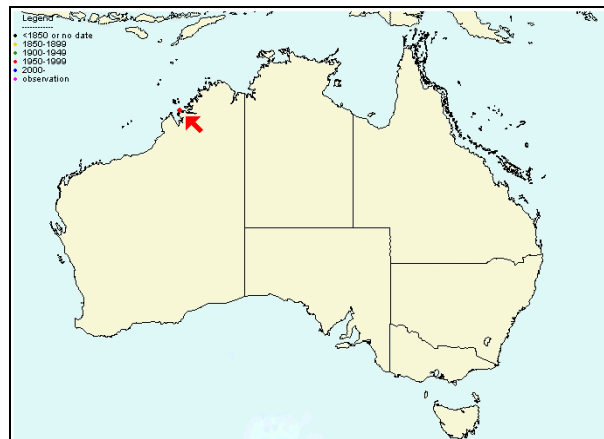
Table 1: Description of *Ramphotyphlops yampiensis*.

Total Length	128 mm
Identification	Slender with snout rounded from above and in profile Midbody scales in 18 rows Brown darker on head and tail and paler on snout and ventral surfaces
Classification	Order Squamata Suborder Serpentes Family Typhlopidae
Other Names	Yampi Blind Snake

Source: Wilson and Swan (2003).

Distribution and Habitat

The species is only known from Koolan Island (Figure 2). No habitat information was provided for the single collection of the Yampi Blind Snake. Other Australian *Ramphotyphlops* species tend to spend most of their time in topsoil, ant nests or termite mounds or under logs, rocks and other debris (Greer 2004). They will move to the surface when soils become water logged or in hot humid conditions and can often be found on the surface after summer thunderstorms (Storr *et al.* 2002).



(Source: Western Australian Museum 2006)

Figure 2: Distribution of *Ramphotyphlops yampiensis*

Diet

Blind snakes feed primarily on the egg, larvae and pupa of ants. They enter the nest and feed in the chambers where these developing ants are located (Greer 2004). A probable defence mechanism against adult ants is a foul smelling secretion from their cloaca (Greer 2004).

Breeding

All blind snakes are currently thought to lay eggs. The clutch size varies between species and is unknown for *R. yampiensis*.

Significance of Koolan Island Population

R. yampiensis is only known from one record taken from Koolan Island in 1966. It is possible that this species is endemic to Koolan Island.

Threatening Processes

In general, Blind snakes burrow in the ground so land clearing has the potential to negatively impact on the population.

Previous Records

The Yampi Blind Snake is only known from one specimen found on Koolan Island in 1966 (McKenzie *et al.* 1995) and has not been recorded in any other surveys on Koolan Island or anywhere else (Ecologia 2005a, 2006a, 2007b; MBS 2008b, 2009b, 2010b, 2011b and 2012b).

6.7.1.4.2 Ghost Bat (*Macroderma gigas*)

Description

The Ghost Bat (Plate 1:) is the largest microchiropteran bat in Australia (Richards and Hand 1995). It is the only member of the family Megadermatidae (False Vampires) in Australia and is endemic to the continent. The Ghost Bat is listed as Priority 4 on the DEC Priority Fauna List and Vulnerable by the IUCN. A description is provided in Table 2.



(Source: Western Australian Museum 2006)

Plate 1: The Ghost Bat

Table 2: Description of *Macroderma gigas*.

Head and Body Length	100 - 130 (115) mm
Forearm Length	102 - 112 (105) mm
Weight	140 -165 g
Identification	Light to dark grey above, paler below. Long ears joined together, large eyes, simple noseleaf, no tail. Largest microchiropteran bat in Australia.
Classification	Order Chiroptera Sub-order Microchiroptera Family Megadermatidae
Other Names	False Vampire False Vampire Bat Australian False Vampire Bat

Source: Strahan (1995).

Distribution

The present distribution of the Ghost Bat is widespread but intermittent throughout northern Australia (Figure 3). Availability of roost sites is the limiting factor of the distribution of the Ghost Bat. Since European settlement its range has contracted; however, the causal factors for the decline are still mostly unknown.

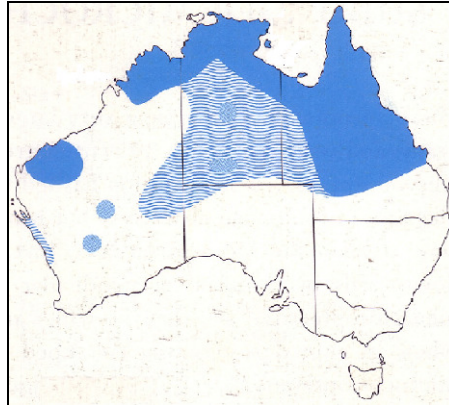


Figure 3: Distribution of *Macroderma gigas* in Australia

(Dark shading indicates current distribution, light indicates former distribution, and hatching indicates recent fossil distribution [adapted from Richards and Hand 1995]).

Habitat and Diet

The Ghost Bat occupies a diverse range of habitats from the arid Pilbara to lush northern rainforests. During the day, Ghost Bats generally roost in large, often complex cave systems with several entrances, deep rock fissures or mine adits. Individuals have been observed roosting in shallow rocky overhangs and sheds. The bats emerge from the roosts approximately one hour after sunset to forage (Douglas 1967).

This species is Australia's only truly predatory bat, feeding on frogs, reptiles, small birds and mammals, including other bats (Jolly and Hand 1995). Much of the prey is captured on the ground and usually within 2 km of their roost site (Tideman *et al.* 1985). The species flies smoothly and directly with the head held high. Prey is located visually, as well as by echo location, captured by being enveloped in the wings of the Ghost Bat, and killed with powerful bites. The prey is then taken to an established feeding site, such as a rock overhang or small cave, which often have an accumulation of discarded parts of prey. An individual's foraging area is around 61 hectares and each bat will take up a vantage point and observe before venturing to capture prey (Tideman *et al.* 1985). This vantage point is changed every fifteen minutes to another one roughly 300 metres away (Tideman *et al.* 1985).

Breeding

Ghost Bats mate during July and August. Gestation takes three months with a single young being born between September and November each year. Females form maternity colonies separate from males while the young are being weaned. Maternity colonies may contain numerous individuals (Thomson 1991). Juveniles hunt with their mothers until they become completely independent. Colony sizes range from a few individuals to greater than 100, although colonies of this size are rare. In the Pilbara colony sizes in natural roosts are generally much smaller, often consisting of just a few animals.

Significance of the Koolan Island Population

The occurrence of the Ghost Bat on Koolan Island is of state significance and indicates that Koolan Island may be a significant refuge for bats from the mainland where feral animals are widespread (Ecologia 2005a).

To date, however, no roost or maternity caves have been located.

Threatening Processes

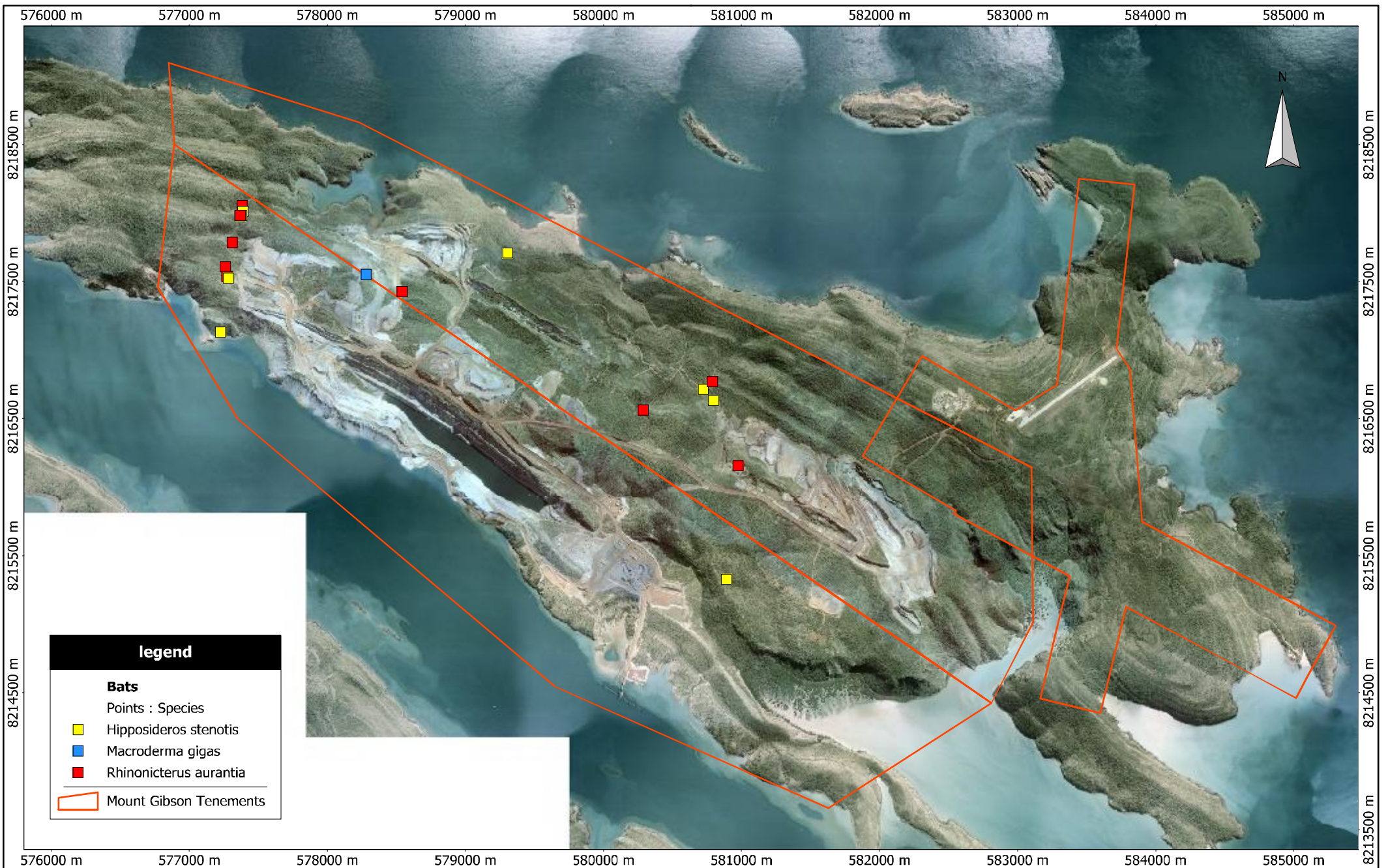
The species is quite sensitive to disturbance (Richards and Hand 1995). Roost disturbance affects 13 out of the 36 threatened species of bats in Australia. Disturbance is usually in the form of human disturbance where humans come into close proximity of roosting caves. This disturbance is even more disruptive to the bat if it occurs at a sensitive period, such as during the breeding season.

The closure, collapse or reopening of old mines is described in the Action Plan for Australian Bats (Duncan *et al.* 1999) as a threatening process. The Ghost Bat has been recorded as using abandoned mines as roosts and as maternity sites (Hall *et al.* 1997). Abandoned mines can be used as dispersal stopover points (Duncan *et al.* 1999) and may assist in the widening or reclaiming of a species range.

On Koolan Island land clearing has the potential to impact roost caves, reduce available foraging habitat and cause a decline in available prey. Vehicles can impact low flying, foraging individuals and noise and vibration from blasting can disturb roosting females.

Previous Records

The Ghost Bat was recorded on Koolan Island in Japanese tunnels on the south side of the island in 1965. The tunnels have since been excavated as part of the ore body (McKenzie *et al.* 1995). An echolocation call was recorded in the 2004 baseline biological survey and the location of this call is shown in Figure 4 (Ecologia 2005a). Subsequent pre-clearance surveys undertaken in 2006 to 2012 did not record Ghost Bats with Anabat recordings (Ecologia 2006a, 2007b; MBS 2008b, 2009b, 2010b, 2011b and 2012b).



6.7.1.4.3 Orange Leaf Nosed Bat (*Rhinonictoris aurantia*)

Description

The Orange Leaf-nosed Bat has striking golden fur and complex facial features (Source: Jolly & Hand 1995)

Plate 2). This species is sensitive to human interference and quickly takes to the wing at the slightest disturbance (Jolly and Hand 1995). The Orange Leaf-nosed Bat is listed as Schedule 1 (fauna that is rare or likely to become extinct) of the Wildlife Conservation (Specially Protected Fauna) Notice 2005. A description of the species is provided in

Table 3.



(Source: Jolly & Hand 1995)

Plate 2: The Orange Leaf-nosed Bat

Table 3: Description of *Rhinonictoris aurantia*

Head and Body Length	45 – 53 mm
Tail Length	24 – 28 mm
Forearm Length	47 – 50 mm
Weight	8 – 10 g
Identification	<p>Orange fur, occasionally darkened by brown-tipped hairs; darker fur around the eyes, dark brown wings. Colonies of brown, yellow and all white individuals can occur. Colour of individuals within a colony can change over time.</p> <p>Noseleaf complex; lower part broad with central gap at the front; upper part scalloped.</p> <p>Nasal pits deep.</p> <p>Ears small and acutely pointed.</p>
Classification	<p>Order Chiroptera</p> <p>Sub Order Microchiroptera</p> <p>Family Hipposideridae</p>
Other Names	<p>Orange Leaf-nosed Bat</p> <p>Golden Horseshoe Bat</p>

Source: Strahan (1995); Churchill (1998)

Distribution

The Orange Leaf-nosed Bat is found from the Pilbara region of Western Australia, through the Kimberley and across northern Australia into north-western Queensland, and is endemic to Australia (Churchill 1998) (Figure 5). Hall et al. (1997) concludes that their fragility in temperature regulation is the limiting factor in their range.

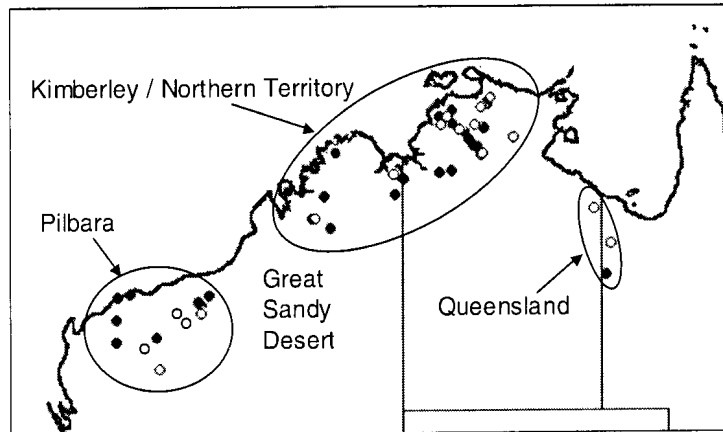


Figure 5: Distribution of *Rhinonictes aurantia* in Australia

(Closed circles represent specimens used by Armstrong (2002), open circles are other records of specimens not measured by Armstrong (2002) (Data from Churchill 1998)

Habitat and Diet

The Orange Leaf-nosed Bat is very selective when it comes to roost caverns. In the Pilbara the species is associated with gorges and watercourses in areas of high relief as these landforms support caves with high humidity and ambient temperature (Armstrong 2001). High temperature and humidity caves are essential as this species is unable to maintain its body temperature when resting; however, these caves are not abundant (Armstrong 2000; Jolly 1988; Churchill 1998). Orange Leaf-nosed Bats do not cluster for warmth, with individuals hanging from the roof with a separation distance of approximately 12 centimetres (Jolly and Hand 1995).

The species usually only leaves its dry season roost caves from November to February, when the outside climatic conditions are similar to the roost microclimate. During this time these bats become forest dwellers and may utilise hollow timber, rock overhangs, smaller, less complex caves and mines as roosts (Churchill 1998; Duncan *et al.* 1999).

At dusk the Orange Leaf-nosed Bat emerges from its roosting site to feed (Hall 1989; Jolly and Hand 1995). It is an opportunistic, aerial insectivore, with no records of these bats landing on the ground or gleaning insects. Prey is typically captured in the tail membrane and passed to the mouth (Hall 1989). The diet of Orange Leaf-nosed Bats comprises of approximately 70% moths, 17% beetles and 8% termites (Churchill 1998). They are often seen flying along roads at night and their bright fur is very distinctive in the car headlights (Churchill 1998).

Breeding

Orange Leaf-nosed Bats mate in July and the females give birth to a single young in late December or early January after a five month gestation. The young grow quickly and are almost indistinguishable from the adults when they are weaned in late February (Churchill

1998). The females are reproductively mature at seven months, but males do not mature until their second year at 18 months.

Significance of the Koolan Island Population

The occurrence of the Orange Leaf-nosed Bat on Koolan Island is of state significance and indicates that Koolan Island may be a significant refuge for bats from the mainland where feral animals are widespread (Ecologia 2007b; MBS 2008b, 2009b, 2010b, 2011b, 2012b).

To date, however, no roost or maternity caves have been located.

Threatening Processes

Roost disturbance affects 13 out of the 36 threatened species of bats in Australia. This species is particularly sensitive to human interference and quickly takes to the wing at the slightest disturbance (Jolly and Hand 1995). Disturbance is usually in the form of human disturbance where humans come into close proximity of roosting caves. This disturbance is even more disruptive to the bat if it occurs at a sensitive period, such as during the breeding season.

The closure, collapse or reopening of old mines is described in the Action Plan for Australian Bats (Duncan *et al.* 1999) as a threatening process. The Orange Leaf-nosed Bat has been recorded as using abandoned mines as roosts and as maternity sites (Hall *et al.* 1997). Abandoned mines can be used as dispersal stopover points (Duncan *et al.* 1999) and may assist in the widening or reclaiming of a species range.

On Koolan Island land clearing has the potential to impact roost caves, reduce available foraging habitat and cause a decline in available prey. Vehicles can impact low flying, foraging individuals and this species, in particular, is often seen flying along roads at night (Churchill 1998). Noise and vibration from blasting can also disturb roosting females.

Previous Records

The Orange Leaf-nosed Bat has previously been recorded on Koolan Island in 1965 from Japanese tunnels and in 1968 from a mine shaft as detailed by McKenzie *et al.* (1995).

More recently echolocation calls have been recorded during pre-land clearing surveys every year from 2007 to 2012 (Ecologia 2007b; MBS 2008b, 2009b, 2010b, 2011b and 2012b).

6.7.1.4.4 Northern Leaf Nosed Bat (*Hipposideros stenotis*)

Description

Little is known about this species of bat as it is considered rare, although this may be inaccurate (Strahan 1995). The Northern Leaf-nosed bat has two “warty” protuberances on the noseleaf, one just above the eye level and another on the top edge (Strahan 1995) (Plate 3). It is currently listed as Priority 2 on the DEC Priority Fauna List. A description of the species is provided in Table 4.



(Source: Western Australian Museum 2006)

Plate 3: The Northern Leaf-nosed Bat

Table 4: Description of *Hipposideros stenotis*.

Head and Body Length	42 – 45 mm
Tail Length	25 – 30 mm
Forearm Length	42 – 45 mm
Weight	6 – 10 g
Identification	Brown above slightly paler below Noseleaf complex covering much of face Two “warts” on the upper portion of noseleaf
Classification	Order Chiroptera Sub order Microchiroptera Family Hipposideridae
Other Names	Dahl’s Horseshoe-bat Lesser Wart-nosed Horseshoe-bat Narrow Eared Roundleaf Bat

Source: Strahan (1995).

Distribution

This bat is thought to tolerate a wide range of conditions and is found in northern reaches of Western Australia, Northern Territory and Queensland (Figure 6). It roosts in caves and cracks found in and along ridgelines (Strahan 1995).



Figure 6: Distribution of *Hipposideros stenotis* in Australia
(Adapted from Hall 1995)

Habitat, Diet and Breeding

This species feeds on moths, beetles, mosquitos and flies, which it catches using ultrasonic emissions and by adopting a fluttering flight pattern, similar to a butterfly. The breeding season is thought to be long but this has not been confirmed, as with a lot of other characteristics of this bat (Strahan 1995).

Significance of the Koolan Island Population

The Northern Leaf-nosed Bat is broadly distributed across the north of Australia, as well as down the west Kimberley Coast. New populations have been recently discovered that extend their previously known range (Ladyman and Bullen pers. comm.). The species does have specific habitat requirements, such as those available on Koolan Island, but these habitats are common in the Kimberley.

Though the species is difficult to locate, residing in low numbers rather than clusters, more acoustic recording would likely reveal more individuals across a broader range. Therefore, the population on Koolan Island is valuable (locally significant), but not particularly unique.

Threatening Processes

Roost disturbance affects 13 out of the 36 threatened species of bats in Australia. Disturbance is usually in the form of human disturbance where humans come into close proximity of roosting caves. This disturbance is even more disruptive to the bat if it occurs at a sensitive period, such as during the breeding season.

The closure, collapse or reopening of old mines is described in the Action Plan for Australian Bats (Duncan *et al.* 1999) as a threatening process. The Northern Leaf-nosed Bat has been recorded as using abandoned mines as roosts and as maternity sites (Hall *et al.* 1997). Abandoned mines can be used as dispersal stopover points (Duncan *et al.* 1999) and may assist in the widening or reclaiming of a species range.

This species does not appear to be as sensitive to disturbance as other species, with individuals recorded over multiple years in the same cave within 2-300 metres of mining, with both drill and blast and Vemeer continuous miners being used (Ladyman and Bullen pers comm.).

On Koolan Island land clearing has the potential to impact roost caves, reduce available foraging habitat and cause a decline in available prey. Vehicles can impact low flying, foraging individuals.

Previous Records

On Koolan Island the Northern Leaf-nosed Bat was collected from Japanese tunnels in 1965 and the *Acacia* Exploration Shaft in 1968, pairs were also observed roosting in two small caves in 1993 (McKenzie *et al.* 1995). More recently echolocation calls of the Northern Leaf-nosed Bat were recorded once during a 2007 pre-clearance survey and on three occasions during 2008 pre-clearance surveys (Ecologia 2007b, 2007c; MBS 2008b). Where available, these locations are shown on Figure 4.

6.7.1.4.5 Red Goshawk (*Erythrotriorchis radiatus*)

Description

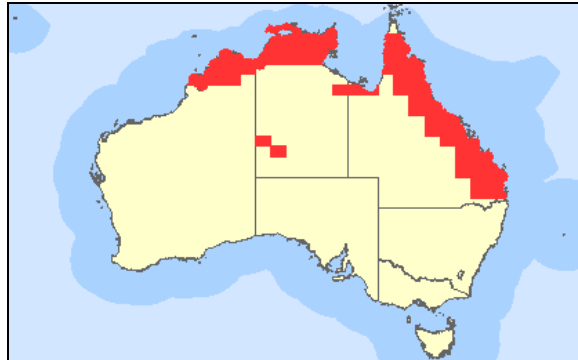
The Red Goshawk is a reddish colour and about the size of a little egret. It has a whitish streaked head, blacked mottled underparts, yellow legs and feet and a grey barred tail (Pizzey and Knight 2003). It is listed as Vulnerable under the *EPBC Act* and Schedule 1 of the *WC Act*. A summary of the key characteristics of this species are presented in **Error! Reference source not found.**

Table 5: Key Characteristics of the Red Goshawk

Length	40 - 60 centimetres.
Wing span	110 - 135 centimetres.
Weight	0.65 kilograms (males). 1.1 kilograms (females).
Identification	<ul style="list-style-type: none"> • Reddish coloured body. • Whitish dark streaked head. • Wings long and broad.
Classification	Order <i>Falconiformes</i> Family <i>Accipitridae</i>
Other names	Red-legged Goshawk, Radiated Goshawk, Red or Rufous-bellied Buzzard, Red Hawk

Distribution

The Red Goshawk is endemic to Australia and is sparsely distributed from north-western Australia to northern New South Wales. The Red Goshawk's distribution is shown in **Error! Reference source not found.** Although no exact location was provided for the 2004 sightings on Koolan Island the general location provided was the 'Back Beach' (Ecologia 2005a).



(Source: DSEWPaC 2009)

Figure 7: Red Goshawk Distribution

Habitat and Diet

The Red Goshawk is found mainly in open forests, woodlands and at the edge of rainforests (Slater 1986). Its diet is predominantly birds (DSEWPaC 2009).

Breeding

The Red Goshawk breeds from April to September. The breeding habitat is specific with nests of sticks being built in very tall trees which are found close to watercourses. Between one and two eggs are laid. Young are fully dependent on the parents until week 17 or 18 (Pizzey and Knight 2003).

Significance of the Koolan Island Population

The lack of suitable breeding habitat and the fact the species has not been seen on Koolan Island since 2004 indicates the Red Goshawk is unlikely to be breeding and permanently present on the island. The previous sightings were most likely made of an occasional visitor undertaking opportunistic foraging from its mainland-based territory (Ecologia 2005d).

Threatening Processes

Across Australia, the main threats to the Red Goshawk are clearing of habitat, shooting, illegal egg collection and fire (Garnett and Crowley 2000). However, on Koolan Island clearing of habitat and blasting immediately adjacent nest sites would be the principal disturbances.

Previous Records

The Red Goshawk has potentially been recorded twice on Koolan Island, with a confirmed sighting during a fauna survey in July 2004 and a second, potential sighting, was made during a flora survey in June 2004 (Ecologia 2005a, 2005c). The targeted Red Goshawk

survey in September 2005 and all subsequent fauna surveys have failed to record any further sightings of the Red Goshawk.

6.7.1.4.6 **Short Range Endemic Snails Species**

Description

Short Range Endemics (SREs) are primarily invertebrate fauna with a highly restricted distribution (EPA 2009). A combination of factors including poor dispersal capabilities or opportunities, habitat preferences, life history attributes, physiological attributes, habitat availability, biotic and abiotic interactions and historical factors determine not only the geographic distribution of a taxon, but its propensity for population differentiation and speciation (Ponder and Coglean 2002).

In Western Australia, relict taxa are generally fragmented populations from lineages reaching back to historically wetter periods. With progressively drier and more seasonal climatic conditions, the most favourable habitats have now become increasingly fragmented until such fauna are now restricted to specialised moist microhabitats which simulate on a small scale an earlier more widespread habitat (Main 1996). Many of the current species that have restricted distributions are a result of these processes.

Eleven species of land snail have been surveyed on Koolan Island to date. Six of these are from the Camaenidae family (*Amplirhagada astuta*, *Kimboraga koolanensis*, *Kimboraga yampiensis*, *Retroterra* sp., *Setobaudinia* sp. and *Torresitrachia bathurstensis*) and are considered to be SRE Fauna, which have been separated from mainland populations for a significant period of time (Slack-Smith 2006).

- ***Amplirhagada astuta* (Iredale, 1939)**

The holotype for this snail was collected on Koolan Island, and has been subsequently surveyed in several locations (McKenzie *et al.* 1995), indicating a distribution through the central portion of Koolan Island (Slack-Smith 2008). It is described as habitat tolerant, though favouring cooler more sheltered habitats where litter is abundant it has been surveyed in woodlands in gullies (Slack-Smith 2006). It is the only snail surveyed on Koolan Island to be registered as Schedule 1 under the WC Act.

- ***Kimboraga koolanensis* (Iredale, 1939)**

This snail is only known from four badly worn specimens and has not been sampled on Koolan Island in any recent surveys (McKenzie *et al.* 1995). Solem (1985, cited in McKenzie *et al.* 1995) suggests the species should never have been described based on the existing material, as characteristics of the specimens indicate it is not even of the *Kimboraga* genus.

- ***Kimboraga yampiensis* (Solem, 1985)**

This species was initially described from specimens found in a Koolan Island garden in 1967, and has since been sampled on the mainland, Cockatoo Island and other locations on Koolan Island (Slack-Smith 2008). It has been surveyed in vine thicket as well as a town garden (McKenzie *et al.* 1995).

- ***Retroterra* sp. and ?*Retroterra* sp. (Undescribed)**

Shells taken in 2005 surveys fit the characteristics of the genus but do not correspond with any known species, and were tentatively called *Retroterra* sp. (Slack-Smith 2006). *Retroterra* sp. was the second most widely spread snail in the 2005 survey (Slack-Smith 2006). This snail is described as habitat tolerant, though seen to favour cooler more sheltered habitats where litter is abundant, it has been surveyed in vine thicket and in woodlands along gullies (Slack-Smith 2006).

Collections in 2007 identified additional specimens which may be placed in a new and yet undescribed genus *?Retroterra* sp. (Slack-Smith 2008). *?Retroterra* sp. was surveyed at a quarter of transects in 2007 (Slack-Smith 2008).

- ***Setobaudinia* sp. (Undescribed)**

The Koolan Island *Setobaudinia* snails sampled do not correspond with any known species of the *Setobaudinia* genus and as such are regarded as belonging to an undescribed taxon of the genus. This snail has been collected in rainforest/vine thicket, woodland in gullies and open woodland on stony ridges in north eastern portion of the island (McKenzie *et al.* 1995; Slack-Smith 2006).

- ***Torresitrachia bathurstensis***

Until recently *Torresitrachia bathurstensis* was considered a common land snail, and although it is from the Camaenidae family it was not considered to be an SRE due to its widespread distribution. The species was first described from specimens collected on Bathurst and Heywood Islands in King Sound, Western Australia (Slack-Smith 2010). Samples considered to be conspecific were subsequently collected from Kimbolton on the Stewart River and from Doubtful Bay, Cockatoo Island and Secure Bay (Slack-Smith 2010). Recent work undertaken in the Kimberley has indicated *Torresitrachia bathurstensis* is comprised of several separate species, each one being endemic to single islands or portions of larger islands (Köhler 2011). As a result it is possible the Koolan Island population may represent a new short range endemic *Torresitrachia* species. Until further work is undertaken on the Koolan Island specimens it will be referred to as *Torresitrachia* cf. *bathurstensis*, and considered an SRE.

Distribution

The distribution of four of the five known SRE snail species is shown in Figure 8. The distribution of *Kimboraga koolanensis* cannot be shown as no location was reported from the initial collection and it has not been sampled in recent surveys. Each SRE snail has been surveyed outside of the mine footprint, with surveyed locations shown in Figure 8.

Examples of Koolan Island's short range endemic land snails are shown in Plate 4.



Plate 4: Short Range Endemic Land Snails of Koolan Island

Significance of Koolan Island Populations

The Koolan Island Camaenidae species are considered to be SRE fauna and have clearly been separated from mainland populations for a significant period of time.

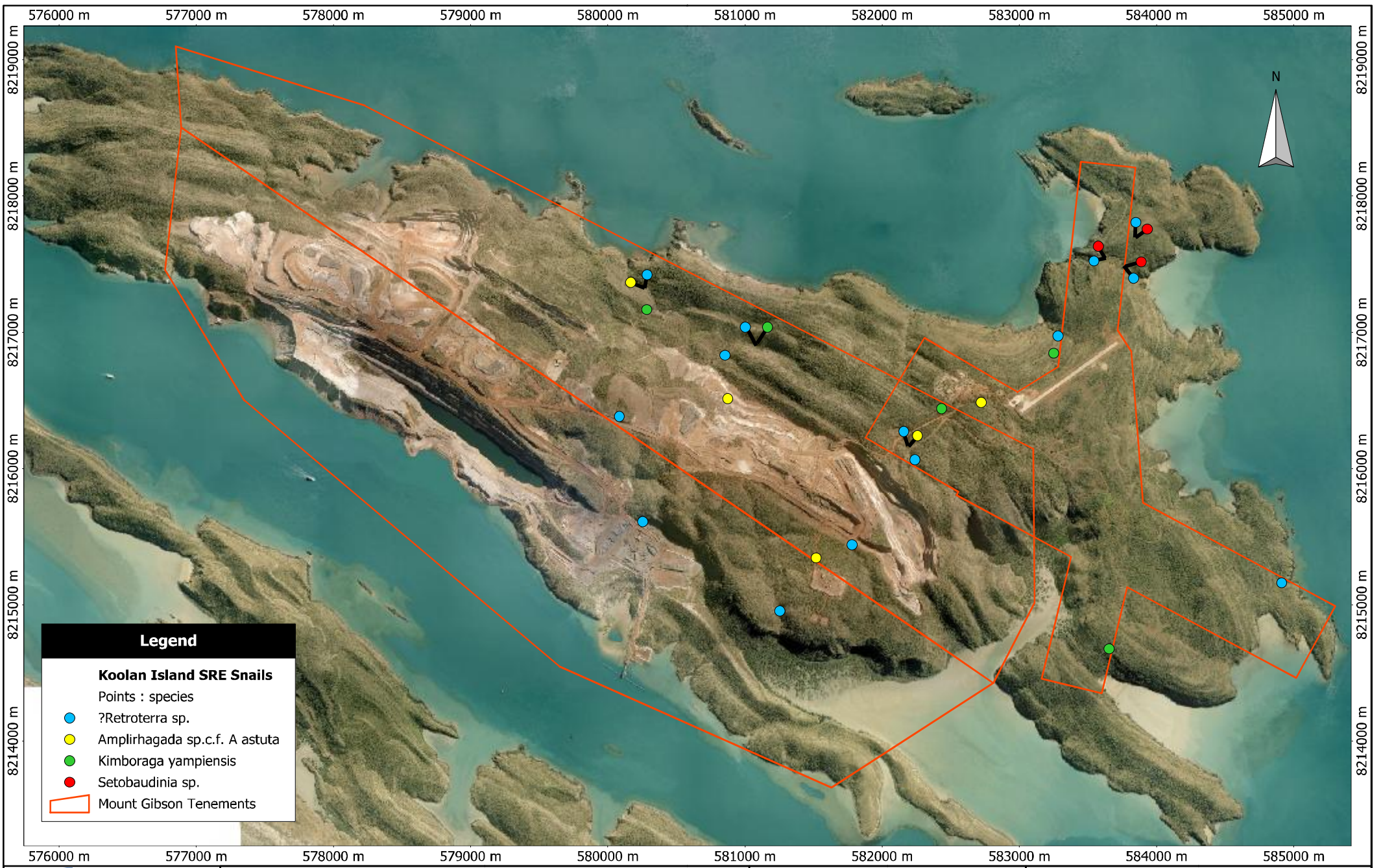
Threatening Processes

Presently operating factors that may contribute to a decline in distribution, abundance or diversity of land snails in Koolan Island include:

- Clearing of known populations.
- Introduction of exotic and mainland native snails and slug species.
- Introduction of exotic weeds.
- Changes in vegetation structure.
- Fire frequency (changes to vegetation structure including weed abundance and loss of litter accumulations).

Previous Records

- *Amplirhagada astuta* was first recorded on Koolan Island in 1966 and has since been recorded during the WA Museum land snail survey (2005), pre-land clearance surveys (2006, 2007, 2012) and during the biennial snail monitoring surveys (2010 and 2012) (MBS 2012c).
- *Kimboraga koolanensis* has not been recorded on Koolan Island since its initial description in 1967 (Solem 1985, cited in Slack-Smith 2006).
- *Kimboraga yampiensis* was first recorded on Koolan Island in 1939 and has since been recorded in 1967 and 1993, during the pre-land clearing surveys in 2007 and 2010, and during the biennial snail monitoring in 2010 and 2012. *K. yampiensis* is also known from Cockatoo Island and the adjacent mainland (MBS 2012c).
- *Retroterra* sp. was recorded during the 2005 WA Museum land snail survey (Slack-Smith 2006).
? *Retroterra* sp. was recorded during the 2007 pre-land clearance survey from eroded, broken and/or juvenile specimens. No similar specimens had been taken in previous surveys (MBS 2012c).
- *Setobaudinia* sp. was recorded during the 2005 WA Museum land snail survey and more recently in the 2011 and 2012 biennial snail monitoring surveys (Slack-Smith 2006; MBS 2012c)
- *Torresitrachia* cf. *bathurstensis* has been recorded from most sites since 2007 (MBS 2012c).



Legend

Koolan Island SRE Snails

Points : species

- ?Retroterra sp.
- Amplirhagada sp.c.f. A astuta
- Kimboraga yampiensis
- Setobaudinia sp.

Mount Gibson Tenements



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Facsimile: + 618 9226 3177
info@mbsenvironmental.com.au

Scale: 1:35000
Original Size: A4
Air Photo Date: August 2009
Grid: Australia MGA94 (51)

0 1 km



Mount Gibson Iron Limited
Koolan Island Operations
Significant Fauna Species Management Plan

Known Locations of Short Range
Endemic Snails on Koolan Island

Figure 8

7.0 POTENTIAL AND KNOWN IMPACTS

7.1 LAND DISTURBANCE

Land disturbance is potentially the greatest impact from the Koolan Island project. The total amount to be cleared for the project was initially 540 hectares, of which 45% was previously disturbed land. Since recommencement of operations the clearing footprint has been authorised to increase by 50 hectares to 590 hectares via a Section 45C approval and a further increase to 650 hectares via another Section 45C. The majority of this has already been cleared.

Known and potential impacts on conservation significant fauna species from land clearing include:

- Loss of critical habitat required for roosting, nesting and feeding.
- Loss of general habitat resulting in increased pressure on remaining resources.
- Loss of individuals from direct contact with clearing machinery, especially those without effective methods of dispersal (snails, blind snakes).
- Fragmentation of populations of species with poor powers of dispersal (snails, blind snakes).
- Alteration or degradation of habitat causing changes in surface water flow and a reduction in soil water content of specific microhabitats for SRE snails.

7.2 INTRODUCED FLORA

Weed species are introduced flora species that establish themselves in natural ecosystems and modify natural processes, often resulting in the decline of the invaded community (DEC 2012).

Weed surveys undertaken on Koolan Island up until 2009 have identified a total of 80 weed species including three Declared Plant species. Most weeds are present as a result of previous mining activities on the island, and are confined to the old BHP town site or settlement. Current mining activities have the potential to introduce new weeds to the island, however, weed management, quarantine and control are governed by the Quarantine Management Plan (MGI 2011) developed for Koolan Island that aims to reduce the spread of weeds and prevent the introduction of new weeds.

Known and potential impacts posed by introduced flora on conservation significant fauna species include:

- Dominance of the weed at the exclusion of native species, creating a monoculture and leading to a loss of biodiversity.
- Reduction in habitat value (feeding and refuge resources for fauna) through a reduction of plant species richness and diversity.
- Alteration of fire regimes from introduced plants. For instance Mission Grass has been identified as having the potential to change fire regimes on Koolan Island.

7.3 INTRODUCED FAUNA

Current operations have the potential to introduce a range of fauna species from the mainland which could impact Koolan Island's populations of conservation significant fauna.

Fauna species with the potential to be introduced to Koolan Island include the Asian House Gecko (*Hemidactylus frenatus*), Brown Rat (*Rattus norvegicus*), Back Rat (*Rattus rattus*), Cane Toad (*Bufo marinus*), European Red Fox (*Vulpes vulpes*), European Rabbit (*Oryctolagus cuniculus*), Feral Cat (*Felis catus*), House Mouse (*Mus musculus*) and the Singapore Ant (*Monomorium destructor*) (Ecologia 2006b). Informal records suggest that a few of these species may be present on the island, but none have been captured/recorded to date during the baseline or pre-clearance surveys (Ecologia 2005a, 2006a, 2007b; MBS 2008b, 2009b, 2010b, 2011b and 2012b).

Introduced carnivorous fauna species have the potential to:

- Predate upon Koolan Island's conservation significant fauna.
- Compete for resources with local conservation significant fauna.
- Poison carnivorous conservation significant fauna.
- Introduce diseases to local conservation significant fauna.

Introduced herbivorous fauna species have the potential to:

- Degrade habitat through soil compaction and erosion.
- Alter vegetation structure and habitat through herbivory.
- Compete with local conservation significant herbivorous species (snails) for resources.

7.4 NOISE DISTURBANCE

Noise from current operations is generated by:

- Heavy vehicles transporting ore and waste.
- Blasting.
- Dumping of ore and waste rock material.
- Crushing.

The conservation significant bat species discussed in this management plan are sensitive to noise and it is possible that operational noise may disturb them from roosting sites that are in close proximity to mining operations. Essentially, this reduces habitat quality and availability and increases pressure on remaining resources. It also reduces the size and viability of populations.

In pre-clearance surveys undertaken in 2008, two of the three conservation significant bat species were surveyed in close proximity to waste dumps, indicating noise had not impacted them thus far in regards to foraging.

Pre-clearance surveys to date have not identified any caves suitable for, or used by, conservation significant bats in areas close to operations.

7.5 WATER

Dewatering of aquifers will occur for mining and domestic water use. Dewatering is not expected to impact any known conservation significant fauna species (NB: Management of Stygofauna is addressed through the Stygofauna Management Plan).

As there are no sources of permanent fresh surface water on Koolan Island (Aquaterra 2006a-c), operations are not expected to have any impact on conservation significant fauna species that are dependent upon or influenced by surface water.

Groundwater abstraction and alteration of temporary surface water flow regimes may impact on conservation-significant fauna species through:

- Alteration of vegetation structure due to a reduction in the availability of surface water and groundwater water resources leading to habitat degradation.
- Reducing or removing fresh water availability.
- Increasing fresh water availability.

7.6 DUST

The main sources of dust at the Koolan Island operation are excavation at the mine face, blasting, construction, roads, waste dumps, crushing and screening.

Dust settles on foliage, blocking stomata and preventing transpiration. Over time this leads to death of the plant, reducing habitat structure and diversity. Excessive dust can also prevent the recruitment of new plants into an area.

Following rain events surface flows of dust material leads to sedimentation in natural water ways, increasing turbidity and reducing habitat value.

7.7 FIRE

Mining operations on Koolan Island have the potential to increase the frequency of fires through machinery causing sparks when working in dry vegetation and the general increased risk from increasing anthropogenic activities in an area.

In the tropical north, early Wet Season fires are frequently caused by lightning strikes.

A complete fire ban and strict commitments regarding fire on the island have resulted in no accidental fires on the island since operations began in 2006. Potential impacts of fire on conservation significant species include:

- Mortality of individuals.
- Habitat modification or total loss of habitat.
- Increased soil erosion causing increased sediment down slope of burnt areas.

7.8 HYDROCARBONS AND CHEMICALS

Mining operations on Koolan Island require the use of significant quantities of hydrocarbons and other chemicals. Impacts are managed through the appropriate use and storage of hydrocarbons and chemicals brought to Koolan Island and transported for use around the project area. Contamination of soil, ground and surface water, and vegetation from spillage is a potential impact.

7.9 WASTE

Mining operations and housing of approximately 320 mine workers has led to the creation of putrescible and inert waste on Koolan Island. A licensed landfill site has been used since operations began in 2006. It is maintained regularly. Impacts from wastes that are not correctly disposed of could include:

- Contamination of groundwater and surface water.
- Habitat degradation.
- Increased populations of native and/or introduced species supported by waste.
- Impacts to native fauna through waste ingestion, poisoning, entrapment or killed by vehicles on adjacent roads.

7.10 VEHICLE COLLISION

Mining operations result in traffic flows on the island. Light and heavy vehicle movements along the mining roads may result in the following impacts on conservation significant species:

- Mortality of individual fauna through direct collisions with vehicles.
- Injury of individual fauna through direct collisions with vehicles.

7.11 KNOWLEDGE

A lack of knowledge about conservation significant species can have the following impacts:

- Inappropriate management initiated by a lack of knowledge of abundance, diversity and distribution of these species.
- Incorrect conservation status applied to species which are more or less abundant or more or less widely distributed than currently believed.
- Operational personnel not exhibiting correct behaviours.

8.0 ENVIRONMENTAL OBJECTIVE AND PERFORMANCE INDICATORS

Table 6: Environmental Objectives and Performance Indicator for Conservation Significant Flora Management (Ministerial Statement 715)

Environmental Objective	Performance Indicator
Maintain the abundance, geographic distribution, conservation status and productivity of conservation-significant fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	<ul style="list-style-type: none"> • No significant long term change to the abundance of conservation-significant fauna species. • No change to the geographic distribution of conservation-significant fauna species. • No change to the conservation status of conservation-significant fauna species on Koolan Island.

9.0 MANAGEMENT STRATEGY

Table 7: Management Strategies for Identified Environmental Objectives

Ministerial Condition	Impact	Management Strategy	Performance Indicator	Timeframe and Reporting
<p>9-1 Prior to ground-disturbing activities, the proponent shall commence staged pre-land clearing surveys of the areas to be disturbed for conservation-significant flora and fauna species.</p> <p>The summary report of the results of the staged pre-land clearing surveys shall be provided to the Environmental Protection Authority and the Department of Conservation and Land Management within two weeks of becoming available.</p>	Land Disturbance	<ul style="list-style-type: none"> Disturbance to natural vegetation will be minimised. Conduct pre-clearance surveys as per prior to clearing to identify conservation significant fauna and habitat. A Ground Disturbance Permit completed and authorised prior to clearing activities. Alter mine plans where possible to avoid populations of conservation significant fauna and habitat. Notify DEC of conservation significant fauna species and numbers prior to clearing. Topsoil stripped (where terrain permits), stripping avoided during or immediately following heavy rains, or in very dry, windy conditions. Direct return of topsoil where possible. If topsoil stock-piling required stock-piles not to exceed heights of 2 metres to maintain aeration and biological activity, stock-piles clearly marked 'topsoil', with areas of known weed infestations stock-piled separately. Conservation management and weed hygiene zones clearly marked and sign posted. No unauthorised entry into conservation management and weed hygiene zones. No unauthorised off-track driving. Vehicle speed limits will be imposed. Minimise the time between disturbance and rehabilitation with progressive rehabilitation. Seed collection undertaken on Koolan Island to supply local provenance seed. Rehabilitation monitoring undertaken in accordance with the Mine Closure Plan. 	<ul style="list-style-type: none"> No clearing outside of approved areas. Pre-clearance surveys conducted prior to clearing. Pre-clearance survey report produced. Clearing permits system implemented and evidence of forms completed and conditions of clearing permit assessed and complied with. Clearing Register maintained which shows areas cleared, topsoil stripped, when it was cleared, native vegetation or rehabilitated land disturbed Production of a Mine Closure Plan. Correspondence with DEC regarding notification of presence of conservation significant fauna and habitat. 	<ul style="list-style-type: none"> Clearing and rehabilitation to be reported annually in the Annual Environmental Report (AER). Pre-clearance survey reports to be submitted as they become available following surveys. AER submitted to DEC annually.
<p>9-2 Prior to ground-disturbing activities in a particular staged area to be cleared, the</p>		<ul style="list-style-type: none"> This Plan. 	<ul style="list-style-type: none"> Plan compliant with Ministerial Statement 715. 	<ul style="list-style-type: none"> Compliance with the Sig Fauna MP written into the AER



Ministerial Condition	Impact	Management Strategy	Performance Indicator	Timeframe and Reporting
proponent shall prepare a Significant Species Management Plan for conservation-significant flora or fauna species recorded during the staged pre-land clearing surveys required by condition 9-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management and the Western Australian Museum.				<ul style="list-style-type: none"> Report as required in Ministerial Statement 715.
The objective of this Plan is to maintain the abundance, diversity, geographic distribution, conservation status and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.		<ul style="list-style-type: none"> This plan. 	<ul style="list-style-type: none"> Plan compliant with Ministerial Statement 715. 	<ul style="list-style-type: none"> Compliance with the Sig Fauna MP written into the AER Report as required in Ministerial Statement 715
This Plan shall describe the significant, identified species of flora and fauna, and describe significant vegetation associations and habitat areas, and shall set out procedures to: 1. demarcate identified populations and/or individuals of conservation-significant species of flora and fauna, vegetation associations and habitat areas;		<ul style="list-style-type: none"> The Significant Fauna Species Management Plan Section 6.7.1.4, Figure 4 and Figure 8. 	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> n/a
2. modify land clearing plans and evaluate alternative mine		<ul style="list-style-type: none"> Pre-clearance fauna survey reports to include provisions for impact management and mitigation. 	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> n/a



Ministerial Condition	Impact	Management Strategy	Performance Indicator	Timeframe and Reporting
plans, to minimise or avoid impacts on the conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas;				
3. minimise impacts where proposed mining activities are likely to impact on conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas;	Introduced flora and fauna	<ul style="list-style-type: none"> Invasion prevention and control of introduced flora and fauna species will be managed as per the Quarantine Management Plan (MGI 2011). Weed monitoring to occur as per the Quarantine Management Procedure (MGI 2011). Introduced fauna monitoring to occur as per the Quarantine Management Procedure (MGI 2011). 	<ul style="list-style-type: none"> As per Quarantine Management Plan (MGI2011). Annual weed and introduced fauna monitoring conducted. Weed and introduced fauna maps maintained. Weed and introduced fauna Control Register maintained. Ground disturbance permits completed and conditions of clearing permit assessed and complied with. 	<ul style="list-style-type: none"> Weeds and introduced fauna reported in AER. Audited as per requirements of Ministerial Statement 715 and EPBC Act approval.
	Noise Disturbance	<ul style="list-style-type: none"> All plant and equipment design will meet occupational noise standards and will be regularly serviced to ensure minimisation of noise generation. 	<ul style="list-style-type: none"> Noise emissions do not exceed those stated. Records show regular servicing. 	<ul style="list-style-type: none"> Audited as per requirements of Ministerial Statement 715 and EPBC Act approval.
	Water	<ul style="list-style-type: none"> Groundwater and surface water will be managed as per the Water Management Plan (GHD 2010). 	<ul style="list-style-type: none"> Pre-clearance fauna surveys conducted prior to potentially impacting activity 	<ul style="list-style-type: none"> Pre-clearance Fauna Survey report submitted annually.
	Dust	<ul style="list-style-type: none"> Dust generation from project activities will be minimised by engineering controls and use of dust suppression measures, such as water trucks, sprinklers and deluge sprays. Vehicle speed restrictions of 40km/hr implemented. 	<ul style="list-style-type: none"> Water cart used as required in dry season. Clearing register to be maintained. 	<ul style="list-style-type: none"> Clearing detailed in AER.
	Fire	<ul style="list-style-type: none"> A Fire Management Plan (FMP) has been developed in consultation with DEC and will be submitted to EPA and SEWPAC, fire management to be undertaken in accordance with the FMP. 	<ul style="list-style-type: none"> ERT training conducted and register maintained. 	<ul style="list-style-type: none"> Audited as per requirements of Ministerial



Ministerial Condition	Impact	Management Strategy	Performance Indicator	Timeframe and Reporting
		<ul style="list-style-type: none"> Equip hydrocarbon and chemical storage facilities, light vehicles, mobile plant and fixed plant with approved fire extinguishers. Personnel will be trained in the use of fire extinguishing equipment and fire prevention measures in work areas. Hydrocarbon and chemical storage facilities, light vehicles, mobile plant and fixed plant will be equipped with approved fire extinguishers. Hot works permits will be obtained for work that has the potential to create ignition sources. Adequate fire suppression equipment will be made available for hot works within 3m of vegetation. An emergency response team will be available. 	<ul style="list-style-type: none"> Fire extinguisher register maintained. Records of staff induction maintained. 	Statement 715 and EPBC Act approval.
	Hydrocarbons and chemicals	<ul style="list-style-type: none"> Hydrocarbons and chemicals will be stored, used, transported and disposed of in accordance with Dangerous Goods Regulations, Australian Standards and DoCEP guidelines. Spills will be immediately cleaned up and contaminated material appropriately disposed of. 	<ul style="list-style-type: none"> Areas with hydrocarbons show compliance via inspection reports. Spills register maintained. No hydrocarbon or chemical contaminated material in Koolan Island landfill facility. Records maintained of hydrocarbon and chemical contaminated material appropriate disposal. 	<ul style="list-style-type: none"> Spills reported as incidents in the AER.
	Waste	<ul style="list-style-type: none"> Inert and putrescible waste disposed of in a licensed landfill facility on Koolan Island Hazardous waste will be removed from the island and disposed of by a licensed contractor. 	<ul style="list-style-type: none"> Landfill facility licensed, records kept of appropriate disposal. No contaminated or hazardous waste in Koolan Island landfill facility. Records maintained of hydrocarbon and chemical contaminated material appropriate disposal. 	<ul style="list-style-type: none"> Summary of waste disposal reported in the AER.
	Vehicle Collision	<ul style="list-style-type: none"> Vehicle speed restrictions of 40km/hr implemented. Caution signs installed indicating conservation significant fauna presence. 	<ul style="list-style-type: none"> Speeds adhered to. Signs in place. 	<ul style="list-style-type: none"> Audited as per requirements of Ministerial Statement 715 and



Ministerial Condition	Impact	Management Strategy	Performance Indicator	Timeframe and Reporting
				EPBC Act approval.
	Knowledge and Awareness	<ul style="list-style-type: none"> Pre-clearance surveys conducted to identify conservation significant fauna presence/absence. Information on conservation significant species provided to employees within the site induction. Opportunistic sightings of conservation significant fauna reported to the Environmental Superintendent. Register maintained which includes a map of all conservation significant fauna species recorded, date observed, locations and number of individuals Report all conservation significant fauna species records to DEC. Compilation of an identification booklet for conservation significant species for use at Koolan Island. Update information on species in the SFSMP, register maps and identification booklet as it becomes available. Check annually whether conservation status of relevant species has changed. 	<ul style="list-style-type: none"> Pre-clearance surveys conducted Conservation significant fauna species register and maps maintained. Reports made to DEC when conservation significant fauna identified. Records of staff attending site induction and content. SFSMP, maps and register maintained using most current taxonomic information. Identification booklet produced and made available to mine site personnel. 	<ul style="list-style-type: none"> Annual Pre-clearance Survey Report. Opportunistic sightings register shows evidence of updates. SFSMP updated with most recent information, at timeframes not exceeding 4 years, with consultation from DEC.
4. monitor and record impacts on conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas; and		<ul style="list-style-type: none"> Section Error! Reference source not found. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">
5. Implement appropriate contingency measures where impacts on conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas are identified.		<ul style="list-style-type: none"> Section Error! Reference source not found. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">
9-3 The proponent shall review and revise the Significant Species Management Plan required by condition 9-2 at intervals not exceeding four years.	n/a	<ul style="list-style-type: none"> Review and revise Significant Fauna Species Management Plan every 4 years. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">
9-4 The proponent shall implement the Significant	n/a	<ul style="list-style-type: none"> Implement current Significant Fauna Species Management Plan. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">



Ministerial Condition	Impact	Management Strategy	Performance Indicator	Timeframe and Reporting
Species Management Plan required by condition 9-2 and subsequent revisions required by condition 9-3.				
9-5 The proponent shall make the Significant Species Management Plan required by condition 9-2 and subsequent revisions required by condition 9-3 publicly available.	n/a	<ul style="list-style-type: none"> • Ensure current Significant Fauna Species Management Plan is uploaded onto the Mount Gibson website. 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> •

10.0 DETAILS OF MONITORING PROGRAMMES

10.1 PRE-CLEARANCE FAUNA SURVEYS

Since 2006, Mount Gibson have been undertaking pre-land clearance surveys for six terrestrial vertebrate fauna species and a number of land snail taxa all of which are of conservation significance and identified as species of interest in Ministerial Statement 715.

The substantive effort invested has failed to reveal the presence of the following species:

- *Ramphotyphlops yampiensis* (Blind Snake)
- *Erythrotriorchis radiates* (Red Goshawk)
- *Macroderma gigas* (Ghost Bat)

Ministerial Condition 9-2 stipulates that the Significant Species Management Plan should be prepared to conserve the fauna of conservation significance located during the staged pre-land clearing surveys. As repeated surveys have failed to locate many of the fauna listed in Ministerial Statement 715, all future pre-land clearing surveys will target only the following species:

- *Dasyurus hallucatus* (Northern Quoll - as per the Northern Quoll Management Plan)
- *Rhinonictoris aurantius* (Orange Leaf-nosed Bat – Including roosting sites)
- *Hipposideros stenotis* (Northern Leaf-nosed Bat – Including roosting sites)
- Short range endemic invertebrate fauna (land snails)

Mount Gibson will continue to undertake pre-land clearing surveys only in areas that have not been subjected to previous historical surveys.

Surveys for short range endemic invertebrate fauna (land snails) and the orange and northern leaf-nosed bat will be undertaken with enough time prior to when land clearing is scheduled to ensure that the survey is undertaken in the appropriate season for those species and any management strategies which are included in the survey report can be implemented. Management strategies will be specifically designed for the species identified by the surveys. The DEC will be consulted on the development of these strategies and their implementation.

A summary report of the results of the staged pre-land clearing surveys shall be provided to the EPA and DEC within two weeks of becoming available.

10.2 SNAIL MONITORING PROGRAMME

The biennial snail monitoring programme initiated on Koolan Island in 2005 to monitor the abundance, diversity and distribution of Camaenid land snails and the distribution and abundance of the introduced species *Prosopeas achatinaceum* will continue. The results of the snail monitoring will be reported to DEC.

Survey methodology will be modified in accordance with EPA Guidance Statement 20 on Short Range Endemic species. Western Australian Museum experts will be



consulted prior to undertaking the first sampling event to ensure that the Museum is satisfied with the methodology.

11.0 CONTINGENCIES

In the event that pre-clearance fauna surveys demonstrate the presence of any new conservation-significant fauna species within the project area, DEC will be consulted and contingency measures determined and implemented, where required.

12.0 STAKEHOLDER CONSULTATION

Mount Gibson identified and engaged key stakeholders throughout the impact assessment and referral process. Stakeholders involved comprise of regulatory agencies, conservation groups and local interest groups (Table 8). The issues raised through consultations are addressed in the Environmental Referral Document (ERD) submitted to the EPA (Ecologia 2005b).

Table 8: Key stakeholder groups in the Koolan Island Iron Ore Mine and Port Facility Project.

Regulatory Stakeholders	Non-regulatory Stakeholders
SEWPAC	Conservation Council of Western Australia
DEC (Perth)	Kimberley Land Council
DEC (North West Region)	Environs Kimberley
DEC (EPA Service Unit)	Greens (MLC)
DEC (Land and Water Quality Branch)	Marine and Coastal Community Network
DIA (Perth)	Broome Botanical Society
DIA (North West Region)	Kimberley Environ Horticulture
Department of Fisheries	Wildflower Society
Shire of Derby and West Kimberley	
Western Australian Museum	

13.0 AUDITING

The proponent shall prepare an audit program within which all EMPs are included as per Condition 5-1 of the Ministerial Statement 715 and submit compliance reports to the Department of Environment which address:

1. The status of implementation of the proposal as defined in schedule 1 of this statement.
2. Evidence of compliance with the conditions and commitments.
3. The performance of the environmental management plans and programmes.

This management plan will be audited in accordance with the approved audit programme.

14.0 REVIEW AND REVISION

This Significant Fauna Species Management Plan must be reviewed every four years, from February 2006, as required by Ministerial Statement 715. The revision must be undertaken by a suitably qualified environmental professional. The revision will encompass the following aspects:

- Assessment of the management plan’s relevance to the current operations.
- Effectiveness in meeting the environmental objective (Ministerial Statement 715).
- Incorporation of new information on conservation significant fauna.
- Review of conservation listings of Koolan Island fauna species.

A review record including summary of changes must be incorporated into the management plan and updated with each review, as shown in Table 9.

Table 9: Revision Status Record for Significant Fauna Species Management Plan

Rev.	Year	Reviewer	Comments and Changes
1	2006	Ecologia	Original Management Plan.
2	2010	MBS	<p>Section 6:5: Update number of flora and families.</p> <p>Section Error! Reference source not found.: More detail provided on Koolan Island vegetation.</p> <p>Section 6.7: Figure 4 and Figure 8: More detail included on conservation significant species including distribution and abundance data from pre-clearance fauna surveys 2006 to 2009.</p> <p>Section 6.7: Review of knowledge and conservation status of conservation significant fauna species: Yampi Blind Snake surveyed in 1966 not 1963, Priority listing changed to P2 from P4. Northern Leaf-nosed Bat Priority listing changed to P2 from P4. SRE snails updated to only include snails of conservation significance.</p> <p>Section Error! Reference source not found.: Vehicle Collision, new addition.</p> <p>Section Error! Reference source not found.: Knowledge and Awareness, new addition.</p> <p>Section Error! Reference source not found.: Management Strategies: Inclusion of ground disturbance permits. Inclusion of topsoil stripping and storage requirements. Inclusion of rehabilitation commitments and reference to the Mine Closure Plan. Inclusion of weed and introduced fauna monitoring. Reference to potential for controlled burns under approved Fire Management Plan. Inclusion of caution signs for significant fauna.</p> <p>Section Error! Reference source not found.: Section aligned with Ministerial Statement, removal of requirement for results to be valid for two years.</p> <p>Section 10.2: Snail monitoring programme updated.</p>

Rev.	Year	Reviewer	Comments and Changes
			<p>Section Error! Reference source not found.: Auditing requirements updated to reflect Ministerial Statement 715 commitments, as per approved audit programme.</p> <p>Section Error! Reference source not found.: This plan to be reviewed every four years as per Ministerial Statement 715.</p> <p>Section Error! Reference source not found.: Updated to include the plan being made publicly available on the MGI website.</p>
3	2013	APM	<p>Section 4.0: Heritage status update</p> <p>Section 6.6.1.2: Flora family update - Mimosaceae & Papilionaceae are now classed as Fabaceae.</p> <p>Section 6.6.1.3: Flora of Conservation Significance: Priority status review</p> <p>Section 6.6.1: Review and update of conservation status.</p> <p>Section 6.7.1.4.1: Yampi Blind Snake Review: Surveyed in 1966 not 1963. Priority listing changed to P2 from P4.</p> <p>Section 6.7.1.4.2: Ghost Bat review: Threatening processes and previous records update.</p> <p>Section 6.7.1.4.3: Orange Leaf-nosed bat review: Description, threatening processes and previous records update.</p> <p>Section 6.7.1.4.4: Northern Leaf-nosed bat review: Description, threatening processes and previous records update. Priority listing changed to P4 from P2.</p> <p>Section 6.7.1.4.5: Red Goshawk review: Threatening processes update.</p> <p>Section 6.7.1.4.6: Short Range Endemic Snails: Number check and species review.</p> <p>Figure 4: Conservation Significant Bat Recording Locations Update</p> <p>Section 7.1: Definition of 'Old Settlement' (Former BHP townsite).</p> <p>Section 7.3: Review of introduced species - None have been captured during baseline or pre-clearance surveys to date. Singapore added to section.</p> <p>Section 7.5: Review of water section</p> <p>Section 7.6: Review/update of dust section</p> <p>Section 10.1: Review and update of pre-land clearance fauna surveys. All future pre-clearance surveys to target: Northern Quoll (as per Northern Quoll Management Plan), Orange Leaf-nosed Bat, Northern Leaf-nosed Bat and Short Range Endemic Snails.</p>

15.0 REPORTING

The Annual Environmental Report (AER) will provide a detailed summary on the current status of conservation-significant fauna species on Koolan Island. The AER will be submitted to DEC annually.

All revisions of the Significant Fauna Species Management Plan will be made publicly available on the Mount Gibson website.

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1.0 APPENDIX 1

Conservation Category	Definition
Critically Endangered	The species is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Extinct	A species is presumed extinct if it has not been located in the last 5 years, or it has not been located in the last 100 years despite thorough searching.
Extinct in the wild	The species is only known to survive in cultivation, in captivity or as a naturalised population well outside its past range or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a timeframe appropriate to its life cycle and form.
Conservation Dependent	The species is the focus of a specific conservation programme, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

WA Wildlife Conservation Act 1950 (Specially Protected Fauna) Notice

Classification of rare and endangered fauna under the WA *Wildlife Conservation (Specially Protected Fauna) Notice 2003*, recognises four distinct schedules:

Code	Definition
Schedule 1	“fauna which are Rare or likely to become extinct, are declared to be fauna that is in need of special protection”
Schedule 2	“fauna which are presumed to be extinct, are declared to be fauna that is in need of special protection”
Schedule 3	“birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection”
Schedule 4	“declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in paragraphs (a), (b) and (c).”



DEC Priority Fauna

Species on the DEC Priority Fauna List include those removed from the Scheduled Fauna List and other species known from only a few populations or in need of monitoring. Five Priority Codes are recognised.

Explanation of DEC Priority Fauna Categories.

Priority Category	Definition
Priority One Taxa with few, poorly known populations on threatened lands.	Taxa which are known from few specimens or sight records from one or a few localities, on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two Taxa with few, poorly known populations on conservation lands.	Taxa which are known from few specimens or sight records from one or a few localities, on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna
Priority Three Taxa with several, poorly known populations, some on conservation lands.	Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four Taxa in need of monitoring	Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five Taxa in need of monitoring	Taxa which are not considered threatened but are subject to a specific conservation programme, the cessation of which would result in the species becoming threatened within five years.