ROY HILL INFRASTRUCTURE PTY LTD

Roy Hill Infrastructure Railway

Fauna Management Plan

RH1-001-30-RL-PLN-0120

9 July 2010

SYNOPSIS

This document provides information on the potential impacts to fauna during the construction and operation of the Roy Hill Infrastructure Railway and the effective management strategies in place to mitigate these. This is currently a draft management plan for use during the investigation, planning and design phases of the project. More detailed information will be incorporated within this management plan as the project evolves and the findings of surveys and studies become available.

Disclaimer

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This Fauna Management Plan (FMP) provides the approach for identifying potential impacts to significant fauna and their effective management on the Roy Hill Infrastructure Railway. Roy Hill Infrastructure Pty Ltd (RHI) will ensure this FMP will be implemented as part of the Environmental Management System (EMS) for the Project to mitigate and minimise impacts during the construction and operation of the railway.

This EMP is based on framework EMPs described in the Environmental Referral document and an assessment of Project environmental aspects and impacts. This is currently a draft management plan to use during the investigation, planning and design phases of the project. More detailed information will be incorporated within this management plan as the project evolves and the findings of surveys and studies become available.

1.2 OBJECTIVES

The objectives of this FMP are to:

- Identify potential impacts to fauna;
- Avoid potential impacts within the Project design;
- Minimise the potential impacts during the construction and operation of the Project;
- Outline the general fauna management requirements; and
- Outline specific requirements for the management of selected conservation significant fauna species.

1.3 KEY PERFORMANCE INDICATORS

Key performance indicators of fauna management for the project are:

- No impact to fauna outside the approved project footprint; and
- Minimal impact to fauna within the approved project footprint.

1.4 RELEVANT LEGISLATION

1.4.1 Commonwealth Legislation

The relevant Commonwealth legislation relating to fauna management is the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999.* The Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined in the Act as matters of national environmental significance.

1.4.2 International Agreements

The relevant international agreements relating to fauna management include;

- The Japan-Australia Migratory Bird Agreement (1974) (JAMBA);

- The China-Australia Migratory Bird Agreement (1986) (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement (2007) (ROKAMBA); and
- Convention on the Conservation of Migratory Species of Wild Animals (The Bonn Convention) (1979).

1.4.3 State Legislation

The relevant Western Australian legislation relating to fauna management include:

- *Aboriginal Heritage Act 1972;*
- *Agriculture and Related Resources Protection Act 1976;*
  - *Bush Fires Act 1954;*
  - *Conservation and Land Management Act 1984;*
  - *Environmental Protection Act 1986;*
  - *Environmental Protection Regulations 1987;*
  - *Environmental Protection (Clearing of Native Vegetation) Regulations 2004;*
  - *Environmental Protection (Noise) Regulations 2004;*
  - *Soil and Land Conservation Act 1945;*
  - *Soil and Land Conservation Regulations 1992;*
  - *Wildlife Conservation Act 1950.*

1.5 DEFINITIONS AND ABBREVIATIONS

DEC	Department of Environment and Conservation
EMP	Environmental Management Plan
EMS	Environmental Management System
EPBC	*Environmental Protection and Biodiversity Conservation Act 1999*
GD	Ground Disturbance
KPI	Key Performance Indicator
RHI	Roy Hill Infrastructure Pty Ltd
WC	*Wildlife Conservation Act 1950*

2 CONTEXT

2.1.1 Fauna habitats

The 2 km environmental approval corridor proposed for the Roy Hill Infrastructure Railway (RHI Railway) intersects 16 land systems as described by van Vreeswyk et al. (2004). These land systems are described with respect to major vegetation associations, broad landform types and geological characteristics.

The habitat descriptions outlined below are used to describe the potential distribution of any species within the project impact area, based on the ecological information available at the time. The habitat requirements of many species are not well known and therefore potential distribution has been interpreted with caution.

Fauna habitats found along the RHI Railway have been classified as follows (Terrestrial Ecosystems 2010, Biota 2002b; Ecologia 2008)

1) Tussock grassland on the gilgai plains;

2) Open scrubland on the drainage areas of the gilgai plains;

3) Low woodland on the hard clay pans;

4a) *Acacia aneura* low open forest; or

4b) *Acacia ayersiana* and *A. aneura* low open forest on the drainage areas of the foot slope;

5) *Acacia citrinoviridis* low open forest on the creek lines of the flat areas;

6) *Acacia citrinoviridis* and *Corymbia hamersleyana* low woodland on the creek lines/floodplains of the flat areas;

7a) *Eucalyptus victrix* open forest over melaleuca shrubland; or

7b) *Petalostylis labicheoides* and mixed *Acacia* spp. high shrubland; or

7c) *Corymbia* spp. and low open woodland on the creek lines

8a) *Eucalyptus leucophloia* low open woodland, over *Triodia* hummock grassland; or

8b) *Acacia aneura* low woodland; or

8c) High shrubland on the rocky hill slopes

9a) Mixed *Acacia* spp. open heath; or

9b) *Acacia aneura* low open forest on the drainage channels of the rocky hill slopes.

10) Flat plain on the northern fringe of the Fortescue Marsh with:

    a) mostly bare ground;

    b) mulga woodland; or

    c) mulga woodland groves and creek lines in a sparsely vegetated plain;

11) Flat and slightly undulating plain vegetated with scattered trees and shrubs and spinifex often with a stony substrate;

12) Undulating hills vegetated with scattered trees and shrubs and spinifex often with a stony substrate;

13) Ephemeral creek lines in undulating hills that are vegetated with trees, shrubs, grasses and spinifex;

14) Mesas and stony ridges, often with scree slopes that are vegetated with scattered trees and shrubs and spinifex leading to ephemeral creek lines that are more densely treed;

15) Flat plains on a sandy substrate and vegetated with scattered trees and shrubs and spinifex; and

16) Creek lines on a flat plain on a sandy-clay substrate vegetated with trees and shrubs.

2.1.2 Vertebrate fauna of conservation significance

Vertebrate fauna species that have special status in the *EPBC Act,* the *WC Act* or are on the Department of Environment and Conservation (DEC) Priority Species List, are listed in Table 2.

A desktop assessment of the likelihood of these species occurring in the railway corridor was undertaken by fauna specialists, Terrestrial Ecosystems (2010). The likelihood of their occurrence is based on published sightings and/or presence of potential habitat within the corridor. Further to this, Bamford Consulting conducted a fauna risk assessment of potential impacts of the Project (Bamford 2010). The findings of the desk top study and risk assessment are summarised in Table 2.

The Bamford risk assessment identified:

- Potential sources of risk to fauna for the Project;
- Potential consequences for fauna with standard management practises in place and their risk level (inherent risk level), and
- Potential consequences with additional management practises in place and their risk level (residual risk level).

For the risk assessment 'standard management practises' were defined as:

- Fauna surveys undertaken in accordance with State and Commonwealth regulatory agency guidelines;
- Pre-disturbance fauna surveys, including searches for dens and burrows;
- Optimisation of construction and permanent rail footprint to avoid and/or minimise clearing of good condition conservation significant vegetation, flora, and fauna habitat, where practicable;
- Ground disturbance procedures, including demarcation of disturbance footprint and 'no go' areas, such as identified environmentally sensitive areas;
- Surface water, sediment and erosion control, fire, weed, dust, noise, light, feral animal, waste, hydrocarbon and hazardous chemical, and groundwater management;

- Raise employee and contractors awareness through inductions and training.

For the risk assessment, 'additional management practises' were defined as:

- Trapping and relocation of conservation significant fauna; and
- Construction of underpasses (through the placement of culverts).

The risk assessment determined that with effective management practises in place, the residual potential risk to fauna is medium or lower, and therefore acceptable.

2.1.3 Risk Management

Records for twenty four (24) conservation significant vertebrate fauna species resulted from fauna database searches of the 30 km railway reference area corridor.

A three level management hierarchy has been adopted to assign the appropriate level of management strategies to conservation significant vertebrate fauna (Table 1). The three management levels are categorised according to vertebrate fauna database records and an impact risk assessment prepared by Bamford Consulting (June, 2010).

Level 1: Species with records in fauna database searches as occurring within the 200 m railway construction disturbance corridor

Level 2: Species with records in fauna database searches as occurring within the 2 km environment approval corridor OR assessed as being a 'Medium' mitigated impact risk by Bamford Consulting (June, 2010)

Level 3: Species with records within the 30 km reference area corridor but not occurring within the 2 km environment approval corridor AND assessed as being a 'Low' mitigated impact risk by Bamford Consulting (June, 2010).

Table 1: RHI Management Hierarchy for Conservation Significant Vertebrate Fauna

	Level 1	Level 2	Level 3
Summary of Category	Fauna species with database records within the 0.2 km railway construction disturbance corridor	Fauna species with database records within the 2 km environment approval corridor OR assessed as being a 'Medium' mitigated impact risk by Bamford Consulting (June, 2010)	Fauna species with database records within the 30 km reference area corridor but not occurring within the 2 km environment approval corridor AND assessed as being a 'Low' mitigated impact risk by Bamford Consulting (June, 2010)
Summary of Level of Management Required	Implement higher level specific management plans and monitoring, in addition to general environmental management measures.	Implementation of species specific management requirements (Section 4), plus general environmental management measures (Section 3)	Implementation of general environmental management measures (Section 3)
Species currently in Category	*No database records identified for any conservation significant fauna species.*	– Bilby – Bush Stone-curlew * – Mulgara (Crest-tailed and Brush-tailed) – Night Parrot – Northern Quoll – Pilbara Olive Python – Spectacled Hare-wallaby – Star Finch * ** Identified in fauna database searches as being present within the 2 km environmental approval corridor*	– Australian Bustard – Barn Swallow – Cattle Egret – Eastern Great Egret – Fork-tailed Swift – Ghost Bat – Lakeland Downs Mouse – Little North-western Mastiff Bat – Oriental Dotterel / Oriental Plover – Oriental Pratincole – Pebble-mound Mouse – Peregrine Falcon – Pilbara Leaf-nosed Bat – Rainbow Bee-eater – Skink – White-bellied Sea-Eagle

Table 2: Risk assessment study outcomes of conservation significant fauna potentially occurring within the environmental approval corridor (adapted from Terrestrial Ecosystems (2010) and Bamford Consulting (2010))

Species		Conservation status			Risk Assessment Study Conclusions
Common name	**Scientific name**	**DEC List**	***EPBC Act***	***WC Act***	
Australian Bustard	*Ardeotis australis*	P4			The Australian Bustard is very widespread and mobile. Negligible risk of impact from the proposed railway, except for roadkill, to which the species is sensitive, and possibly changed fire regimes.
Barn Swallow	*Hirundo rustica*		Migratory		A mostly aerial, non-breeding migrant in the Pilbara, usually seen only in coastal towns (M. Bamford pers. comm.). Impact risk from the railway considered to be Negligible.
Bilby	*Macrotis lagotis*	Vulnerable	Vulnerable	Schedule 1	The proposed rail corridor contains habitat (sandy soil vegetated with dense spinifex) suitable for the Bilby from north of the Chichester Range to close to Port Hedland, and the species is known to be patchily distributed through this region. Localised habitat loss, with some direct mortality and the species is vulnerable to roadkill. The species is also known to be sensitive to introduced predators and changed fire regimes. The railway in isolation is not considered to have severe impacts, but there may be cumulative consequences due to other projects.
Blind snake	*Ramphotyphlops ganei*				Little information is available on the biology of this species but records are all from south of the railway (Newman, Pannawonica and Millstream, Storr et al. 2002). There are clearly extensive populations outside the railway corridor. Very localised impacts only and therefore considered Negligible consequence. Habitat alteration due to fire and weed invasion considered only Minor consequence as probably localised.
Brush-tailed Mulgara	*Dasycercus blythi*	P4			The proposed railway corridor contains habitat (sandy soil vegetated with dense spinifex) suitable for mulgara from north of the Chichester Range to close to Port Hedland. Localised habitat loss with some direct mortality and the species is vulnerable to roadkill. The species may also be affected by introduced predators and is known to be sensitive to changed fire regimes. With the exception of fire, these impacts should be localised and the species is widespread regionally, including populations outside the Pilbara where habitat is more extensive. Changed fire regimes may be the greatest threat to the mulgara posed by the rail development.
Crest-tailed Mulgara	*Dasycerus hillieri*	Vulnerable	Vulnerable	Schedule 1	
Bush Stone-curlew	*Burhinus grallarius*	P4			The Bush Stone-curlew tends to occur along watercourses with associated dense acacia thickets in the Pilbara (M. Bamford pers. obs.). It is sensitive to roadkill and introduced predators, and possibly changed fire regimes and hydrological change. It appears to occur at low population densities and pairs may be sedentary, and therefore ongoing mortality can be a concern for local populations.
Cattle Egret	*Ardea ibis*		Migratory		A widespread and abundant waterbird across northern Australia, but an infrequent visitor in the Pilbara. Unlikely to be affected by the railway because of its biology and the low impact upon wetlands, and impacts on individual birds would be of low importance as the species is effectively a vagrant in the region. Therefore, all consequences are expected to be Negligible.

Species		Conservation status			Risk Assessment Study Conclusions
Common name	**Scientific name**	**DEC List**	***EPBC Act***	***WC Act***	
Eastern Great Egret	*Ardea modesta*		Migratory		A widespread and abundant waterbird that may visit seasonal and permanent wetlands along the rail corridor. Because of its abundance, mobility and wide range of wetland types utilised, and the minimal impact expected of the rail corridor upon wetlands, all consequences are expected to be Negligible
Fork-Tailed Swift	*Apus pacificus*				This is an almost entirely aerial species in Australia that is more or less independent of terrestrial developments. Therefore, all consequences are expected to be Negligible
Ghost Bat	*Macroderma gigas*	P4			Roosting habitat is critical for this species in the Pilbara. Limited roosting habitat encountered along the railway, although some in the general region of sections, such as around Abydos and possibly in the Chichester Range. Direct impacts are likely to be minimal. Disturbance of roost caves during operation, such as from personnel visiting caves, may be a concern. When the railway is finalised, any caves likely to be disturbed should be investigated by a suitably trained and experienced zoologist to see whether they provide a roost for the species
Grey Falcon	*Falco hypoleucos*				Occurs in low numbers along riverine woodlands in the Pilbara. Consequences of impacts are expected to be Negligible except for the possibility of hydrological change affecting riverine trees, and fire regimes affecting the abundance of prey.
Lakeland Downs Mouse	*Leggadina lakedownensis*	P4			In the Pilbara, the Lakelands Downs Mouse is associated with grasslands on clay soils that may be subject to seasonal waterlogging. It may therefore be sensitive to hydrological change but other impacts, such as habitat loss, are likely to be vey localised. Suitable habitat is present along the railway but is also widespread across the Pilbara.
Long-tailed Dunnart	*Sminthopsis longicaudata*				May occur in rocky environments such as the Chichester Range. Therefore small area of habitat loss and some direct mortality possible, but species is not known to be particularly sensitive to other impacting processes so consequences mostly Negligible.
Night Parrot	*Pezoporus occidentalis*	Critical	Endangered / Migratory	Schedule 1	Impacts upon the Night Parrot are difficult to quantify because the species is poorly-known. It has been recorded in a wide range of habitats but is possibly associated closely with the spinifex/samphire ecotone around seasonal wetlands such as the Fortescue Marshes (Higgins 1999), and such habitat lies outside the railway corridor. Impacts from changed fire regimes, introduced predators and weed invasion may be a concern, but the broad distribution of the species at apparently low densities and, its preference for habitats outside the railway corridor, mean the consequences of these are predicted to be only Minor.
Northern Quoll	*Dasyurus hallucatus*	Endangered	Endangered	Schedule 1	Habitat (gullies, rocky hills, gorges and rocky ranges) for the Northern Quoll occurs in some sections of the railway corridor, particularly in the Chichester Range. While the species is abundant in the Abydos and Panorama area, the railway passes through plains between rocky hills in this area. Localised habitat loss. Species is vulnerable to roadkill. The species may also be affected by introduced predators and possibly changed fire regimes. However, these impacts should be localised and the species is widespread in the Pilbara. Incursions of introduced predators may be the greatest threat to the Northern Quoll posed by the rail development.

Species		Conservation status			Risk Assessment Study Conclusions
Common name	**Scientific name**	**DEC List**	***EPBC Act***	***WC Act***	
Pebble-mound Mouse	*Pseudomys chapmani*	P4			The proposed railway corridor contains habitat (typically stony foothills supporting low spinifex) suitable for the Pebble-mound Mouse in several areas, and localised habitat loss and some direct mortality are inevitable. The species could also be affected by weed invasion and may be sensitive to changed fire regimes. However, it is widespread in the Pilbara and effects would be localised.
Peregrine Falcon	*Falco peregrinus*	Specially Protected		Schedule 4	Occurs in low numbers along riverine woodlands in the Pilbara. Consequences of impacts are expected to be Negligible except for the possibility of hydrological change affecting riverine trees, and fire regimes affecting the abundance of prey.
Pilbara Leaf-nosed Bat	*Rhinonicteris aurantius*		Vulnerable	Schedule 1	Roosting habitat is critical for this species in the Pilbara and there is limited roosting habitat along the railway, although some in the general region of certain sections, such as around Abydos and possibly in the Chichester Range. Direct impacts are likely to be minimal. Disturbance of roost caves during operation, such as from personnel visiting caves, may be a concern, as this species is particularly sensitive to disturbance (Armstrong 2001). When the railway is finalised, any caves likely to be disturbed should be investigated by a suitably trained and experienced zoologist to see whether they provide a roost for the species.
Pilbara Olive Python	*Liasis olivaceus barroni*		Vulnerable	Schedule 1	Habitat (gullies, gorges and rocky ranges, particularly with watercourses) for the Pilbara Olive Python occurs in some sections of the rail corridor, particularly in the Chichester Range and possibly where major river systems (e.g. Yule and Turner Rivers) are crossed. Localised habitat loss is therefore inevitable, with some direct mortality, and the species is vulnerable to roadkill. These impacts should be localised and the species is widespread in the Pilbara.
Rainbow Bee-eater	*Merops ornatus*		Migratory		A widespread and abundant species that could suffer some individual mortality, most likely from roadkill, but may also benefit from the creation of nesting habitat as it burrows in sloping banks. All consequences are expected to be Negligible.
Spectacled Hare-wallaby	*Lagorchestes conspicillatus leichardti*	P3			The Spectacled Hare-Wallaby has declined across much of its range in Western Australia, with few recent sightings in the Pilbara. These include two recent records from the Abydos/Panorama area (Bamford Consulting database). Like the Bilby, the Spectacled Hare-Wallaby is particularly sensitive to introduced predators and changed fire regimes, although it is probably not so restricted in its distribution by soil type. With a small surviving population, mortality of individuals during operation may be significant, but changed fire regimes and incursion of introduced predators are likely to have the greatest consequence.
Star Finch	*Neochmia ruficauda subclarescens*	P4			In the Pilbara, the Star Finch is associated with semi-permanent or permanent creeks and ponds that support a dense vegetation of reeds. There should be little if any direct impact upon this environment, but it could be sensitive to hydrological change, while changed fire regimes can affect such riparian vegetation. The Star Finch is also at risk from roadkill as the birds will sometimes fly low, in flocks, along roads.

Species		Conservation status			Risk Assessment Study Conclusions
Common name	**Scientific name**	**DEC List**	***EPBC Act***	***WC Act***	
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		Migratory		The White-bellied Sea-Eagle uses a variety of coastal habitats but will forage along major rivers, with records on the Fortescue Marshes (Bamford consulting database). The low impact of the railway development on broad, shallow wetlands and major rivers mean that all consequences are predicted to be Negligible.
Woma Python	*Aspidites ramsayi*	Specially Protected		Schedule 4	The Woma may occur on sandy soils along the rail corridor, particularly around Port Hedland. Localised habitat loss is inevitable, with some direct mortality, and the species is vulnerable to roadkill. These impacts should be localised and the species is widespread, especially to the north and east

3 GENERAL FAUNA MANAGEMENT

This section outlines general management of fauna for the railway construction and operation.

3.1 MANAGEMENT WITHIN DESIGN

Effective management within the design and planning phase may include:

- Avoidance of potential impacts on fauna where practicable;
- Incorporation of findings from surveys within the design;
- Incorporation of drainage features, such as environmental culverts, into the engineering design to minimise potential changes to hydrology;
- Minimising of clearing and disturbance;
- Incorporation of fauna underpasses, where practicable, including the use of environmental culverts with a "fauna friendly" base;
- Scheduling ground works to avoid times when creeks are flowing, where practicable; and
- Undertaking an Environmental Design Review prior to construction to ensure environmental requirements have been incorporated into the final design.

3.2 SURVEYS, GROUND DISTURBANCE AND BUFFER ZONES

During construction, all areas to be cleared will be searched for fauna prior to ground disturbance.

Where necessary, pre-clearing fauna searches will be conducted by site environmental staff. As a minimum requirement, the searches will include:

- A search of the area to identify the location of active and inactive dens and burrows of the Northern Quoll, Pebble-mound Mouse, Bilby and Mulgaras. An 'active site' is a den or burrow with tracks, scats or where disturbed soil is present at the entrance.
- The GPS location of identified active and inactive dens, burrows and nests will be recorded.
- Dens and burrows determined to be active will be identified as a fauna site to avoid where possible. If an active fauna site cannot be avoided, permits will be obtained to clear the site of fauna.

A ground disturbance procedure will be developed that includes the following minimum requirements:

- A signed Ground Disturbance (GD) Permit must be in place prior to undertaking any ground disturbing work;
- Areas to be cleared will be surveyed and flagged to ensure disturbance remains within approved boundaries; and

- Fauna sites to be avoided will be suitably flagged off with information tags attached.

3.3 EARTHWORKS

During construction, contractors will adhere to the following minimum earthwork requirements:

- Trenches and pits will be backfilled as soon as practical;
- Open trenches and pits will be fitted with egress ramps to prevent trapping of native fauna overnight; and
- Open trenches and pits will be inspected for trapped fauna each morning prior to the commencement of work. Trapped fauna removed by qualified fauna handlers or site environmental staff.

3.4 FAUNA PROCEDURES, SIGHTINGS AND REPORTING

Employees and contractors shall meet the following minimum requirements:

- Employees and contractors shall not interfere with fauna;
- Native animals will be given the opportunity to move on of their own accord if there is no threat to personnel safety and no major interruption to work. If there is likely to be an interruption to work, the animals will be moved by site environmental staff.
- Employees and contractors shall not feed native or feral animals;
- Domestic animals, off-road recreational vehicles or firearms are prohibited at all times;
- All fauna sightings shall be reported to the site environmental staff ;
- Only authorised and trained snake handlers are permitted to touch, handle or trap snakes;
- Employees and contractors shall not attempt to kill or handle snakes.

If a snake is observed in a work area and it does not leave of its own accord, employees and contractors should:

- Warn people in the area of the snake's presence and advise not to approach;
- Notify the site environmental staff, who will then arrange for an authorised snake handler to attend;
- Monitor the snake's location and inform the snake handler; and
- Keep a safe distance away from the snake at all times.

3.5 FERAL ANIMALS

To manage feral animals, the following minimum requirements shall be met:

- Implement good housekeeping and rubbish disposal practices. This includes ensuring that all bins used for domestic waste are closed to avoid attracting feral and native animals;
- Domestic animals and pets are not permitted on site;

- Feeding or sheltering native or feral animals is prohibited;
- Sightings of feral animals (e.g. wild dogs and cats) must be reported to the site environmental staff.

3.6 TRAFFIC MANAGEMENT

To mitigate potential traffic impact, the following minimum requirements shall be met:

- Traffic speeds shall be signposted and adhered to;
- Traffic will be restricted to existing access tracks and designated roads;
- Off road driving without specific cause is prohibited;
- Any vehicle collision with fauna within the active railway construction and operating areas shall be reported through the incident reporting system;
- Any injured or dead native fauna is to be reported to the site environmental staff for advice on the appropriate actions to be taken.

3.7 SICK AND INJURED WILDLIFE

In the event that a sick or injured animal is found, employees and contractors shall contact the site environmental staff and monitor the animal until assistance arrives.

Sick or injured wildlife will be cared for by site environmental staff until it can be taken to a wildlife rehabilitation centre. Assistance may be sought from the DEC Wildlife Helpline (08) 9474 9055. This call centre is available 24 hours per day, seven days per week to provide immediate assistance.

Critically injured wildlife will be euthanised in accordance with the DEC Minimum Standards for Wildlife Rehabilitation in Western Australia (Department of Environment and Conservation 2008).

3.8 FAUNA REGISTER

A fauna register will be maintained listing the sightings, injuries and deaths of fauna reported during construction and operations.

3.9 TRAINING AND AWARENESS

Employee and contractor inductions shall include the following information points:

- Photographs and description of the conservation significant species that potentially occur in the railway corridor, including appearance, habitat and conservation status;
- Employees and contractors are not permitted to interact with fauna;
- Only authorised and trained snake handlers are permitted to handle snakes;

- Signage will identify sensitive environmental areas as 'avoidance sites'. Access to these areas is not permitted without prior authorisation from site environmental staff;
- No clearing will be undertaken without a ground disturbance permit;
- Deliberately interfering with any native fauna is an offence under the *Wildlife Conservation Act 1950*;
- Any fauna injuries or fatalities from any cause shall be reported through the incident reporting system;
- All vehicles and mobile machinery movements are restricted to designated roads;
- Off-road (or off corridor driving) is prohibited, unless specific approval is obtained from Project management;
- Domestic animals or pets are prohibited from site;
- Sightings of feral animals shall be reported to site environmental staff.
- Toolbox meetings will also include specific fauna management information and procedures, including on any conservation significant species that could be encountered.

4 SPECIES SPECIFIC MANAGEMENT REQUIREMENTS FOR RHI LEVEL 2 SPECIES

4.1 BILBY (*MACROTIS LOGOTIS*)

4.1.1 Conservation status

The Bilby is listed as:

- 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- 'Specially Protected Fauna' (Schedule 1 – Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950*; and
- 'Vulnerable' on the Department of Environment and Conservation's (DEC) Declared Threatened Fauna list.

4.1.2 Identification and habitat

The Bilby is a marsupial that grows to 55 cm long with a tail up to 29 cm. It has large ears, a long pointed snout and a black tail with a white tip. It has slender hind limbs and its forelimbs have three stoutly clawed toes (and two unclawed toes) that enables the Bilby to burrow efficiently. It has long, soft, blue-grey fur over most of the body and white to cream fur on the belly as shown in Figure 1.

Figure 1: Bilby

Bilbies require sandy or loamy soil in which to burrow and hence occur in mulga scrub, hummock grasslands, along sand plains or salt lake systems (Pavey 2006). These animals dig large, multi-entranced burrows up to two metres deep. An individual animal may have over a dozen regularly used burrows within its home-range.

Bilbies forage at night excavating prey from the soil and holes up to 25 cm in depth. Prey often includes termites, ants, beetles, insect larvae and spiders. Males, females and juveniles may occupy overlapping home ranges, and in optimal habitat can have a density of 12–16 individuals/km^2.

The proposed rail corridor contains habitat (sandy soil vegetated with dense spinifex) that is suitable for the Bilby from north of the Chichester Range to close to Port Hedland, and the species is known to be patchily distributed through this region. Localised habitat loss is therefore inevitable, with some direct mortality and the species is vulnerable to roadkill. The species is also known to be sensitive to introduced predators and changed fire regimes.

While some of these impacts should be localised, the Bilby population is small and introduced predators and changed fire regimes have had severe impacts on the species in other parts of its range. It is not thought that the rail route in isolation would have severe impacts through introduced predators and changed fire regimes.

4.1.3 Management

- All confirmed sightings of the species will be reported to the DEC. Where practicable, reports will include a GPS location, time of sighting and activity of animal.
- Conduct an initial survey in the proposed corridor to establish baseline data. Follow this up with routine monitoring to understand the current distribution and population size
- Implement a Fire Management Plan to reduce the potential for bush fires and spot fires. This includes addressing fire started from locomotive brake sparks.
- Implement a Feral Animal Management Plan to reduce the feral animal (wild dog and wild cat) population. This will include an annual monitoring and trapping program to control feral animals.

4.2 BUSH STONE-CURLEW (*BURHINUS GRALLARIUS*)

4.2.1 Conservation status

The Bush Stone-curlew is listed as:

- Priority 4 species on the Department of Environment and Conservation's (DEC) Declared Threatened Fauna list.

4.2.2 Identification and habitat

The Bush-Stone-curlew is described as having grey-brown upperparts with black streaking, with buff white underparts. It has a medium sized black bill, with characteristic large yellow eyes.

The Bush Stone-curlew requires a habitat that is sparsely grassed, lightly timbered, open forest or woodland. Its diet consists of small vertebrates and invertebrates, as well as seeds and shoots.

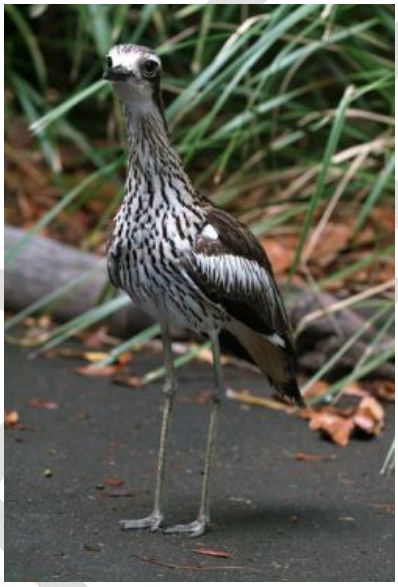

Figure 2: Bush Stone-curlew

The Bush Stone-curlew tends to occur along watercourses with associated dense acacia thickets in the Pilbara. It is sensitive to road kill and introduced predators, and possibly changed fire regimes and hydrological change. It appears to occur at low population densities and pairs may be sedentary, and therefore ongoing mortality can be a concern for local populations.

4.2.3 Management

- All sightings of the species will be reported to the DEC. Where practicable, reports will include a GPS location, time of sighting, activity of bird, i.e. roosting or feeding, and a description of the habitat/roosting site.
- Conduct an initial survey in the proposed corridor to establish baseline data. Follow this up with routine monitoring to understand the current distribution and population size.

- Implement a Surface Water Management Plan to manage potential impacts from surface water and sheet flows.
- Implement a Fire Management Plan to reduce the potential for bush fires and spot fires. This includes addressing fire started from locomotive brake sparks.
- Implement a Feral Animal Management Plan to reduce the feral animal (wild dog and wild cat) population. This will include an annual monitoring and trapping program to control feral animals

4.3 MULGARA (*DASYCERCUS CRISTICAUDA*, (*D. BLYTHI, D. HILLIERI*)

4.3.1 Conservation Status

The Crest-tailed Mulgara is listed as:

- 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- 'Specially Protected Fauna' (Schedule 1 – Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950*; and
- 'Vulnerable' on the Department of Environment and Conservation's (DEC) Declared Threatened Fauna list.

The Brush-tailed Mulgara is listed as:

- P4 on the Department of Environment and Conservation's (DEC) Priority Species List.

4.3.2 Identification and Habitat

Brush-tailed Mulgara are a medium-sized dasyurid with a characteristic short thick tail that is covered in black hairs for most of its length (Woolley 2008). The species is a light sandy brown colour with greyish-white on its belly Figure 3.

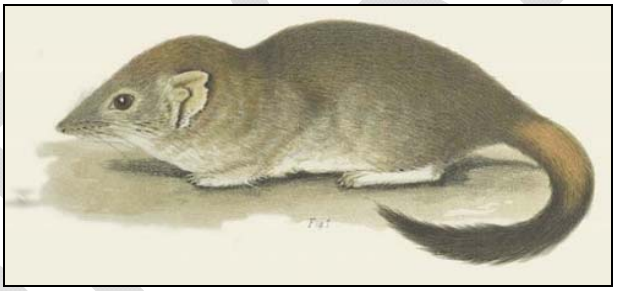

Figure 3: Brush-tailed Mulgara

Mulgaras occur sporadically on spinifex grasslands throughout much of the arid zone (Woolley 2008). Their habitat is characterised as sandy areas with moderately dense spinifex with 'runways' between clumps. The species hunts at night for insects, other arthropods and small vertebrates. During the day the species shelter in burrows up to 50 cm deep.

The proposed rail corridor contains habitat (sandy soil vegetated with dense spinifex) suitable for mulgara from north of the Chichester Range to close to Port Hedland. Localised habitat loss is therefore inevitable, with some direct mortality and the species is vulnerable to roadkill. The species may also be affected by introduced predators that may move along the railway route using tracks for access, and is known to be sensitive to changed fire regimes.

With the exception of fire, these impacts should be localised and the species is widespread regionally, including populations outside the Pilbara where habitat is more extensive. Changed fire regimes may be the greatest threat to the Mulgara posed by the rail development.

4.3.3 Management

- All sightings of the species will be reported to the DEC. Where practicable, reports will include a GPS location, time of sighting and activity of animal.
- Conduct an initial survey in the proposed corridor to establish baseline data. Follow this up with routine monitoring to understand the current distribution and population size
- Implement a Fire Management Plan to reduce the potential for bush fires and spot fires. This includes addressing fire started from locomotive brake sparks.
- Implement a Feral Animal Management Plan to reduce the feral animal (wild dog and wild cat) population. This will include an annual monitoring and trapping program to control feral animals

4.4 NIGHT PARROT (*PEZOPORUS OCCIDENTALIS*)

4.4.1 Conservation status

The Night Parrot is listed as:

- 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- 'Specially Protected Fauna' (Schedule 1 – Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950*; and

4.4.2 Identification and Habitat

The Night Parrot is a Migratory Bird measuring 22 to 25 cm in length, with a wingspan of 44 to 46 cm. The adults are predominantly green in colour, but with black and yellow bars, spots and streaks over much of the body, bright yellow colouring on the belly and vent, and black colouring on the upper surface of the periphery of the wings and tail. In flight, a prominent bar, off-white to pale-yellow in colour, becomes visible on the underside of each wing (Higgins 1999).

Figure 4: Night Parrot

The Night Parrot inhabits arid and semi arid areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of *Triodia* grasslands in stony or sandy environments and samphire and chenopod shrublands, including genera such as Atriplex and Maireana, on floodplains and claypans, and on the margins of salt lakes, creeks or other sources of water (Department of Environment, Water, Heritage and the Arts, 2010a). The Night Parrot is usually considered to be nocturnal or possibly crepuscular. It allegedly feeds on the seeds of grasses (especially *Triodia*) and herbs.

There have been no definite observations of the Night Parrot in the Pilbara. Scientists have postulated about its habitat and food preference but no live specimens have been found in the Pilbara to confirm the validity of those postulations.

Although there is a very low likelihood the Night Parrot will occur within the railway corridor, the EPBC search of the wider area identified the potential presence of the species so RHI will apply the precautionary principle and consider management strategies to mitigate any potential impact on the species.

4.4.3 Management

The EPA convened a workshop on 10 November 2009 with RHIO and relevant technical experts to refine the understanding of the key environmental risks associated with a nearby railway route and management required. The key finding of the workshop was that the proposed railway presented medium to low (mitigated) environmental risk that can be managed.

The Night Parrot's range is thought to be approximately 8 km and they were allegedly observed 20 km away from the railway. Given the lack of sightings and knowledge about this bird's preferred habitat, food and mating behaviour, the likelihood of the construction or operation activities disturbing or causing fatalities is very low. This supports the DEC and EPA findings at the November 2009 workshop.

RHIO will commit to the implementation of the following management strategies:

- All sightings of the species will be reported to the DEC. Where practicable, reports will include a GPS location, time of sighting, activity of bird, i.e. roosting or feeding, and a description of the habitat/roosting site.
- Conduct an initial survey in the proposed corridor to establish baseline data. Follow this up with routine monitoring to understand the current distribution and population size
- Manage illuminated areas at night and noise to avoid disturbance to fauna.
- Implement a Fire Management Plan to reduce the potential for bush fires and spot fires. This includes addressing fire started from locomotive brake sparks.
- Implement a Feral Animal Management Plan to reduce the feral animal (wild dog and wild cat) population. This will include an annual monitoring and trapping program to control feral animals.

4.5 NORTHERN QUOLL (*DASYURUS HALLUCATUS*)

This section outlines the specific requirements to manage the impact on Northern Quolls during the construction and operation of the RHI Railway.

4.5.1 Conservation Status

The Northern Quoll is listed as:

- 'Endangered' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- 'Specially Protected Fauna' (Schedule 1 – Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950*; and
- 'Endangered' on the Department of Environment and Conservation's (DEC) Declared Threatened Fauna list.

Fires and the lethal ingestion of Cane Toad toxin can have a major impact on the Northern Quoll populations, however Cane Toad toxin is currently a low risk to the Pilbara population.

4.5.2 Identification and Habitat

The Northern Quoll is a medium sized, solitary, carnivorous marsupial that varies from grey-brown to brown, with large white spots on its head, back and occasionally the base of the tail Figure 5.

Figure 5: Northern Quoll

Northern Quolls are nocturnal carnivores, although they can also be active during dusk and dawn. They shelter in tree hollows, timber piles or rock crevices during the day (Biota Environmental Sciences 2009).

Habitat (gullies, rocky hills, gorges and rocky ranges) for the Northern Quoll occurs in some sections of the rail corridor, particularly in the Chichester Range.

While the species is abundant in the Abydos and Panorama area, the rail route passes through plains between rocky hills in this area. Localised habitat loss is therefore inevitable, with some direct mortality and the species is vulnerable to roadkill. The species may also be affected by introduced predators and possibly changed fire regimes.

These impacts, however, should be localised as the species is widespread in the Pilbara. Incursions of introduced predators may be the greatest threat to the Northern Quoll posed by the rail development, with the route and associated service road potentially being used by predators to access areas where they might not otherwise occur.

4.5.3 Management

- All sightings of the species will be reported to the DEC. Where practicable, reports will include a GPS location, time of sighting, activity of bird, i.e. roosting or feeding, and a description of the habitat/roosting site.
- Conduct an initial survey in the proposed corridor to establish baseline data. Follow this up with routine monitoring to understand the current distribution and population size
- Implement a Feral Animal Management Plan to reduce the feral animal (wild dog and wild cat) population. This will include an annual monitoring and trapping program to control feral animals.

4.6 PILBARA OLIVE PYTHON (*LIASIS OLIVACEUS BARONI*)

4.6.1 Conservation Status

The Pilbara Olive Python is listed as:

- 'Vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- 'Specially Protected Fauna' (Schedule 1 – Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950*; and

4.6.2 Identification and Habitat

The Pilbara Olive Python (Figure 6) is described as being a dull olive-brown to pale fawn python, having a white/cream belly, pale lips with pale grey or brown dots, pitted anterial scales bordering the lips and smooth scales in 55–80 rows at mid-body (Department of the Environment, Water, Heritage and the Arts, 2010b). The Pilbara Olive Python has an average size of 2.5 m, but can grow to 4 m (Cogger 2000). Females are generally slightly longer than males (Shine & Slip 1990).

Figure 6: Pilbara Olive Python

Habitat (gullies, gorges and rocky ranges, particularly with watercourses) for the Pilbara Olive Python occurs in some sections of the rail corridor, particularly in the Chichester Range and possibly where major river systems are crossed (e.g. Yule and Turner Rivers). Localised habitat loss is therefore inevitable, with some direct mortality, and the species is vulnerable to roadkill. These impacts should be localised and the species is widespread in the Pilbara, but it may occur at low population densities and therefore the death of adults from roadkill may be the greatest threat to the Pilbara Olive Python posed by the rail development.

4.6.3 Management

Pilbara Olive Pythons are large, easy to spot and easy to avoid. They will also move away from an area if disturbed. Relocation of the Pilbara Olive Python will only be undertaken as a last resort. If possible, the python will be allowed to pass through the work zone safely.

Pilbara Olive Pythons will be managed in a similar manner to other snakes, as described in Section 3.

4.7 SPECTACLED HARE-WALLABY (*LAGORCHESTES CONSPICILLATUS LEICHARDTI*)

4.7.1 Conservation status

The Spectacled Hare-Wallaby is listed as:

- Priority 3 species on the Department of Environment and Conservation's (DEC) Declared Threatened Fauna list.

4.7.2 Identification and habitat

The Spectacled Hare-Wallaby is approximately 43 cm in length and is described as having brown hairs with white tips. It is identifiable by the distinctive bright orange ring around the eyes and a white hip stripe. The wallaby's feet are pale grey brown in colour whilst the tail is sparse, short with grey brown hair that is darker near the tip (Figure 7).

The Spectacled Hare-Wallaby inhabits shrub and tropical grasslands and feeds by browsing mainly on colonising shrubs and also eats the tips of spinifex leaves.

Figure 7: Spectacled Hare Wallaby

They live in open woodlands, shrub lands and hummock grasslands, sheltering under vegetation or in burrows during the day and searching for herbs, grass and fruits at night (Australian Wildlife 2010)

The Spectacled Hare-Wallaby has declined across much of its range in Western Australia, with few recent sightings in the Pilbara. These include two recent records from the Abydos/Panorama area (Bamford Consulting database). Like the Bilby, the Spectacled Hare-Wallaby is particularly sensitive to introduced predators and changed fire regimes, although it is probably not so restricted in its distribution by soil type. With a small surviving population, mortality of individuals during operation may be significant, but changed fire regimes and incursion of introduced predators are likely to have the greatest consequence

4.7.3 Management

- All sightings of the species will be reported to the DEC. Where practicable, reports will include a GPS location, time of sighting and activity of animal.
- Conduct an initial survey in the proposed corridor to establish baseline data. Follow this up with routine monitoring to understand the current distribution and population size
- Implement a Fire Management Plan to reduce the potential for bush fires and spot fires. This includes addressing fire started from locomotive brake sparks.
- Implement a Feral Animal Management Plan to reduce the feral animal (wild dog and wild cat) population. This will include an annual monitoring and trapping program to control feral animals.
- Implement a Traffic Management Plan to incorporate speed limits, signage and personnel awareness.

4.8 STAR FINCH (*NEOCHMIA RUFICAUDA SUBCLARESCENS*)

4.8.1 Conservation Status

The Star Finch is listed as:

- 'Priority 4' species on the Department of Environment and Conservation's (DEC) Priority Fauna list.

4.8.2 Identification and Habitat

A small (11.5 cm), compact finch with rounded head and slender bill. It is described as being plain, olivey brown in colour with a pale belly and a distinctive red face and bill. White spots are prominent on the face, breast and flanks (Figure 8). Juveniles are mostly plain brown with a rusty tail and dark bill.

The Star Finch inhabits low, dense, grasslands bordering estuarine areas, watercourses, swamps and other freshwater-bodies. The finch is granivorous, typically foraging in vegetation just off the ground. It often feeds on the ground, almost entirely so in the dry season (Birdlife 2010)

Figure 8: Star Finch

In the Pilbara, the star finch is associated with semi-permanent or permanent creeks and ponds that support a dense vegetation of reeds. There should be little if any direct impact upon this environment, but it could be sensitive to hydrological change, while changed fire regimes can affect such riparian vegetation. The Star Finch is also at risk from roadkill as the birds will sometimes fly low, in flocks, along roads.

4.8.3 Management

- Implement a Fire Management Plan to reduce the potential for bush fires and spot fires. This includes addressing fire started from locomotive brake sparks.
- Implement a Surface Water Management Plan to manage potential impacts from surface water and sheet flows.
- Implement a Traffic Management Plan to incorporate speed limits, signage and personnel awareness.

5 ENVIRONMENTAL ASPECTS AND IMPACTS

Mitigation strategies and management actions have been developed to address the environmental aspects and impacts on fauna. The mitigation strategies and actions presented in Table 3 will be updated if new hazards or opportunities for improvement are identified.

Table 3: Environmental Aspects and Impacts relevant to Fauna

Activity	Aspect	Potential Impact	Summary Mitigation Strategy	Mitigation Action	Timing	ASSIGNED TO
Clearing	Removal of vegetation and soil disturbance within the railway corridor.	Disturbance of local fauna populations and reduced connectivity between habitats. Risk of fauna injury or mortality.	Minimise disturbance footprint and conduct rehabilitation progressively. Avoid local populations where practicable. Appropriately protect any significant fauna species prior to clearing. Clearly demarcate the permitted clearing area and any buffers for areas to be avoided. Develop a Ground disturbance procedure with ground disturbance permitting system. Inductions and training raise fauna awareness and educate workforce on fauna management procedures.	The permitted clearing area will be marked on all construction drawings and physically flagged on the ground to ensure only the minimum area required is cleared.	During clearing activities	EPCM contractor
				Incorporate findings of surveys within design to avoid potential impacts to fauna where practicable.	During design	RHI management
				Minimise footprint within design.	During design	RHI management
				Ground disturbance permit to be signed off and approved prior to clearing.	During clearing activities	All contractors
				A licence under *Regulation 17 Licence to Take* issued under the *Wildlife Conservation Act 1950* (WA) shall be in place prior to the translocation of native fauna.	Prior to relocation/ trapping programs	EPCM contractor/ terrestrial fauna consultants
				Inductions and training to include key native and non-native species in the project area, potential locations and movements of fauna species, particularly nocturnal species if night works are to occur.	During construction & operation	EPCM contractor
Earthwork activities	Noise, vibrations generated from earthworks.	Disturbance of local fauna populations and displacement of fauna. Increased risk of fauna injury or mortality.	Inductions and training to raise fauna awareness and educate workforce on fauna management procedures. Restrict vehicles and equipment on site and maintain vehicles and equipment .	Inductions and training to include key native and non-native species in the project area, potential locations and movements of fauna species, particularly nocturnal species if night works are to occur.	During construction & operation	EPCM contractor
				Audits of contractors maintenance records for equipment and vehicles to be conducted.	During construction	EPCM contractor
	Landform modification.	Trapped fauna in open pits and excavations	Backfill trenches and pits as soon as practicable and fit fauna escape measures for all excavations open overnight	Fit open trenches and pits with egress ramps to prevent the trapping of native fauna overnight.	During construction	Contractors
				Inspect open trenches and pits each morning prior to the commencement of work.	During construction	EPCM contractor
	Dust generated from earthworks.	Damage to vegetation and subsequent loss of habitat. Disturbance to fauna.	Restrict vehicles and equipment on site and maintain vehicles and equipment Dust suppression measures.	All vehicles and equipment to be approved by project management prior to mobilising to site.	During construction	EPCM contractor
				Dust suppression methods.	During construction & operation	EPCM contractor

Activity	Aspect	Potential Impact	Summary Mitigation Strategy	Mitigation Action	Timing	ASSIGNED TO
	Light generated from earthworks.	Disturbance, displacement, attraction and/or disorientation of fauna.	Inductions and training to raise fauna awareness and educate workforce on fauna management procedures. Restrict vehicles and equipment on site and maintain vehicles and equipment. Avoid night works as far as practicable. If night works must occur then lighting shall be arranged to minimise illumination of known fauna habitats.	Inductions and training to include key native and non-native species in the project area, potential locations and movements of fauna species, particularly nocturnal species if night works are to occur.	During construction & operation	EPCM contractor
Transport	Vehicle and personnel movement.	Risk of vehicle collision resulting in fauna injury/ mortality. Fauna attraction into work areas.	Inductions and training to raise fauna awareness and educate workforce on fauna management procedures. Restrict vehicles and equipment on site and maintain vehicles and equipment.	Inductions and training to include key native and non-native species in the project area, potential locations and movements of fauna species, particularly nocturnal species if night works are to occur.	During construction & operation	EPCM contractor
				Vehicles to be restricted to designated tracks and project speed limits.	During construction & operation	EPCM contractor
General construction/ operation activities	Risk of fire.	Loss of habitat; displacement of fauna; increased predation and increased risk of fauna injury or mortality.	Implementation of a fire management plan and emergency response plan.	Fire fighting equipment to be available in work area and on heavy vehicles.	During construction & operation	EPCM contractor
				Fire fighting training to be provided to selected personnel.	During construction & operation	EPCM contractor
				Regular housekeeping inspections of work areas to be conducted by environmental advisor.	During construction & operation	EPCM contractor
	Increased human activity.	Increase in pest species leading to impact on native fauna populations and biodiversity.	Inductions and training to raise fauna awareness and educate workforce on fauna management procedures. Implement housekeeping measures to limit introduced species access to resources. Record all fauna sightings in a register to monitor populations of native and pest species. Implement pest control programs where necessary.	Regular housekeeping inspections of work areas to be conducted by environmental advisor	During construction & operation	EPCM contractor
				Inspect vehicles and equipment prior to use on site for weeds, seed and pests	During construction & operation	EPCM contractor
				Inductions and training to include key native and non-native species in the project area, potential locations and movements of fauna species, particularly nocturnal species if night works are to occur.	During construction & operation	EPCM contractor
				Maintain a fauna register and document fauna sightings.	During construction & operation	EPCM contractor
				Implement pest control programs where necessary.	During construction & operation	EPCM contractor
	Increased human activity, presence of water and waste.	Attraction of fauna and increased risk of injury and fatality to native fauna.	Inductions and training to raise fauna awareness and educate workforce on fauna management procedures. Implement housekeeping measures to limit introduced species' access to resources.	Inductions and training to include key native and non-native species in the project area, potential locations and movements of fauna species, particularly nocturnal species if night works are to occur.	During construction & operation	EPCM contractor
				Regular housekeeping inspections of work areas to be conducted by site environmental staff.	During construction & operation	EPCM contractor

Activity	Aspect	Potential Impact	Summary Mitigation Strategy	Mitigation Action	Timing	ASSIGNED TO
	Inadequate education.	Personnel not understanding fauna management leading to increased fauna injury or mortality.	Inductions and training to raise fauna awareness and educate workforce on fauna management procedures.	Selected personnel will be trained in snake handling		
				Conduct 'tool box talks' to increase knowledge of fauna management procedures including the requirement for no interference with fauna and reporting all fauna sightings.	During construction & operation	EPCM contractor
				Fauna awareness posters will be displayed in work areas, crib rooms and offices.	During construction & operation	EPCM contractor
				Training of selected personnel to ensure effective implementation of this EMP	During construction & operation	EPCM contractor
	Physical presence of rail	Changes to surface water hydrology	Develop and implement Surface Water Management Plan.	Develop and implement Surface Water Management Plan	During design	RHI management

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