Ninga Level 1 Vertebrate Fauna Assessment

Prepared for
BHP Billiton Iron Ore

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Contents

List of Figures

List of Tables

Abbreviations

ABBREVIATION	DESCRIPTION
BHPBIO	BHP Billiton Iron Ore
BoM	Bureau of Meteorology
Bonn Convention	Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS)
CALM	Department of Conservation and Land Management (now known as (DPaW)
CAMBA	China - Australia Migratory Bird Agreement
CE	Critically Endangered
DAFWA	Department of Agriculture and Food WA
DD	Data Deficient
DEC	Department of Environment and Conservation WA (now known as (DPaW)
DEH	Commonwealth Department of Environment and Heritage (now known as DSEWPaC)
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts (now known as DSEWPaC)
DoIR	Department of Industry and Resources
DPaW	WA Department of Parks and Wildlife (formerly DEC)
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population & Communities
EIA	Environmental Impact Assessment
ELA	Eco Logical Australia
EN	Endangered
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority WA
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Federal)
ESAs	Environmentally Sensitive Areas
EW	Extinct in the wild
EX	Extinct
GAS	Gascoyne Bioregion
GDA	Geocentric Datum of Australia
GPS	Global Positioning System
ha	hectares
IBRA	Interim Bio-geographical Regionalisation for Australia
IUCN	International Union for Conservation of Nature
JAMBA	Japan – Australia Migratory Bird Agreement
km	Kilometres
LC	Least Concern
NT	Near Threatened
MGA	Map Grid of Australia
mm	Millimetres

ABBREVIATION	DESCRIPTION
ML	Mining Lease
NE	Not evaluated
M	Migratory
MNES	Matter of National Environmental Significance
NSW	New South Wales
NT	Near Threatened
NVCP	Native Vegetation Clearing Permit
OB	Ore Body
PECs	Priority Ecological Communities
PIL	Pilbara Bioregion
ROKAMBA	Republic of Korea – Australia Migratory Bird Agreement
TECs	Threatened Ecological Communities
VU	Vulnerable
WA	Western Australia
WAM	Western Australian Museum
WC Act	*Wildlife Conservation Act 1950* (WA)

Executive Summary

BHP Billiton Iron Ore Pty Ltd (BHPBIO) is planning to undertake exploratory drilling in the Ninga Project exploration area (the Project area), located in the Eastern Pilbara, approximately 20 km north-east of Newman. The Project area is at the eastern end of the Ophthalmia Range within mining lease ML244SA and is approximately 38.9 km^2 (square kilometres) in size. BHPBIO is required to submit a Native Vegetation Clearing Permit for the proposed drilling program in the Project area.

Eco Logical Australia (ELA) was contracted by BHPBIO to undertake a Level 1 vertebrate fauna survey of the Project area to support the NVCP application. This report summarises the findings of the desktop assessment and the field survey conducted by ELA during May 2013.

The desktop assessment included databases searches and review of previous reports. The field survey involved a seven day site visit between the 10th and 16th of May 2013 to assess and map fauna habitats, record opportunistic fauna, and search for target conservation significant species in suitable habitats. The field survey was undertaken by Robert Browne-Cooper (Senior Zoologist) and Dr Enhua Lee (Senior Ecologist).

The desktop review identified seven amphibian, 70 reptile, 153 bird and 38 mammal species that have previously been recorded, or have the potential to occur within the Project area. This list was used as a basis for an assessment of the likelihood of occurrence of all locally relevant conservation significant vertebrate fauna species.

Based on the field survey, five broad habitat types were identified and mapped, including:

1. Rivers and major creeks (172 ha)
2. Low shrubland plains (915 ha)
3. Stony rises and lower stony hill slopes (1311 ha)
4. Rocky hill tops (1060 ha)
5. Steep rocky canyons and cliffs (338 ha)

The field survey recorded a total of 75 vertebrate fauna species including one amphibian, 16 reptiles, 41 birds and 17 mammals. The majority of species recorded were opportunistically observed reptiles and birds. Most species recorded are common and widespread throughout the Pilbara and adjacent biogeographic regions. Target searching and opportunistic observations during the field survey recorded five fauna species of conservation significance and one additional species was recorded during previous surveys (*ecologia* 2004a):

- Pilbara Olive Python (*Lialis olivaceus barroni*) - Vulnerable EPBC Act and Schedule 1 WC Act;
- Grey Falcon (*Falco hypoleucos*) - Schedule 1 under WC Act;
- Rainbow Bee-eater (*Merops ornatus*) - Migratory under EPBC Act and Schedule 3 WC Act;
- Fork-tailed Swift (*Apus pacificus*) - Migratory under EPBC Act and Schedule 3 WC Act (*ecologia* 2004a);
- Western Pebble-mound Mouse (*Pseudomys chapmani*) - Priority 4 under WC Act;
- Brush-tailed Mulgara (*Dasycercus blythi*) - Priority 4 under WC Act[1].

[1] The conservation status for Brush-tailed Mulgara is currently being reviewed by the Department of Sustainability, Environment, Water, Population & Communities (DSEWPaC)

One additional species, the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) was assessed as unconfirmed from an acoustic recording analysis taken during the current survey.

A number of locally occurring conservation significant species were not recorded during this survey but were assessed as likely to occur. These were:

- Great Egret (*Ardea alba*) - Migratory under EPBC Act and Schedule 3 WC Act;
- Cattle Egret (*Ardea ibis*) - Migratory under EPBC Act and Schedule 3 WC Act;
- Australian Bustard (*Ardeotis australis*) - Priority 4 under WC Act.

The Project area is likely to support a number of Pilbara Olive Pythons based on the individual recorded during survey and the extent and variety of rocky canyons and cliffs (habitat type 5) suitable for shelter and foraging for this species. Connectivity and extent of rocky hills and proximity to the Fortescue River indicate that the Project area would be part of an extensive local population.

Habitat type 5 also contains potential roosting cave habitat for both Ghost Bats and Pilbara Leaf-nosed Bats. Based on the desktop assessment, the Pilbara Leaf-nosed Bat has not been recorded locally within the eastern Ophthalmia Range; however, based on albeit inconclusive bat call identification and the extent of potential roosting caves, this species' occurrence cannot be ruled out. The Ghost Bat was not recorded during the current survey, however was recorded in the area during several previous surveys. The Ghost Bat therefore has the potential to occur in the Project area based on local records and the extent of potential roosting caves and foraging habitat.

The Western Pebble-mound Mouse was detected on several hill tops (habitat type 4) and based on the extent of potentially suitable pebble-strewn hills and lower slopes, there is likely to be more mounds including active mounds, within the Project area.

Based on the habitat assessment, a comparatively small proportion of the Project area (or 3%) is considered suitable habitat for Brush-tailed Mulgara. This habitat represents approximately 118 hectares of the Project area within habitat type 2 – shrubland plains.

One other target species was the Northern Quoll (*Dasyurus hallucatus*) however no evidence such as scats or tracks or motion camera images of the Northern Quoll were detected even though extensive searchers were carried out in areas of potentially suitable habitat. Given the lack of scats detected during late autumn when Northern Quolls are generally very active and detectable in the lead up to breeding, and given the lack of recent records locally, this species is unlikely to occur within the Project area.

A number of EPBC Act listed migratory wetland and shore birds potentially occur within Ophthalmia Dam and the Fortescue River system. However occurrence of these species within the Project area is considered to be on an occasional or transient basis at most. The Fortescue River within the western portion of the Project area represents marginally suitable non-breeding season habitat, as it lacks extensive mud flats, open shallow water flood plains or tidal shallows that are preferred habitats of the majority of these birds.

The Project area provides a range of suitable habitats for a diverse assemblage of vertebrate fauna. These habitat types are all well represented within the Pilbara sub-bioregion. Most of the species recorded or likely to occur are known to be common and widespread throughout the Pilbara biogeographic region. Several species of conservation significance were recorded and several others potentially occur. Of the conservation significant species recorded, the Pilbara Olive Python will be dependent on habitat and susceptible to impacts on habitats within the Project area. This could also be

true for the Pilbara Leaf-nosed Bat if it is present within the Project area, however due to inconclusive bat call identification this cannot be confirmed.

1 Introduction

1.1 Project Background

BHP Billiton Iron Ore Pty Ltd (BHPBIO) is planning to undertake exploratory drilling in the Ninga Project exploration area (the Project area), located in the Eastern Pilbara, approximately 20 km north-east of Newman. The Project area is at the eastern end of the Ophthalmia Range within mining lease ML244SA and is approximately 38.9 km^2 (square kilometres) in size. BHPBIO is required to submit a Native Vegetation Clearing Permit (NVCP) for the proposed drilling program in the Project area.

Eco Logical Australia (ELA) was contracted by BHPBIO to undertake a Level 1 vertebrate fauna survey of the Project area in order to support the NVCP application. This report summarises the findings of the Level 1 vertebrate fauna survey conducted by ELA during May 2013.

1.2 Legislative framework

Federal and State legislation applicable to the conservation of native fauna includes, but is not limited to:

- The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
  A Federal Act aimed at protecting Matters of National Environmental Significance (MNES), promoting ecologically sustainable development through the conservation and ecologically sustainable use of natural resources, and promoting the conservation of biodiversity. Under this Act, the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) lists threatened species in categories determined by criteria set out in the Act (**Appendix A**). Projects likely to cause impacts on MNES should be referred to DSEWPaC for assessment under the Act.

- The *Wildlife Conservation Act 1950* (WC Act)
  State legislation that aims to provide for the conservation and protection of wildlife in Western Australia by formally recognising taxa identified by the Department of Parks and Wildlife (DPaW) as protected, and listing them according to classifications ranging from Schedule 1 to Schedule 4 depending upon their need for protection (**Appendix A**).

  The WC Act was developed to provide for the conservation and protection of wildlife in Western Australia. Under Section 14 of the WC Act, all flora and fauna within Western Australia is protected; however, the Minister may, via a notice published in the Government Gazette, declare a list of fauna identified as rare, likely to become extinct, or otherwise in need of special protection (**Appendix A**). The current listing was gazetted in February 2012.

- The *Environmental Protection Act 1986* (EP Act)
  Under the Western Australian EP Act, the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* contain ten principles by which applications to clear native vegetation are assessed. Significant habitat necessary for the maintenance of indigenous fauna species is one of these principles. In addition, Threatened Ecological Communities (TECs) include fauna assemblages / communities, and have special status as Environmentally Sensitive Areas (ESAs) under this Act.

  Projects undertaken as part of the Environmental Impact Assessment (EIA) process, or that are applying for a NVCP are required to address guidelines produced by the

Environmental Protection Authority (EPA). In regards to terrestrial fauna, this includes principles outlined in EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002), as well as survey methodology guidelines within Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004) and the document *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and Department of Environment and Conservation 2010).

1.3 Objectives

The scope of works undertaken for the vertebrate fauna assessment is to satisfy Level 1 fauna survey requirements consistent with the following:

- EPA Position Statement No. 2: *Environmental Protection of Native Vegetation in Western Australia* (EPA 2000, or its revision);
- EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002);
- EPA Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004);
- Department of Environment and Conservation Native Vegetation Protection Guidance: A Guide to Clearing Permits (DEC 2005);
- *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010);
- *DEC Native Vegetation Fact Sheet 10: How to apply for a permit to clear* (DEC 2009);
- Department of Environment and Heritage (DEH) *Guidelines for Biological Survey Data* (DEH 2004);
- BHPBIO (2011) *Guidance for Vertebrate Fauna Surveys in the Pilbara Region* (SPR-IENEMS-012);
- BHPBIO (2010) Terrestrial Fauna Habitat Assessment Pro Forma (FRM-IEN-EMS-003);
- Department of the Environment, Water, Heritage and the Arts (DEWHA) – *Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (*DEWHA 2009)*;*
- *Survey Guidelines for Australia's Threatened Bats* (DEWHA 2010a);
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA 2010b);
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA 2010c);
- *Survey Guidelines for Australia's Threatened Mammals* (DEWHA 2011a); and
- *Survey Guidelines for Australia's Threatened Reptiles* (DEWHA 2011b).

The aim of this report is to:

- Describe background research and desktop review of:
  - Project area location, features and topography
  - All known conservation significant fauna, including Threatened, Priority and Migratory species relevant to the Project area
- Summarise field survey findings including:
  - Description and mapping of fauna habitats within the Project area
  - Assessment of the likelihood of habitats within the Project area to support listed and / or specially protected fauna
  - Description of fauna assemblages within the Project area

  - Description and mapping of conservation significant fauna and fauna habitats within the Project area
- Provide appendices including:
  - Explanation of conservation codes and classification systems
  - Species lists of all vertebrate species recorded during the survey, including those from previous surveys
  - Database search results
  - Locations and photographs of conservation significant species, secondary evidence and / or habitat
  - Habitat assessment data sheets.

2 Project Area

The Project area is north-east of Orebody 37 and east of the Eastern Ridge area (Orebodies 23/24/25) in the Eastern Pilbara, approximately 20 km north-east of Newman, at the eastern end of the Ophthalmia Range (**Figure 1**). The Project area covers an area of approximately 3,897 hectares (ha).

2.1 Climate

The Project area is situated in the Pilbara region of Western Australia which experiences an arid-tropical climate with two distinct seasons; a hot summer from October to April and a mild winter from May to September.

Rainfall is generally low and unpredictable in the Pilbara (some years have recorded zero rainfall) and temperatures are high, resulting in annual evaporation exceeding rainfall by as much as 500 mm per year. Most of the Pilbara has a bimodal rainfall distribution; from January to March; rains resulting from tropical storms producing sporadic thunderstorms, with tropical cyclones moving south also bringing heavy rains. From May to June, extensive cold fronts move eastwards across the state and sometimes reach the Pilbara. These fronts usually produce only light rains. Surface water can be found in some rock pools and springs all year round, although watercourses are episodic due to the short wet season (Beard 1975).

The average annual rainfall in the Newman area is approximately 325 millimetres (mm), although rainfall can vary widely from year to year (BoM 2013). The closest meteorological station to the Project area is the Newman Aero weather station, which recorded approximately 66.2 mm of rain in the three months prior to field survey, which is half the average for the February – April period (BoM 2013).

Maximum daily air temperatures in Newman generally exceed 34 °C during summer, with December and January usually recording the highest temperatures every year (with mean maximum temperatures of 38.9 °C and 39.1 °C respectively). During winter, mean maximum air temperatures range from the low-twenties to 30 °C and the mean minimum air temperatures drop to around 6 – 11 °C.

The Newman Aero weather station recorded average daily maximum temperatures of 37 °C and 36.5 °C for February and March respectively, dropping to an average maximum of 34.2 °C during April 2013. The maximum temperatures recorded during the field survey were milder than average for May, ranging from 16 °C to 28.4 °C with the highest maximum temperature recorded on the 10th of May (BoM 2013).

2.2 Land systems

Land system mapping is based on regional patterns in topography, soils and vegetation. The most recent land system mapping of the Pilbara bioregion, in which the Project area lies, was completed by Van Vreeswyk *et al*. (2004).

The mapping classifies the Pilbara region into 102 land systems. The Project area lies within four land systems: Boolgeeda, Newman, River and Washplain. Their descriptions are listed below:

- Boolgeeda: Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands
- Newman: Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands

- River: Active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands
- Washplain: Hardpan plains supporting groved mulga shrublands (Van Vreeswyk *et al*. 2004).

2.3 Soil type and topography

Soils of the Newman region are described as "Colluviums of unconsolidated quartz and rock fragments in soil, over chert, ferruginous chert and banded iron-formations with minor shale" (Tyler 1994). The Project area lies predominately on stony plains and lower slopes surrounded by ridges, breakaways, mountains and hills (Van Vreeswyk *et al.* 2004).

2.4 IBRA and regional vegetation descriptions

The Interim Biogeographical Regionalisation for Australia (IBRA) recognises 89 bioregions within Australia. These bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna (DSEWPaC 2012). The Project area lies within two IBRA bioregions; the Pilbara (PIL) and the Gascoyne (GAS) bioregions. The Pilbara bioregion is further divided into four subregions and the Gascoyne bioregion into three subregions. The Project area lies predominantly within the Hamersley Plateau (PIL03) subregion, amounting to 37.8 km^2, with two southern sections totalling 1.17 km^2 lying within the Augustus subregion (GAS03):

- Hamersley Plateau (PIL03): Mountainous area of Proterozoic ranges and plateaux with low mulga woodland over bunch grasses on fine textured soils, and Snappy Gum over *Triodia brizoides* on the skeletal sandy soils of the ranges (Kendrick 2001b)
- Augustus (GAS03): Rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys dominated by mulga woodlands and *Triodia* grasslands (Desmond *et al*. 2001).

The Project area occurs within the Fortescue Botanical District which is described as tree and shrub-steppe communities dominated by *Eucalyptus*, *Acacia* and *Triodia* grasses. Hard red soils are found on the plains of the Fortescue Botanical District, whereas soils are shallow and skeletal further up in the ranges (Beard 1990).

Vegetation type and extent has been mapped at a regional scale by Beard (1975) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:1,000,000, the Department of Agriculture and Food WA (DAFWA) has compiled a list of vegetation extent and types across WA (Shepherd *et al.* 2001). The vegetation associations that occurred within the Project area prior to European settlement are as follows (Shepherd *et al.* 2001):

- Vegetation association 29, dominated by sparse low woodland of scattered *Acacia*
- Vegetation association 82, characterised by *Eucalyptus* open woodlands and *Triodia* open hummock grasslands
- Vegetation association 216, dominated by *Acacia* woodlands mulga and sparse *Triodia* hummock grasslands.

As of 2002, the extent of these vegetation associations remaining was over 7,780,000 ha (vegetation association 29), 2,900,000 ha (vegetation association 82), and 298,000 ha (vegetation association 216) respectively (Shepherd *et al.* 2001). Due to recent resource development in the Pilbara, the current

extent remaining is expected to be less than the 2002 figures above, although it is still significantly above the 30% threshold level set for the retention of vegetation types by the EPA (EPA 2000).

2.5 Wetlands

No wetlands of international significance (Ramsar wetlands) listed under the Commonwealth EPBC Act occur within a 20 km radius of the Project area (DSEWPaC 2013a).

There are six wetlands recognised nationally as important wetlands within the Pilbara bioregion of WA (Environment Australia 2001). The Fortescue Marsh, which lies approximately 100 km north of Newman, is currently listed as a wetland of national significance and has been nominated for consideration as a Ramsar wetland. Three major tributaries converge into the Fortescue Marsh: Western Creek, Warrawanda Creek and the Fortescue River. The Fortescue River runs through the western corner of the Project area where it flows north for approximately 100 km before reaching the Fortescue Marsh.

2.6 Conservation reserves in the locality

Karijini National Park is the closest conservation reserve to the Project area, located approximately 150 km north-west of Newman (**Figure 1**). To the north of Karijini National Park lies the Mungaroona Range Nature Reserve which is approximately 200 km north-west of Newman. Other reserves in the region include the Collier Range National Park approximately 190 km to the south and the Rudall River National Park which lies approximately 250 km east-south-east of Newman.

Environmentally Sensitive Areas (ESAs) are areas of high conservation value within which exemptions for requiring a native vegetation clearing permit do not apply in accordance with Section 51B of the EP Act. The endangered TEC 'Ethel Gorge aquifer stygobiont community' is associated with the Ophthalmia Dam; however, as it is underground it is not considered relevant to the Project area. There are no terrestrial fauna ESAs located within a 50 km radius of the Project area.

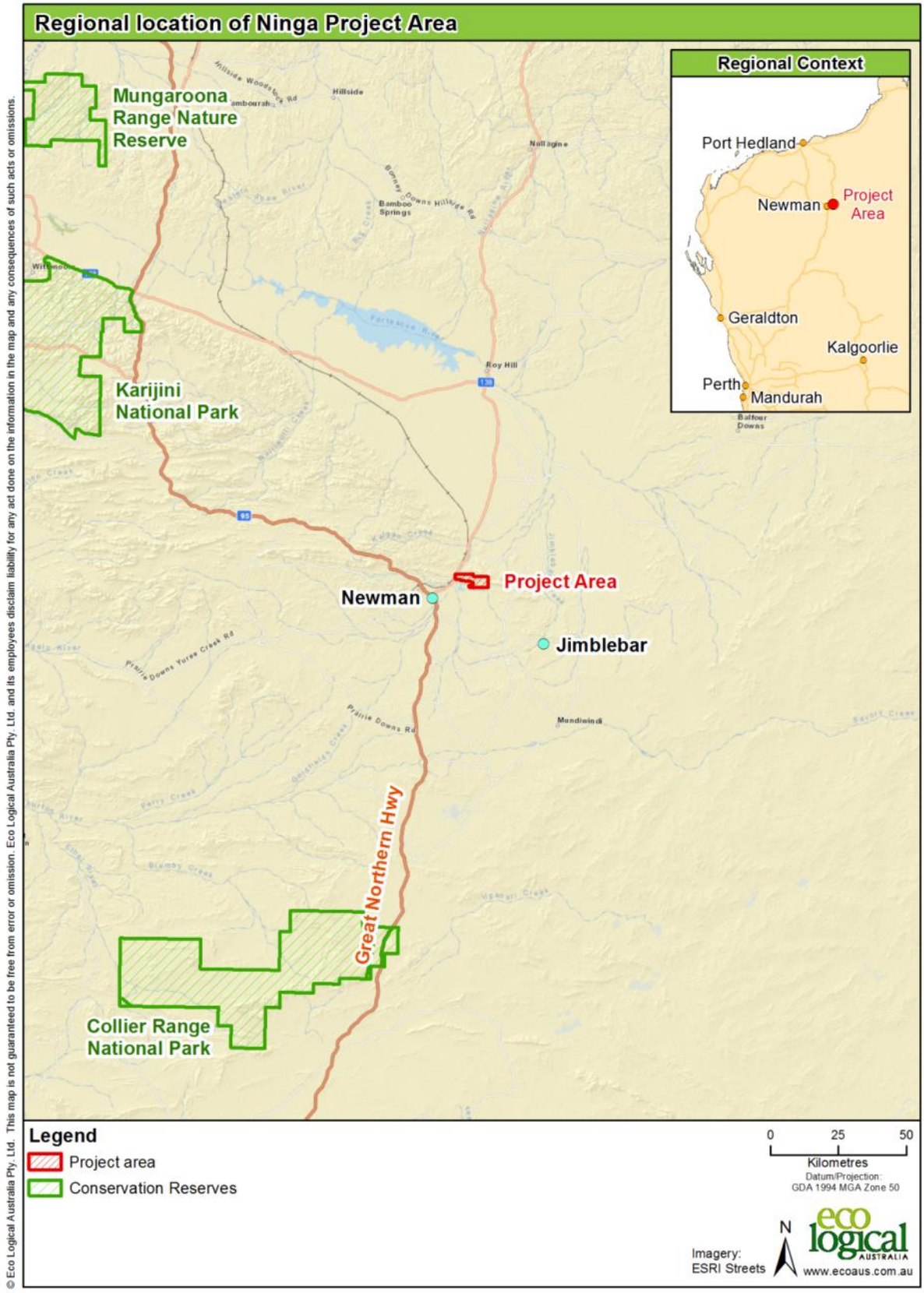

Figure 1: Regional location of the Ninga Project area

3 Desktop Review Methods

3.1 Database searches

The following Federal and State databases were searched for information relating to conservation significant fauna species to target during the Level 1 survey:

- EPBC Act Protected Matters search tool (DSEWPaC 2013a);
- DEC Threatened and Priority fauna database search for Scheduled fauna (DEC 2013a);
- DEC and Western Australian Museum's NatureMap online database (DEC 2013b); and
- Fauna listed on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List (IUCN 2013).

The Department of Environment and Conservation (DEC) is now known as the Department of Parks and Wildlife (DPaW). At the time of the database searches being done it was still known as DEC and therefore references to database searches will remain as the DEC.

A search of the State's Threatened Fauna database was performed for ELA by the DEC using a suitable buffer of 20 km around the point location 23° 19' 21" S and 119° 57' 16" E (using GDA94).

Results from the database searches are presented in **Appendices B and G**. It should be noted that these search results may include species that have been recorded in the general region but may be unlikely to occur in the Project area due to a lack of suitable habitat (e.g. shore birds).

3.2 Previous ecological surveys

As a result of the large scale resource development projects occurring within the Pilbara, there have been many site-specific ecological surveys conducted within the region. A large number of surveys of similar size and scope have been undertaken in the region to fulfil the statutory requirements of the EP Act, WC Act, and the EPBC Act. The following ecological survey reports for sites close to the Project area were provided by BHPBIO and reviewed by ELA:

- Biologic (2009) 'Newman Power Network, Level 2 Flora and Level 1 Fauna Survey'. Report prepared for BHPBIO Pty Ltd;
- Biologic (2013) 'OB 17 and 18 Vertebrate Fauna Habitats'. Report prepared for BHPBIO Pty Ltd;
- Biota Environmental Services (2001) 'Baseline Biological & Soil Surveys and Mapping for ML244SA West of the Fortescue River'. Report prepared for BHPBIO Pty Ltd;
- *ecologia* Environment (1995) 'Orebody 25 - Biological Assessment Survey'. Report prepared for BHPBIO Pty Ltd;
- *ecologia* (1996a) 'Jimblebar Iron Ore Project. Pebble-mound Mouse (*Pseudomys chapmani*) Site Survey'. Report prepared for BHPBIO Pty Ltd;
- *ecologia* (1996b) Jimblebar Rail Spur Biological Assessment Survey'. Report prepared for BHPBIO Pty Ltd;
- *ecologia* (2004a) 'Eastern Ophthalmia Range Expansion Biological Survey'. Report prepared for BHPBIO Pty Ltd;

- *ecologia* Environment (2004b) 'Orebody 24 Expansion Biological Survey'. Report prepared for Mine and Port Developments Joint Venture (MPDJV);
- ELA (2012) 'Orebody 37 Level 1 Vertebrate Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- ENV Australia (2006) 'Ore Body 24 Flora and Fauna Assessment Phase II'. Report prepared for MPDJV Asset Development Projects;
- ENV Australia (2009a) 'Orebody 25 to Newman Fauna Assessment'. Report prepared for Calibre Engenium Joint Venture;
- ENV Australia (2009b) 'Newman to Jimblebar Transmission Line and Newman Town Substation Vertebrate Fauna Assessment'. Report prepared for Worley Parsons;
- ENV Australia (2011a) 'Eastern Ridge (Ore Body 23/24/25) Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- ENV Australia (2011b) 'Orebody 31 Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- ENV Australia (2011c) 'Orebody 42/43 Flora, Vegetation and Fauna Assessment'. Summary letter and recommendations prepared for BHPBIO Pty Ltd;
- ENV Australia (2012) 'Wheelarra Hill North Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- GHD (2008a) 'Report for Mesa Gap Biological Survey'. Report prepared for BHPBIO Pty Ltd;
- GHD (2008b) 'Report for Myopic Project Area, Newman Flora and Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- Outback Ecology (2009a) 'Jimblebar Iron Ore Project Terrestrial Vertebrate Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- Outback Ecology (2009b) 'Jimblebar Linear Development Terrestrial Vertebrate Fauna Assessment'. Report prepared for BHPBIO Pty Ltd;
- Outback Ecology (2009c) 'Wheelarra Hill Accommodation Camp Flora and Fauna Assessment'. Report prepared for BHPBIO Pty Ltd; and
- Onshore Environmental Consultants & Biologic Environmental (2009) 'Biological Survey: Myopic Exploration Leases'. Report prepared for BHPBIO Pty Ltd.

3.3 Potential fauna assemblages

A complete fauna species assemblage list was compiled based on relevant previous studies that have occurred within the vicinity of the Project area and results from the database searches (**Appendix B**).

3.4 Conservation significant fauna

Specific criteria were used to assess the likelihood of conservation significant fauna occurring. The likelihood of occurrence assessment was based on the species matching one or more of the criteria below.

- Likelihood: No
  - Species not known to occur within the bioregion
  - Project area lacks important habitat for a species that has highly selective habitat requirements
  - Species has been historically recorded within Project area or locally, however it is considered locally extinct due to significant habitat changes and introduced predators
- Likelihood: Unlikely
  - Species has been recorded within the bioregion based on literature review, but not recorded locally based on DEC database search, and adequate survey efforts (such as a standardised methodology) have not detected the species
  - Project area assessed as having marginally suitable or low quality habitat at best, or other factors such as high level of disturbance or lack of habit connectivity
- Likelihood: Potential
  - Extensive survey efforts have not detected the species, however the species is known to occur locally or regionally, has cryptic habits, and no effective standardised survey procedure is available
  - Project area assessed as having potentially suitable habitat based on species ecology and on-ground habitat assessment
  - Historical evidence of species occurrence within Project area
  - Species may be highly mobile and/or have extensive foraging range
- Likelihood: Likely
  - Core habitat or preferred habitat for the species occurs within the Project area either year-round or seasonally (for example this could be a host plant, seasonal wetland or roosting cave)
  - Species has been recorded at a number of locations within the local area or in proximity to and in similar habitat to that which occurs within the Project area
- Likelihood: Yes
  - Recent (fresh) evidence of species positively identified by competent ecologist within the Project area such as scats, footprints or burrows
  - Species recorded within Project area recently and/or during current survey.

Records of all conservation significant fauna from previous surveys, database searches and from the current field survey are discussed in **Section 5.4** and are presented in **Appendix C**.

4 Field Survey Methods

A baseline field fauna survey for environmental impact assessment should at the very least provide a comprehensive list of species within a given area. There are two levels of fauna survey as delineated by the EPA:

- **Level One:** desktop study to collate historical knowledge, in conjunction with a reconnaissance survey (Project area inspection)
- **Level Two:** trapping and opportunistic field survey to characterise the fauna present, combined with a Level One survey.

Based on the requirement for the survey to support a NVCP application and the extent of disturbance from an exploratory drilling program, a Level 1 survey was considered suitable.

4.1 Study team and timing of survey

Robert Browne-Cooper (Senior Zoologist) and Dr Enhua Lee (Senior Ecologist) conducted the fauna survey during one seven day site visit between the 10th and 16th of May 2013. The survey was carried out in accordance with BHPBIO's guidance statements as provided to ELA, and the following:

- EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002, or its revision)
- EPA Guidance No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004, or its revision)
- EPA and DEC (2010) *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*

4.2 Sampling methods

4.2.1 Fauna habitats

Fauna habitat types were identified from aerial photographs. The site inspection then confirmed the occurrence of the habitats. Information on fauna habitats and potential fauna assemblages was collected from 15 locations throughout the Project area. Fauna habitat data collected in the field was based on the BHPBIO terrestrial fauna habitat assessment pro-forma (FRM-IEM-EMS-003). The fauna habitats were classified based on characteristics including vegetation, soil, topography, geology, and elevation. Fauna habitats identified were used as a basis for assessing the Project area in terms of suitability for the relevant conservation significant species.

Broad habitat types identified within the Project area were described based on information on:

- Location of the broad habitat type within the Project area;
- Landscape position;
- Associated vegetation and dominant structure;
- Hollow-bearing trees, including dead stags (e.g. average size and abundance of hollows);
- Description of rock and rocky outcrops;
- Logs (e.g. abundance and size);
- Leaf and twig litter percentage;
- Bare ground percentage;
- Wetlands, creeks, rivers, dams and other water bodies;

- Description of observed nests and roosts;
- Subterranean roosts (e.g. caves, disused mineshafts);
- Associated fauna species observed using the habitat;
- Ecological processes important to the habitat;
- Disturbances; and
- Photo showing a typical example of the broad habitat type.

4.2.2 Motion-sensitive camera detection

Motion sensitive cameras were used to target areas where mammal species were expected to frequent, such as water holes, burrows, foraging sites or latrine areas. Motion-sensitive cameras were installed at three locations considered suitable for capturing photographs of fauna (**Figure 2**). Two cameras were set for just over five days and six nights days between 10th and 16th May 2013, while one camera was set for just over three days and three nights between 12th and 16th May 2013. Standard Elliot trap bait, consisting of a mixture of rolled oats, peanut butter and sardines, was scattered in the motion-sensitive camera fields of view to attract fauna. Camera locations were chosen in part based on accessibility. Due to the limited access via vehicle tracks, motion-sensitive camera use in remote areas was avoided due to the time constraint in setting and collecting equipment on foot, as outlined in 4.4 Limitations.

4.2.3 Anabat detection

Bat echolocation calls were recorded using an Anabat SDII ® system (Titley Electronics, Ballina NSW). The Anabat detector, along with specialised software, is able to transform ultrasonic bat echolocation calls into a corresponding graphical representation for analysis. An Anabat detector was set at three locations for two nights (12 hours) at each location respectively as shown in **Figure 2**. Sample locations were selected in areas likely to have high level of bat activity based on landscape features such as flyways, riparian areas and caves. Bat echolocation calls were analysed and identified by Kyle Armstrong and Yuki Konishi of Specialised Zoological. A copy of the bat call analysis report can be found in **Appendix F**.

4.2.4 Targeted searches

Targeted searches were undertaken for conservation significant fauna species within areas where suitable habitat was identified during the field survey. Targeted searches focussed on detecting specific signs of fauna species known or expected to occur within the Project area. Targeted searches for Mulgara and Western Pebble-mound Mouse were undertaken via parallel transect searches with two personnel walking approximately 20 metres apart, and with the aid of hand-held GPS to ensure effective site coverage. **Figure 2** presents the area covered by targeted searches within suitable habitat for the respective species. Other targeted searches included searching for evidence of Northern Quoll and Pilbara Olive Python around water holes and gorges.

4.2.5 Opportunistic sightings

During all field activities, all fauna observations and signs such as scats, tracks, burrows, bird calls and other signs of species presence were recorded. Fauna observations were recorded as per BHPBIO pro-forma FRM-IEM-EMS-002.

4.3 Taxonomy and nomenclature

Nomenclature used for fauna species within this report is based on the most up to date version of the Western Australian Museum's (WAM) Taxonomic checklist of the terrestrial vertebrate fauna for Western Australia (WAM 2012). Additional information on specific vertebrate fauna groups was found in the following:

- Amphibians: Tyler and Doughty (2009);
- Reptiles: Wilson and Swan (2010);
- Birds: Simpson and Day (2010);
- Mammals: Menkhorst and Knight (2011).

4.4 Limitations

It is important to note the specific factors that may affect field survey results. These can often be difficult to predict, as is the extent to which they will ultimately influence survey effort. The limitations identified for the purposes of this survey are outlined in **Table 1**.

Table 1: Potential limiting factors of the Ninga Level 1 fauna survey

LIMITATION	DESCRIPTION
Sources of Information	The Pilbara bioregion has been relatively well surveyed, with increasing survey work occurring due to the mining boom in the region. Numerous fauna surveys have been undertaken in or near Newman (in proximity to the Project area) and BHPBIO provided 22 ecological reports to ELA for the purposes of this survey.
Scope of works	The survey met the requirements of a Level 1 terrestrial fauna survey with additional survey effort employed such as bat call detection, motion camera and target searches for conservation significant fauna in suitable habitats. No fauna trapping (as per a Level 2 terrestrial fauna survey) was undertaken.
Completeness of survey	The Project area was fully surveyed to the satisfaction of a Level 1 survey, based on a field survey of seven days duration; however additional time may have uncovered additional opportunistic species or signs or species presence.
Intensity of survey	A Level 1 survey effort was satisfactory given the number of species, and types of habitats identified within the Project area as per EPA Guidance Statement No. 56. Numerous fauna surveys have been undertaken in surrounding areas which results in increased knowledge of the fauna assemblages in the area.
Timing, weather, season, cycle	The survey was carried out during Autumn which is considered an optimum period for Pilbara fauna surveys following adequate summer rainfall. The field survey dates were 10th to16th May 2013 in a year to date that received 293 mm of rainfall. Of this total, 229 mm of rainfall fell over the summer period in the lead up to the field survey, and overall the total rainfall for the summer was an average amount, and included some cyclonic rainfall.
Disturbances	Few vehicle tracks and roads were present, and some previous exploration activity such as drill pads was present. *Cenchrus ciliaris* (Buffel grass) was noted as a significant weed in some areas, particularly areas of low-lying topography within the southern portion of the Project area. Cattle activity was noted within the areas of lower elevation and those associated with seasonal water flow. Overall the majority of the site displayed a relatively low degree of disturbances.
Resources	The lead zoologist undertaking the survey is suitably qualified to identify fauna of the Pilbara and Gascoyne biogeographic regions. Both field zoologists have considerable experience with Pilbara fauna species and habitat assessments for regionally relevant conservation significant species.
Accessibility/ remoteness	A large proportion of the Project area lacked vehicle tracks, and was not accessible by 4WD vehicle. Consequently most site inspection was conducted on foot and hiking distance was determined by the amount of drinking water able to be carried and in line with BHPBIO safety standards. The Project area was adequately accessed for the scope of the Level 1 survey.

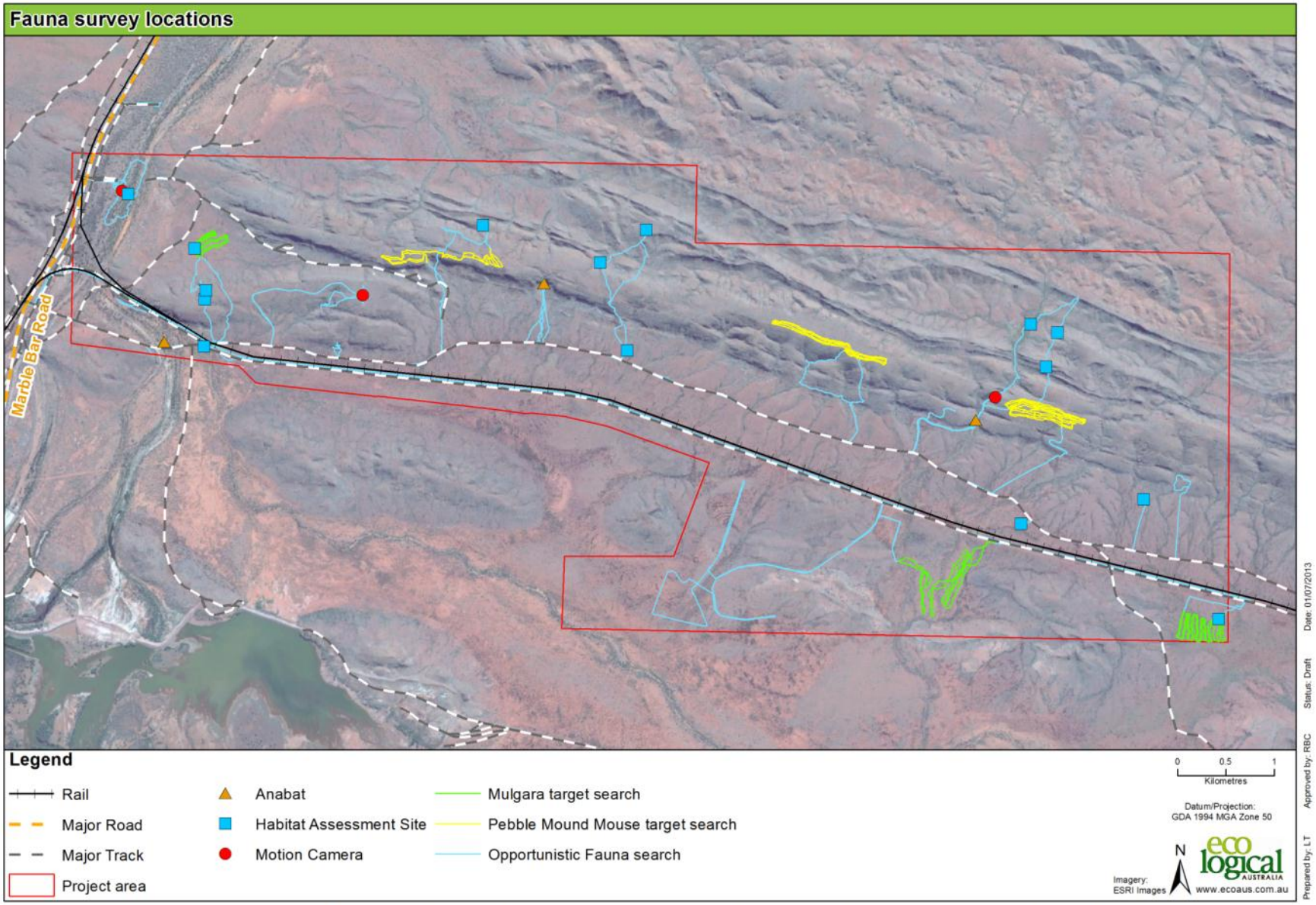

Figure 2: Fauna survey locations

5 Results

5.1 Potential fauna assemblages

The desktop review identified seven species of amphibian, 70 species of reptile, 153 species of bird and 38 species of mammal that have previously been recorded or have the potential to occur within the Project area. These species are listed in **Appendices B and G**, and the list includes some historical and out-lying point records of species that may represent regionally extinct sub-populations. **Appendices B and G** also includes a range of wetland and migratory bird species associated with the Ophthalmia Dam which is approximately three kilometres south of the Project area. The database searches, literature review of reports, and the results from the field survey form the basis for an assessment of likelihood of occurrence of conservation significant species occurring within the Project area. These results are presented in **Section 5.4.1**.

5.2 Fauna habitats

Based on the field survey, five broad habitat types were identified within the Project area (**Figure 3**). **Table 2** describes each fauna habitat, the area of habitat located in the Project area and the percentage of the Project area it represents. **Appendix E** contains the information collected during habitat assessments. Some of these habitats support conservation significant fauna, and features such as waterholes and caves. **Figure 4** shows the locations for these habitats.

In addition to the fauna habitat types identified below, several portions of the Project area were identified as lacking fauna habitat, being completely cleared of native vegetation or developed with existing mine infrastructure (**Figure 3**). This accounts for approximately 101 ha (2.6 %) within the southern section of the Project area.

Table 2: Fauna habitat types mapped within the Project area

Habitat Type	Area (ha)	% of Project area
1. Rivers and major creeks: associated with the Fortescue River system supporting fringing *Eucalyptus camaldulensis* or *Acacia* woodlands, mixed hummock and tussock grasslands on alluvial sandy clays	172	4.4
2. Low shrubland plains: Low lying open sandy clay loam and pebble clay loam plains including minor seasonal creek lines supporting sparse mixed *Eucalyptus* and *Corymbia* woodlands over open mixed *Acacia* and *Grevillia* shrubland over open *Triodia* hummock grasslands, and sparse low mixed grass and shrubs	915	23.4
3. Stony rises and lower stony hill slopes: Pebble strewn low rises, gently slopes and low hills with poorly formed shallow clay soils including minor seasonal creek lines supporting open *Triodia* hummock grasslands and low sparse to scattered mixed *Acacia* shrublands.	1,311	33.6
4. Rocky hill tops: Rocky hill tops, upper slopes and ridges with very poorly formed skeletal clay soil including minor seasonal creek lines	1060	27.2

supporting sparse to occasional *Grevillea* and *Acacia* shrublands over open to sparse *Triodia* hummock grasslands on ironstone pebbles and with areas of rock outcropping.		
5. Steep rocky canyons and cliffs: Steeply eroded and bisected rocky formations including canyons, cliffs, breakaways and gorges supporting mixed sparse to occasional shrublands and mixed *Triodia* hummock and tussock grasslands on shallow stony clay soils, often with rocky outcropping.	338	8.7

Habitat type 1, rivers and major creeks, is predominantly located on the western edge of the Project area as well as two smaller drainage lines coming down the ridge further east within the Project area (**Figure 3**). Where permanent or seasonal water occurs within the Fortescue River and associated major creeks, it is likely that this habitat could support Pilbara Olive Python (*Liasis olivaceus barroni*) (EPBC Act: Vulnerable; WC Act: Schedule 1) on at least a seasonal basis by providing both hunting opportunities and shelter. The Star Finch (*Neochmia ruficauda* subsp. *subclarescens*), listed by DPaW as a Priority 4 species, potentially breeds within emergent rushes and reeds within the river. Disused Rainbow Bee-eater (*Merops ornatus*) (EPBC Act: Migratory; WC Act: Schedule 3) nest burrows were also recorded within this habitat. A range of bird species were observed within or in proximity to the Fortescue River in the western portion of the Project area. Disturbance associated with this riparian habitat included some evidence of cattle damage to low strata vegetation and invasion of Buffel grass associated with low elevation alluvial areas.

Habitat type 2, low shrubland plains, encompasses a large proportion of the lower lying sections of the Project area (**Figure 3**). Most of this habitat was assessed as being in good condition, however, some disturbance caused by infrastructure was evident including vehicle tracks, rail and power line easements in the southern parts of the Project area. The Priority 4 species Brush-tailed Mulgara (*Dasycercus blythi*) was recorded within small portions of this habitat type; these areas have been mapped separately as habitat type 2A (**Figure 4**). The majority of the low shrubland plains in the Project area have substrates of heavy consolidated clays which are unsuitable or sub-optimal for Mulgara burrowing. Habitat type 2A substrates are sandier which make for preferred burrowing habitat. Low shrubland plains are expected to support a diverse assemblage of reptile species including geckos, legless lizards, skinks and elapid snakes. Several arid-adapted frog species are seasonally active in the lower flat areas of these plains such as Water Holding Frogs (*Cyclorana* and *Neobatrachus* species). The emergent *Acacia* and *Eucalyptus* overstorey provides nesting habitat for a range of bird species and seasonal food for nectar-feeding species, and a range of locally abundant mammals including micro-chiropteran bats and small rodents.

Habitat type 3, stony rises and lower stony hill slopes, is the most extensive fauna habitat type within the Project area (**Figure 3**). This habitat type is generally associated with the foot hills and lower slopes of rocky hill top habitat. Habitat condition was assessed as being good to very good with the exception of small areas of ground disturbance and vegetation loss due to geo-exploration activity. This habitat potentially supports the Priority 4 Western Pebble-mound Mouse (*Pseudomys chapmani*).

Habitat type 4, rocky hill tops, is generally associated with high elevation landscapes often with rocky outcrops but lacking steeply eroded rock formations (**Figure 3**). This habitat supports a range of saxicoline (rock inhabiting) reptiles such as the Pilbara Pygmy Spiny-tailed Skink (*Egernia cygnitos*), Perentie (*Varanus giganteus*), Striped Skink (*Ctenotus rutilans*) and rock inhabiting mammals. The Grey Falcon (*Falco hypoleucos*) (WC Act: Schedule 1) and the Western Pebble-mound Mouse (DPaW:

Priority 4) were recorded within this habitat type. The condition of habitat was noted as generally excellent condition with the only disturbance being small localised ground disturbance and vegetation loss associated with geo-exploration and communications infrastructure.

Habitat type 5, steep rocky canyons and cliffs has an extent of approximately 338 hectares of the Project area (**Figure 3**). The main characteristic of this habitat type is the steeply eroded geomorphology that provides potential shelter sites such as caves and crevices, for several conservation significant fauna species such as the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (EPBC Act: Vulnerable; WC Act: Schedule 1), and Ghost Bat (*Macroderma gigas*) (DPaW: Priority 4). A potential Pilbara Leaf-nosed Bat was recorded on an Anabat detector at the entrance of a narrow cave within this habitat type; however analysis of this call was inconclusive. This habitat also provides shelter and foraging habitat for Pilbara Olive Python and one individual was recorded at the entrance of a cave. The condition of this habitat type was very good to excellent with minimal disturbance observed.

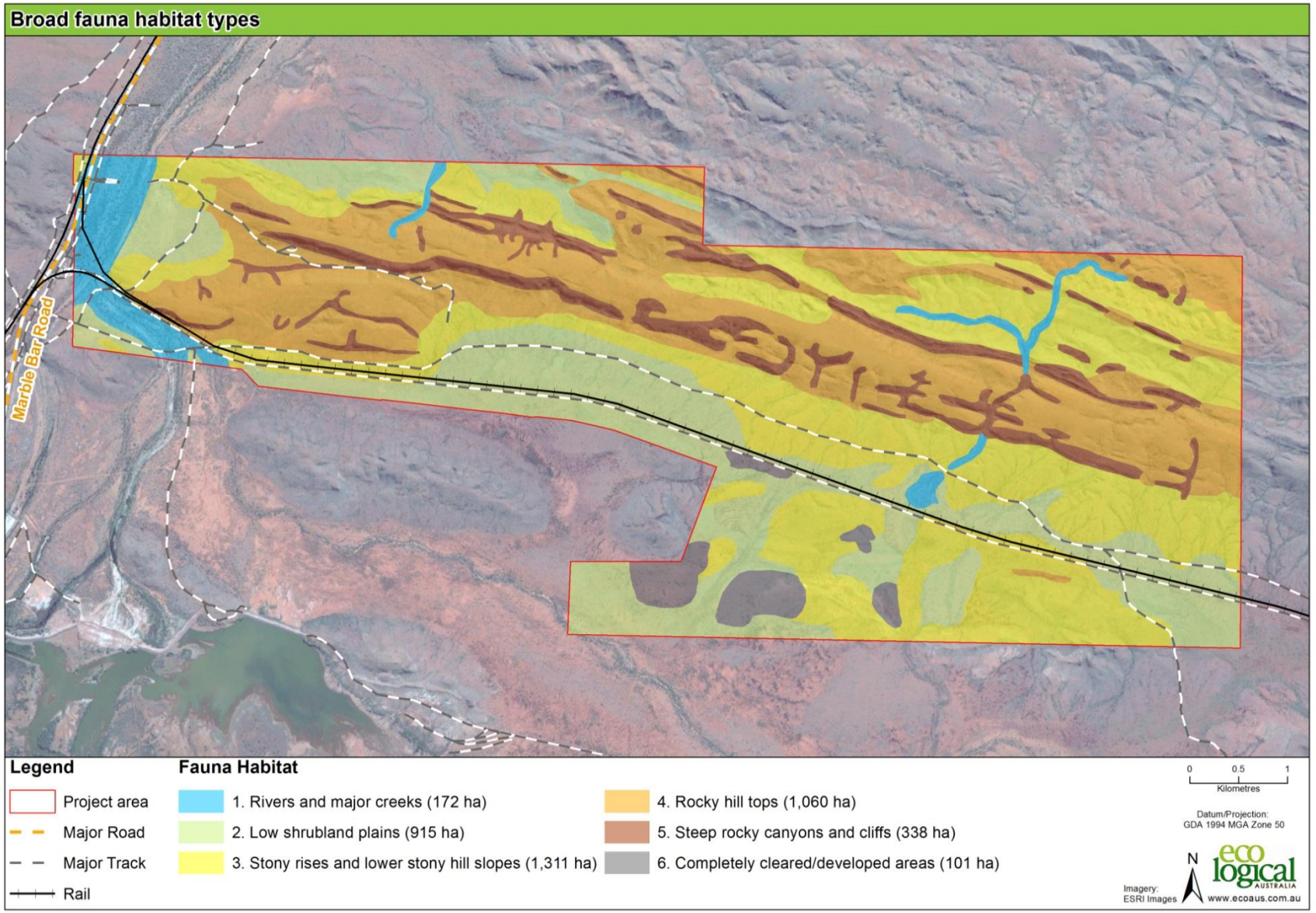

Figure 3: Broad fauna habitat types identified within the Project area

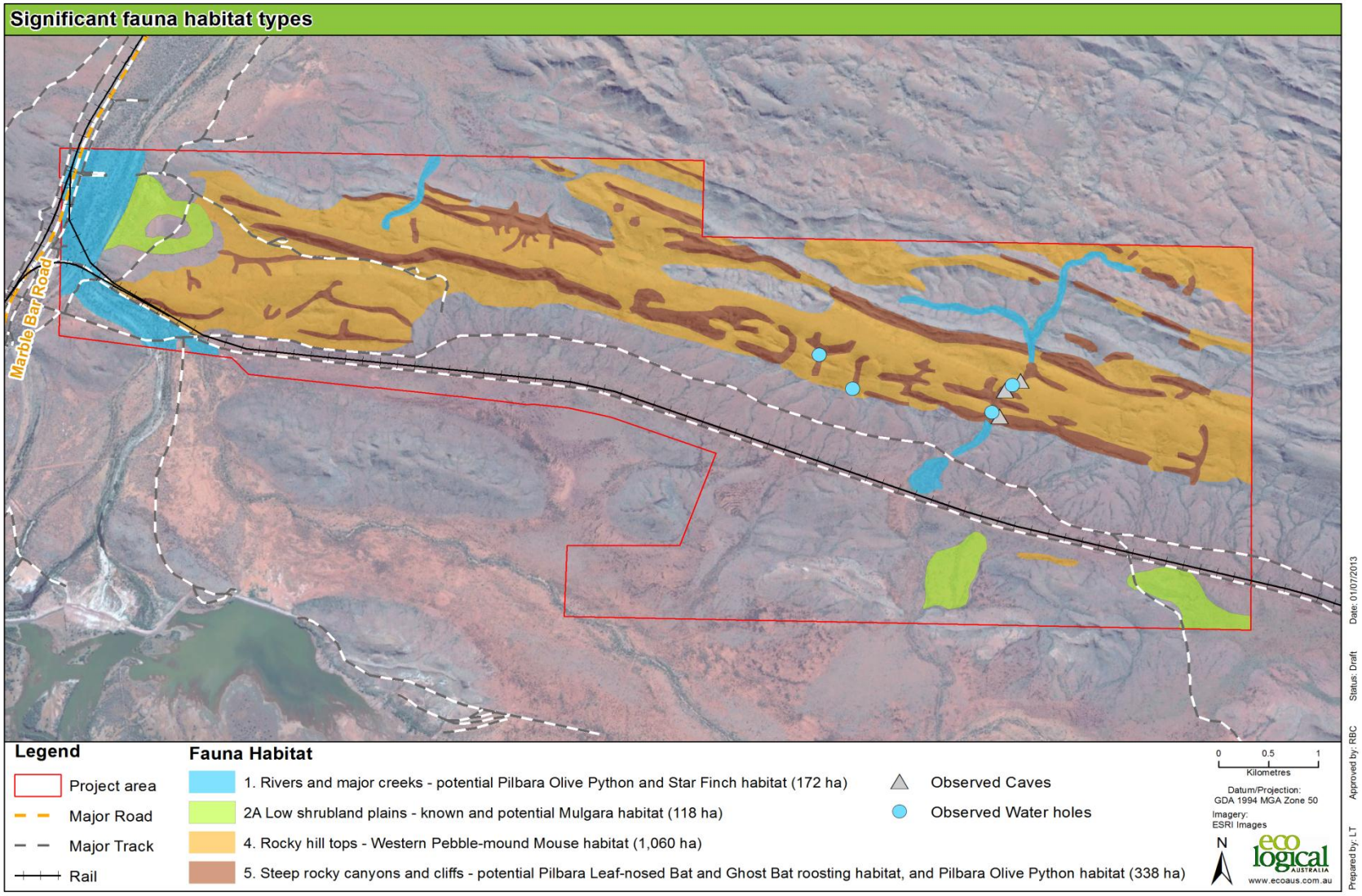

Figure 4: Significant fauna habitats identified within the Project area. Note that some conservation significant species e.g. Rainbow Bee-eater are not wholly reliant on any particular habitat type, and so significant habitat for these species are not shown

5.3 Fauna species recorded

A total of 75 vertebrate fauna species were recorded during the field survey including one amphibian, 16 reptiles, 41 birds and 17 mammals. The majority of species recorded were opportunistically recorded birds and reptiles. The mammals comprise 13 native species, eight of which are micro-chiropteran bats, and four introduced mammal species. Most of the species recorded are common and widespread throughout the Pilbara and adjacent biogeographic regions. All vertebrate fauna species recorded are presented within **Appendices B and C**. Five fauna species of conservation significance were recorded within the Project area during the field survey and these are discussed further below.

5.4 Conservation significant species

Five conservation significant fauna species were recorded within the Project area during the current survey:

- Pilbara Olive Python - listed as Vulnerable under EPBC Act and Schedule 1 under WC Act;
- Grey Falcon - Schedule 1 under WC Act;
- Rainbow Bee-eater - listed as Migratory under EPBC Act and Schedule 3 under WC Act;
- Western Pebble-mound Mouse - listed as Priority 4 by DPaW;
- Brush-tailed Mulgara - listed as Priority 4 by DPaW.

One additional species, the Pilbara Leaf-nosed Bat was unconfirmed based on inconclusive bat call data analysis (**Appendix F**). Locations of conservation significant species observed are provided in **Figure 5**.

A previous survey in the area also recorded the Fork-tailed Swift (*Apus pacificus*), listed as Migratory under the EPBC Act and Schedule 3 under the WC Act, from two separate locations within the Project area (*ecologia* 2004a). At each location, large flocks of the species were observed above the Project area. The Rainbow Bee-eater and Western Pebble-mound Mouse were also recorded (*ecologia* 2004a).

Pilbara Olive Python

The Pilbara Olive Python was recorded within the Project area. A juvenile approximately 1.2 metres in total length, was observed active at the entrance of a shallow cave (see photo in **Appendix D**). This location, shown in **Figure 5**, is within a deeply bisected rocky gorge noted to have several pools providing suitable hunting locations for this species. This location has been mapped together with other steep rocky areas as habitat type 5 being suitable habitat for Pilbara Olive Python. The Fortescue River within the western portion of the Project area (**Figure 3**) also represents suitable foraging habitat for this species.

Grey Falcon

A Grey Falcon was opportunistically observed flying within the Project area. Suitable foraging and potential breeding habitats for this species within the Project area include the rivers and major creeks habitat (habitat type 1) associated with the Fortescue River.

Rainbow Bee-eater

The Rainbow Bee-eater was recorded active in numerous locations and was observed feeding on feral bees at one location. This bird was found to be abundant and widespread within the Project area, and is likely to be a year-round resident that remains in the Pilbara during the winter (non-breeding) period. Several abandoned nest burrows were found within a clay creek bank (**Figure 5**, **Appendix D**). This

species would breed seasonally within limited riparian areas of exposed clay creek banks within rivers and major creeks (habitat type 1).

Fork-tailed Swift

The Fork-tailed Swift was recorded within the Project area during a previous ecological survey (*ecologia* 2004a). Flocks of over 50 individuals were observed flying high above the Project area in two separate locations. Fork-tailed Swift are often observed at altitude while they forage for insects and commonly fly hundreds of metres above the ground. .The Fork-tailed Swift breeds in Siberia, therefore no breeding habitat occurs within the Project area or within the wider region. The Fork-tailed Swift arrives in Australia around October each year and leaves to return to the northern hemisphere to breed in April (DSEWPaC 2013b). The survey timing in May is the likely reason that this species was not observed during the current survey.

Western Pebble-mound Mouse

Several active pebble mounds were recorded on stony hilltops within habitat type 4, shown in **Figure** 5. Several mounds were assessed as active mounds indicating that Western Pebble-mound Mouse is utilising the habitat for breeding and foraging. The remaining pebble mounds were assessed as either currently inactive based on the lack of deep conical burrow entrances, or as very old abandoned mounds based on the derelict appearance and low mound form.

Brush-tailed Mulgara

One potentially active Mulgara burrow was recorded based on identification of fresh Mulgara scats (**Figure 5** and photo in **Appendix D**) found near the burrow entrance. The burrow and scat were likely to belong to Brush-tailed Mulgara rather than Crest-tailed Mulgara given the latter is not known to occur locally. There have also been positive confirmations of Brush-tailed Mulgara from genetic analysis on tissue samples from trapped individuals nearby (pers comm Breanne Menezies, Principal Ecologist, BHPBIO, 2013). Other burrows recorded were assessed as likely to be inactive based on the lack of scats or footprints, although recent light rain may have removed tracks. The burrows were located within habitat type 2 – low shrubland plains. Most of this habitat type was assessed as sub-optimal or unsuitable for Mulgara based on heavy consolidated clay and stony gibber substrate. However there were small patches of suitable loamy soil supporting *Triodia* hummock grasses. These patches were identified as suitable habitat for Mulgara and mapped as habitat type 2A (**Figure 4**). These patches were systematically searched for burrows, which were recorded within two of the three patches however only one burrow was assessed as likely to be active. Potential Brush-tailed Mulgara habitat amounts to approximately 118 hectares in total.

Pilbara Leaf-nosed Bat

Based on the analysis of an ultrasound bat call recording (**Appendix F**), this species is unconfirmed. Analysis of this call was inconclusive and could have been that of one other species, Finlayson's Cave bat (*Vespadelus finlaysoni*). The unconfirmed call was recorded on an Anabat bat detector set for two nights at the entrance of a narrow cave within habitat type 5 – steep rocky canyons and cliffs. The desktop assessment noted that this species has not been recorded locally, so the likely. However, during the fauna habitat assessment, it was noted that in many rocky areas, potential bat caves were extensive along cliffs and breakaways, which could potentially be used by the species as diurnal roosts or night roosts to extend their foraging excursions. However, the suitability of these caves for daytime or night time roosting could not be assessed as entry into caves during this survey was not permitted.

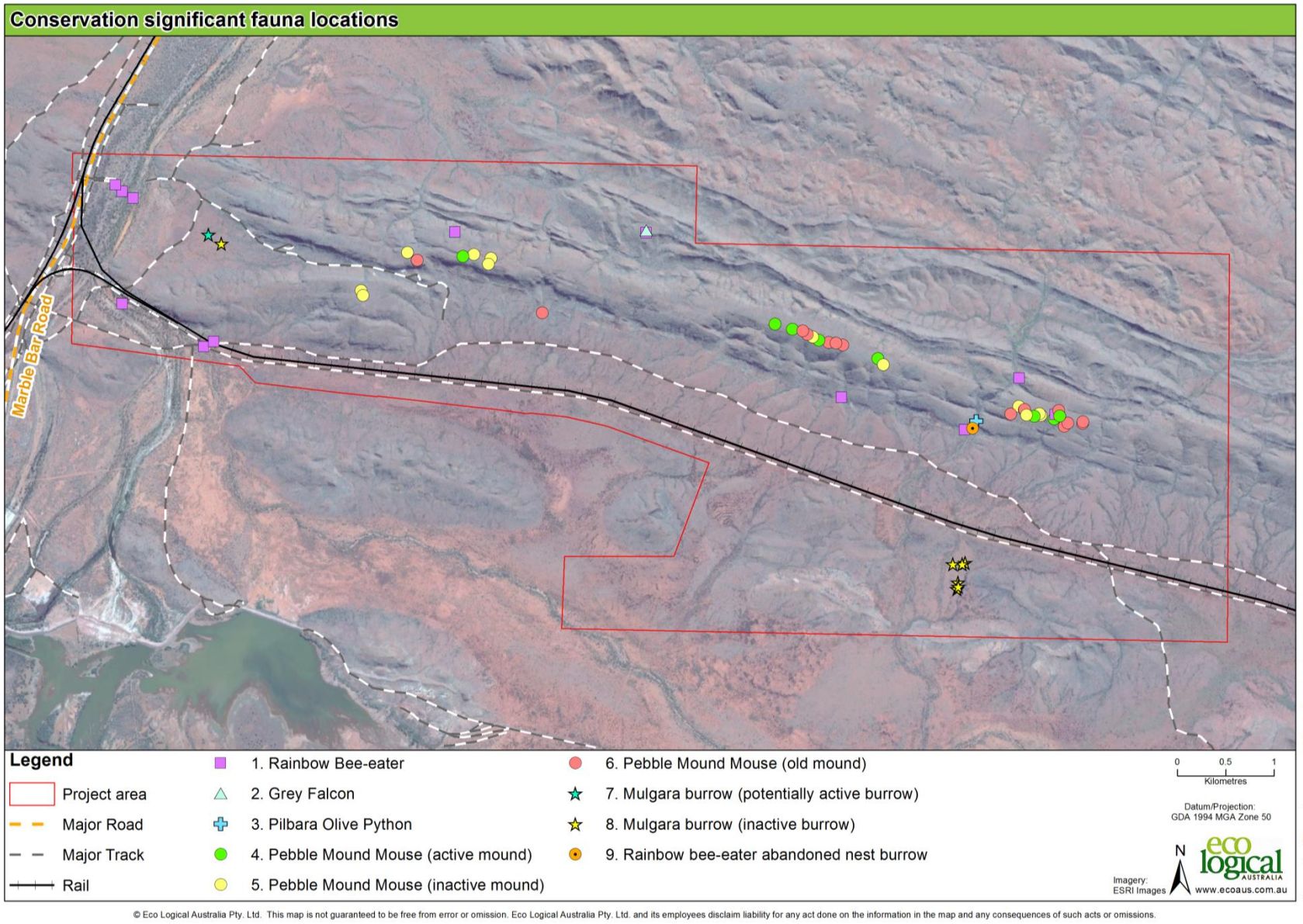

Figure 5: Locations of recorded conservation significant fauna

5.4.1 Likelihood of occurrence of conservation significant species

This likelihood of occurrence table is a compilation of the results of the database searches, literature review, and the field survey (**Table 3**). These sources of information allow the assessment of the likelihood of occurrence of all relevant species based on the fauna habitats mapped.

A total of 37 conservation significant fauna species (four reptiles, 23 birds and 10 mammals) were identified as potentially occurring within the study area. Of these, nine have been classified as unlikely to occur, 19 as having the potential to occur, and three as likely to occur in the Project area. A further six species were recorded within the Project area and have been discussed in detail in **Section 5.4**.

Table 3: Likelihood of occurrence

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS*		LIKELIHOOD OF OCCURRENCE (based on the database searches, literature review, field survey and habitat present within the Project area)
		EPBC ACT	WC ACT / DEC	
Reptiles				
Gane's Blind Snake	*Ramphotyphlops ganei*		P1	**Potential**. Previously recorded within the Newman area. Extensive areas of potential habitat including stony rises and low stony hills, and rocky hill (habitat types 3 and 4 are potential habitat). A cryptic species that can be difficult to detect despite intensive survey effort.
Spotted Skink	*Ctenotus uber johnstonei*		P2	**Unlikely.** Not known to occur within the Pilbara. Occurs in the far north-eastern interior of WA (Wilson and Swan 2010) in the Great Sandy Desert/Tanami biogeographic regions. Several records of this species from the Jimblebar area, listed within the DEC fauna search, may be a result of the taxonomic uncertainty within the species group. These records are likely to be the nominate form *C. uber uber* recorded during a previous survey (ENV 2009a) and erroneously listed as *C. uber johnstonei*.
Burrowing Skink	*Lerista macropisthopus remota*		P2	**Unlikely**. Not recorded during the survey or by the database searches. There are few records of this species from previous fauna surveys, which appears to be restricted to the Robertson Range to the east of the Project area.
Pilbara Olive Python	*Liasis olivaceus barroni*	VU	S1	**Yes**. Recorded within the Project area within habitat type 5.
Birds				
Australian Bustard	*Ardeotis australis*		P4	**Likely**. Has been recorded on numerous occasions within the Newman area and surrounds (DEC 2013b). Open shrubland plains (habitat type 2) within the Project area represents suitable foraging habitat.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS*		LIKELIHOOD OF OCCURRENCE (based on the database searches, literature review, field survey and habitat present within the Project area)
		EPBC ACT	WC ACT / DEC	
Bush-stone Curlew	*Burhinus grallarius*		P4	**Potential**. Suitable foraging habitat including low stony rises and open shrubland plains (habitat types 2 and 3) present. Widespread in the Pilbara region and local records within Newman area and surrounds (DEC 2013b).
Cattle Egret	*Ardea ibis*	M	S3	**Likely**. This species occurs commonly along the river systems within the Pilbara. Has been previously recorded at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area. The riparian habitat associated with the Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable foraging habitat.
Great Egret	*Ardea alba*	M	S3	**Likely**. This species occurs commonly along the river systems within the Pilbara. Has been previously recorded at Ophthalmia Dam on numerous occasions (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.. The riparian habitat associated with the Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable foraging habitat.
Sharp-tailed Sandpiper	*Calidris acuminata*	M	S3	**Potential.** Has been recorded locally at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable, albeit marginal, seasonal foraging habitat.
Curlew Sandpiper	*Calidris ferruginea*	M	S3	**Potential.** Has been recorded locally at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable, albeit marginal, seasonal foraging habitat.
Red-necked Stint	*Calidris ruficollis*	M	S3	**Potential.** Has been recorded locally at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable, albeit marginal, seasonal foraging habitat.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS*		LIKELIHOOD OF OCCURRENCE (based on the database searches, literature review, field survey and habitat present within the Project area)
		EPBC ACT	WC ACT / DEC	
Long-toed Stint	*Calidris subminuta*	M	S3	**Potential.** Has been recorded locally at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable, albeit marginal, seasonal foraging habitat.
Pectoral Sandpiper	*Calidris melanotos*	M	S3	**Unlikely.** No local records exist (DEC 2013a, DEC 2013b, DSEWPaC 2013a). The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable, albeit marginal, seasonal foraging habitat.
White-bellied Sea Eagle	*Haliaeetus leucogaster*	M	S3	**Potential.** Has been recorded locally at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable, albeit marginal, seasonal foraging habitat, given that this species prefers to hunt for fish in open water bodies.
Glossy Ibis	*Plegadis falcinellus*	M	S3	**Potential.** The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable seasonal foraging habitat. This species has been recorded approximately 3 kilometres south of the Project area on several occasions at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.
Common Greenshank	*Tringa nebularia*	M	S3	**Potential**. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable seasonal foraging habitat. This species has been recorded approximately 3 kilometres south of the Project area at Ophthalmia Dam (DEC 2013b) and due to the proximity to the dam this species may fly over the Project area.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS*		LIKELIHOOD OF OCCURRENCE (based on the database searches, literature review, field survey and habitat present within the Project area)
		EPBC ACT	WC ACT / DEC	
Common Sandpiper	*Tringa hypoleucos*	M	S3	**Potential.** The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable seasonal foraging habitat. This species has been recorded approximately 3 kilometres south of the Project area on several occasions at Ophthalmia Dam (DEC 2013b). Due to the proximity to the dam this species may fly over the Project area.
Fork-tailed Swift	*Apus pacificus*	M	S3	**Yes**. Not recorded during this survey, but was recorded during a previous survey in the Project area (*ecologia* 2004a). Is likely to occur at altitude during aerial foraging. Breeding occurs outside the Australian mainland.
Flock Bronzewing	*Phaps histrionica*		P4	**Potential.** Not recorded locally, however open plains (habitat type 2) is potential foraging habitat.
Grey Falcon	*Falco hypoleucos*		P4	**Yes.** Recorded during this survey foraging within rocky hills habitat (habitat type 4).
Marsh Sandpiper	*Tringa stagnatilis*	M	S3	**Potential.** The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable seasonal foraging habitat. This species has been recorded approximately 3 kilometres south of the Project area at Ophthalmia Dam (DEC 2013b). Due to the proximity to the dam this species may fly over the Project area.
Night Parrot	*Pezoporus occidentalis*	CE	S1	**Unlikely**. Previously recorded on northern edge of Fortescue Marsh, but not recorded locally based on DEC database search. Numerous surveys within the Pilbara bioregion have not detected the species. Any local occurrence is considered to be an extremely rare event.
Oriental Plover	*Charadrius veredus*	M	S3	**Potential.** Not recorded locally based on literature review and database searches however it is widespread throughout inland Australia. Open plains (habitat type 2) represents potential foraging habitat.
Peregrine Falcon	*Falco peregrinus*		S4	**Potential.** Recorded locally along the Fortescue River (DEC 2013b). Steep rocky hills and cliffs (habitat type 5) represent potentially suitable nesting habitat. All habitat types within the Project area are potential foraging habitat.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS*		LIKELIHOOD OF OCCURRENCE (based on the database searches, literature review, field survey and habitat present within the Project area)
		EPBC ACT	WC ACT / DEC	
Rainbow Bee-eater	*Merops ornatus*	M	S3	**Yes.** Recorded foraging at several locations within the Project area during the site inspection. No active nesting burrows identified, however creek and river banks (habitat type 1) present are considered potential breeding habitat with historical breeding evidence recorded.
Star Finch	*Neochmia ruficauda subclarescens*		P4	**Potential.** This species has previously been recorded within the Newman area and locally associated with the Ord River and Ophthalmia Dam. Previously recorded within Orebody 24 directly west of the Project area (ENV 2006). The western portion of the Ninga Project area includes riparian emergent reed vegetation along the Ord River which is potential breeding habitat.
Wood Sandpiper	*Tringa glareola*	M	S3	**Potential**. The Fortescue River (habitat type 1) within the western portion of the Project area represents potentially suitable seasonal foraging habitat. This species has been recorded approximately 3 kilometres south of the Project area at Ophthalmia Dam (DEC 2013b).
Mammals				
Black-flanked Rock-wallaby	*Petrogale lateralis lateralis*	VU	S1	**Unlikely**. This species has been recorded locally however records are historic (DEC 2013a). Potentially suitable habitat (habitat type 5) occurs within the Project area however it is considered to be locally extinct within the Newman area, based on the lack of records despite the amount of fauna survey work carried out in the wider Newman area and south-eastern Pilbara.
Ghost Bat	*Macroderma gigas*		P4	**Potential**. Previously recorded within the Eastern Ridge area approximately 8 km from the Project area (ENV 2011a). Caves within habitat type 5 are potentially suitable day or night roosting habitat.
Greater Bilby	*Macrotis lagotis*	VU	S1	**Unlikely**. Not recorded within the Newman area. This species requires extensive areas of sandplain often including red sand dunes. Shrubland plains within the Ninga Project area are generally unsuitable or limited to few small patches due to the presence of expensive stony substrates.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS*		LIKELIHOOD OF OCCURRENCE (based on the database searches, literature review, field survey and habitat present within the Project area)
		EPBC ACT	WC ACT / DEC	
Long-tailed Dunnart	*Sminthopsis longicaudata*		P4	**Potential**. Previously recorded at Whaleback. Extensive areas of potential habitat including stony low slopes and rocky hill (habitat types 4 and 5) within Project area. The paucity of local records suggests this species, if present, occurs in low densities.
Brush-tailed Mulgara	*Dasycercus blythi*		P4	**Yes.** Burrows of this species were identified within the Ninga Project area including a recently occupied or currently active burrow with scats present. Open shrubland plains (habitat type 2) include areas of red sandy loam which is suitable habitat.
Crest-tailed Mulgara	*Dasycercus cristicauda*	V	S1	**Unlikely.** Not known to occur locally.
Northern Quoll	*Dasyurus hallucatus*	EN	S1	**Unlikely**. The site represents the southern edge of the species distribution. Not listed within database searches and the review of numerous relevant local fauna surveys did not record this species. An anecdotal record of a Northern Quoll from Mount Whaleback is likely to be an inadvertent translocation from further north (Morgan O'Connell pers. comm). Otherwise, not recorded locally.
Pilbara Leaf-nosed Bat	*Rhinonicteris aurantia*	VU	S1	**Potential.** Bat calls resembling those of the Pilbara Leaf-nosed Bat *Rhinonicteris aurantia* were recorded during the survey. These calls were fragmented and therefore the identification of this species from the data is ambiguous. It is possible that these call fragments derive from other ultra-high frequency (<100 kHz) calls other than Pilbara Leaf-nosed Bat (Armstrong 2031). Habitat type 5 includes numerous potential day and night roosting caves within the Project area. However, previous surveys within the Newman area have not recorded this species.
Spectacled Hare-wallaby	*Lagorchestes conspicillatus leichardti*		P3	**Unlikely**. Not recorded within the Newman area. Prefers open extensive areas of tall Hummock grassland plains that were not observed with the Project area.
Western Pebble-mound Mouse	*Pseudomys chapmani*		P4	**Yes.** Active pebble mounds were recorded within rocky hill tops (habitat type 4) and have the potential to be present within stony rises and lower stony hill slopes (habitat type 3)

*Likelihood of occurrence: refer to Section 5.4.1
M = species listed as 'migratory' under the EPBC Act.

CE = species listed as ‘critically endangered’ under either the EPBC Act or WC Act.
EN = species listed as ‘endangered’ under either the EPBC Act or WC Act.
VU = species listed as ‘vulnerable’ under either the EPBC Act or WC Act.
S1 = species listed and ‘vulnerable’ or ‘endangered’ under the WC Act.
S3 = migratory birds listed under an international agreement.
S4= species listed as ‘other specially protected fauna’ under the WC Act.
P1 = species considered not currently Threatened but few poorly known populations on Threatened lands.
P2 = species considered not currently Threatened but few poorly known populations on conservation lands.
P3 = species considered not currently Threatened or in need of special protection but populations require monitoring.
P4 = species considered not currently Threatened or in need of special protection but populations require monitoring.

6 Discussion and Summary

The Project area is located in the Eastern Pilbara, approximately 20 km north-east of Newman at the eastern end of the Ophthalmia Range and with the Fortescue River within the western edge. Five broad fauna habitats were identified within the Project area based on substrate and vegetation associations identified. These habitat types generally correspond to elevation within the landscape, geomorphology, and the associated vegetation communities.

Significant habitats identified within the Project area include habitat type 2A which was assessed as suitable habitat for Brush-tailed Mulgara, and caves and water holes within habitat 5. Numerous caves observed could provide potentially suitable daytime or night time roosting for a range of bat species including Pilbara Leaf-nosed Bat and Ghost Bat. The suitability of these caves to be used as roosting sites by these species roosting could not be assessed as entry into caves during this survey was not permitted. Waterholes, caves and gorges supported breeding and foraging habitat for Pilbara Olive Python. A juvenile Pilbara Olive Python was recorded at the entrance of a cave indicating that breeding is likely to occur within the Project area. The cave systems and deeply bisected rocky gorges present within habitat type 5 provide suitable breeding habitat for this species. Several semi-permanent water holes observed during the field survey also provide suitable hunting habitat for Pilbara Olive-Python. Other significant habitats identified included habitat types 1, and 4, which was assessed as habitat for Pilbara Olive Python and Star Finch, and Western Pebble-mound Mouse, respectively.

The condition ratings of habitat types ranged from completely degraded due to habitat clearing associated with infrastructure, to pristine areas. Most of the Project area supported vegetation-soil associations that were assessed as being in excellent to pristine condition. Disturbance characteristics include vegetation clearing and ground disturbance associated with drill activity and infrastructure development.

A total of 75 vertebrate fauna species were recorded including six species of conservation significance. These include Pilbara Olive Python, Rainbow Bee-eater, Fork-tailed Swift, Grey Falcon, Brush-tailed Mulgara and Western Pebble-mound Mouse. One additional species, the Pilbara Leaf-nosed Bat was unconfirmed based on inconclusive bat call data analysis. A number of locally occurring conservation significant species were not recorded during this survey but were assessed as likely to occur based on fauna habitats identified within the Project area. These include Great Egret and Cattle Egret, listed as Migratory under the EPBC Act, and the Australian Bustard, listed as Priority 4 by DPaW.

The Project area is likely to support a number of Pilbara Olive Pythons based on the species being recorded and the extent and variety of rocky habitats suitable for shelter. The connectivity and extent of rocky hills and proximity to the Fortescue River indicate that the Project area would be part of a wider population. Based on the young age of the individual recorded, it is likely that this species breeds within the Project area and is dependent on the steep rocky canyons and cliffs (habitat type 5). There are approximately 338 ha of potential breeding habitat within steep rocky canyons and cliffs of the Project area.

Rainbow Bee-eaters were observed in numerous locations throughout the site. This species is an aerial forager and is considered common and widespread across most of WA. Several abandoned nest burrows were found within a clay creek bank within the Project area, indicating that habitat type 1 is utilised by Rainbow Bee-eater seasonally for breeding. The remainder of the Project area is visited on an at least an occasional basis for foraging.

Fork-tailed Swift was observed during a previous survey foraging at altitude over the Project area (*ecologia* 2004a). It is unlikely that Fork-tailed Swift are dependent on the Project area for foraging, however they are likely to utilise the Project area seasonally on an occasional basis.

A Grey Falcon was observed flying over the Project area and would likely utilise habitat type 1 for foraging and potential breeding habitat, in particular habitat associated with the Fortescue River in the west of the Project area. Although this species is uncommon and sparsely distributed, it is widely distributed and has an extensive foraging range. It is unlikely that the Grey Falcon is dependent on habitat within the Project area.

The Mulgara identification is based on unpublished results of genetic analysis indicating that the Mulgara species occurring widely through the Pilbara, and in particular from nearby surveys in the Eastern Pilbara, is the Brush-tailed Mulgara. Based on the habitat assessment, a comparatively small proportion of the Project area is considered suitable habitat for Brush-tailed Mulgara. This habitat consists of three patches of habitat type 2, low shrubland plains habitat having sandy clay loam substrate supporting *Triodia* which provides suitable burrowing habitat. For the purposes of highlighting the Mulgara habitat from the majority of the low shrubland plains habitat, the Mulgara habitat has been mapped separately as habitat type 2A. It is likely that Brush-tailed Mulgara are dependent on habitat type 2A within the Project area. The remaining areas mapped as low shrubland plains (habitat type 2) have substrates of heavy consolidated clays unsuitable or sub-optimal for Mulgara burrowing.

The Western Pebble-mound Mouse was detected on several hill tops and based on the extent of potentially suitable pebble-strewn hills and lower slopes, there is likely to be more mounds including active mounds based within the Project area. It is likely that this species is dependent on stony rises and lower stony hills (habitat type 3) and rocky hill tops (habitat type 4) within the Project area. There is a combined total of approximately 2371 ha of suitable habitat for this species within habitat type 3 and habitat type 4.

The steep rocky canyons and cliffs (habitat type 5) represents potential day and night roosting cave habitat for both the Ghost Bat and Pilbara Leaf-nosed Bat. Numerous potential caves were noted in this habitat type during fauna habitat assessment and field habitat mapping activities, although investigating caves was beyond the scope of the Level 1 fauna survey. Bat calls resembling those of the Pilbara Leaf-nosed Bat were recorded during the survey. Based on the bat call analysis report (**Appendix F**), these calls were fragmented and thus the identification of this species from the data is ambiguous. It is possible that these call fragments derive from other ultra-high frequency (<100 kHz) bat calls, other than the Pilbara Leaf-nosed Bat. Based on the desktop assessment, the Pilbara Leaf-nosed Bat has not been recorded locally within the eastern Ophthalmia Range, however based on inconclusive bat call identification, their large foraging range and the extent of potential roosting caves, this species' occurrence cannot be ruled out. The Ghost Bat and the Pilbara Leaf-nosed Bat (provided this species is present within the Project area) would be dependent on the steep rocky canyons and cliffs habitat (habitat type 5).

One other target species searched for, was the Northern Quoll. No evidence such as scats or tracks, or motion camera images, of the Northern Quoll was detected even though extensive searches were carried out in areas of potentially suitable habitat. Given the lack of evidence detected during late autumn when Northern Quolls are generally very active and detectable in the lead up to breeding, and given the lack of recent records locally, this species is considered unlikely to occur within the Project area.

A number of EPBC Act listed migratory wetland and shore birds potentially occur within Ophthalmia Dam and the Fortescue River system. However occurrence of these species within the Project area is

considered to be on an occasional or transient basis as these birds would likely fly over the Project area en route to Ophthalmia Dam. The Fortescue River within the western portion represents marginally suitable, non-breeding, seasonal habitat as it lacks extensive mud flats, open shallow water flood plains or tidal shallows that are preferred habitats of the majority of these birds.

The Ninga Project area provides a range of suitable habitats for a diverse assemblage of vertebrate fauna. These habitat types are all well represented within the Pilbara sub-bioregion. Most of the species recorded or likely to occur are known to be common and widespread throughout the Pilbara biogeographic region.

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Appendix A: Conservation Codes

A1 Explanations of conservation classifications, descriptions and codes for Western Australia. IUCN categories and criteria (IUCN 2012)

Categories and criteria are also used for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the WA *Wildlife Conservation Act 1950* (WC Act).

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

Schedules under the *Wildlife Conservation Act 1950*

Category	Definition
Schedule 1 (S1)	Threatened fauna include taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection. Schedule fauna are further ranked according to their level of threat using IUCN (2012) criteria (CR, EN, VU).
Schedule 2 (S2)	Fauna which are presumed to be extinct are declared to be fauna that is in need of special protection. This includes species listed as EX and EW under the IUCN (2012) criteria.
Schedule 3 (S3)	Birds that are subject to an agreement between the government of Australia and the governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, are declared to be fauna that is in need of special protection. This includes Migratory species.
Schedule 4 (S4)	Declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned above. This includes species that are listed as S.

Priority categories used by the Department of Parks and Wildlife (DPaW)

Category	Definition
Priority 1 (P1)	*Poorly-known taxa.* Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
Priority 2 (P2)	*Poorly-known taxa.* Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
Priority 3 (P3)	*Poorly-known taxa.* Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
Priority 4 (P4)	*Rare, Near Threatened and other taxa in need of monitoring.* (a) Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

	(b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Priority 5 (P5)	*Conservation dependent taxa.* Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years..

Appendix B: Fauna Database species list

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Cyclorana maini	Sheep Frog							✓	
Litoria rubella	Desert Tree Frog							✓	✓
Neobatrachus kunapalari	Kunapalari Frog							✓	
Platyplectrum spenceri	Centralian Burrowing Frog							✓	
Pseudophryne douglasi	Gorge Toadlet							✓	
Uperoleia russelli	Northwest Toadlet							✓	
Uperoleia saxatilis	Pilbara Toadlet							✓	
Acanthophis wellsi	Pilbara Death Adder							✓	
Amphibolurus longirostris	Long-snouted Water Dragon							✓	✓
Antaresia perthensis	Pygmy Python							✓	
Antaresia stimsoni	Stimson's Python							✓	
Aspidites melanocephalus	Black-headed Python							✓	
Carlia munda	Rainbow skink							✓	
Carlia triacantha	Rainbow skink							✓	
Cryptoblepharus ustulatus	Russet Snake-eyed Skink							✓	✓
Ctenophorus caudicinctus	Ring-tailed Dragon							✓	✓
Ctenophorus isolepis	Crested Dragon, Military Dragon							✓	✓
Ctenophorus maculatus	Spotted Military Dragon							✓	
Ctenophorus nuchalis	Central Netted Dragon							✓	
Ctenophorus reticulatus	Western Netted Dragon							✓	
Ctenotus ariadnae	skink							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Ctenotus duricola	skink							✓	
Ctenotus grandis	skink							✓	
Ctenotus helenae	skink							✓	
Ctenotus leonhardii	skink							✓	
Ctenotus pantherinus	Leopard Ctenotus							✓	
Ctenotus rubicundus	skink							✓	
Ctenotus saxatilis	Rock Ctenotus							✓	✓
Ctenotus uber	skink							✓	
Ctenotus uber subsp. *johnstonei*	Spotted Ctenotus			P2			✓	✓	
Cyclodomorphus melanops	Slender Blue-tongue							✓	✓
Delma butleri	legless lizard							✓	
Delma haroldi	legless lizard							✓	
Delma nasuta	legless lizard							✓	
Delma pax	legless lizard							✓	
Demansia psammophis	Yellow-faced Whip Snake							✓	
Diplodactylus conspicillatus	Fat-tailed Gecko							✓	
Diplodactylus savagei	Pilbara Beak-faced Gecko							✓	
Egernia cygnitos	Pilbara Pygmy Spiny-tailed Skink							✓	
Egernia formosa	skink							✓	
Furina ornata	Moon Snake							✓	
Gehyra pilbara	gecko							✓	
Gehyra punctata	gecko							✓	✓
Gehyra variegata	gecko							✓	
Heteronotia binoei	Bynoe's Gecko							✓	✓

Species		Conservation Status			Database searches				ELA 2013 survey
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	
Lerista bipes	burrowing skink							✓	
Lerista muelleri	burrowing skink							✓	
Lerista neander	burrowing skink							✓	
Lerista zietzi	burrowing skink							✓	✓
Lialis burtonis	Burton's Legless Lizard							✓	✓
Liasis olivaceus subsp. *barroni*	Pilbara Olive Python	NE	VU	S1		✓	✓	✓	✓
Lucasium stenodactylum	gecko							✓	
Lucasium wombeyi	gecko							✓	✓
Menetia greyii	skink							✓	
Morethia ruficauda	Firetail Skink							✓	✓
Morethia ruficauda exquisita	skink							✓	
Nephrurus wheeleri cinctus	knob-tailed gecko							✓	
Oedura marmorata	Marbled Velvet Gecko							✓	✓
Pseudechis australis	Mulga Snake								✓
Pseudonaja mengdeni	Western Brown Snake							✓	
Pseudonaja nuchalis	Gwardar, Northern Brown Snake							✓	
Pygopus nigriceps	legless lizard							✓	
Ramphotyphlops ammodytes	Blind snake							✓	
Ramphotyphlops ganei	Gane's Blind Snake			S1			✓	✓	
Ramphotyphlops grypus	Blind snake							✓	
Ramphotyphlops hamatus	Blind snake							✓	
Rhynchoedura ornata	Western Beaked Gecko							✓	
Strophurus elderi	Gecko							✓	
Strophurus wellingtonae	Gecko							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Tiliqua multifasciata	Central Blue-tongue							✓	
Varanus acanthurus	Spiny-tailed Monitor							✓	
Varanus caudolineatus	Stripe-tailed Monitor							✓	
Varanus giganteus	Perentie								✓
Varanus gouldii	Bungarra, Sand Monitor							✓	
Varanus pilbarensis	Pilbara Rock Monitor							✓	
Varanus tristis	Black-tailed Monitor							✓	
Vermicella snelli	Bandy Bandy							✓	
Acanthagenys rufogularis	Spiny-cheeked Honeyeater							✓	✓
Acanthiza apicalis	Inland Thornbill							✓	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill							✓	✓
Acanthiza robustirostris	Slaty-backed Thornbill							✓	
Acanthiza uropygialis	Chestnut-rumped Thornbill							✓	
Accipiter cirrocephalus	Collared Sparrowhawk							✓	
Accipiter fasciatus	Brown Goshawk							✓	
Acrocephalus australis	Australian Reed Warbler							✓	
Actitis hypoleucos	Common Sandpiper		M	S3			✓	✓	
Aegotheles cristatus	Australian Owlet-nightjar							✓	
Amytornis striatus whitei	Striated Grasswren							✓	
Anas gracilis	Grey Teal							✓	
Anas rhynchotis	Australasian Shoveler							✓	
Anas superciliosa	Pacific Black Duck							✓	
Anseranas semipalmata	Magpie Goose							✓	
Anthus australis	Australian Pipit							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Apus pacificus	Fork-tailed Swift		M	S3		✓			
Aquila audax	Wedge-tailed Eagle							✓	
Ardea ibis	Cattle Egret		M	S3		✓	✓	✓	
Ardea intermedia	Intermediate Egret							✓	
Ardea modesta	Eastern Great Egret		M	S3		✓	✓	✓	
Ardea novaehollandiae	White-faced Heron							✓	
Ardea pacifica	White-necked Heron							✓	
Ardeotis australis	Australian Bustard	LC		P4			✓	✓	
Artamus cinereus	Black-faced Woodswallow							✓	
Artamus minor	Little Woodswallow							✓	✓
Artamus personatus	Masked Woodswallow							✓	
Artamus superciliosus	White-browed Woodswallow							✓	
Aythya australis	Hardhead							✓	
Burhinus grallarius	Bush Stone-curlew	LC		P4			✓	✓	
Cacatua roseicapilla	Galah							✓	✓
Cacatua sanguinea	Little Corella							✓	✓
Cacomantis pallidus	Pallid Cuckoo							✓	✓
Calidris acuminata	Sharp-tailed Sandpiper		M	S3			✓	✓	
Calidris ferruginea	Curlew Sandpiper		M	S3			✓	✓	
Calidris ruficollis	Red-necked Stint		M	S3			✓	✓	
Calidris subminuta	Long-toed Stint		M	S3			✓	✓	
Certhionyx variegatus	Pied Honeyeater							✓	
Charadrius melanops	Black-fronted Dotterel							✓	
Charadrius ruficapillus	Red-capped Plover							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Charadrius veredus	Oriental Plover		M	S3		✓			
Chenonetta jubata	Australian Wood Duck							✓	
Cheramoeca leucosternus	White-backed Swallow							✓	
Chrysococcyx basalis	Horsfield's Bronze Cuckoo							✓	
Chrysococcyx osculans	Black-eared Cuckoo							✓	✓
Cincloramphus cruralis	Brown Songlark							✓	
Cincloramphus mathewsi	Rufous Songlark							✓	
Circus approximans	Swamp Harrier							✓	
Circus assimilis	Spotted Harrier							✓	
Cladorhynchus leucocephalus	Banded Stilt							✓	
Climacteris melanura subsp. *wellsi*	Black-tailed Treecreeper							✓	
Colluricincla harmonica subsp. *rufiventris*	Grey Shrike-thrush							✓	✓
Coracina novaehollandiae subsp. *subpallida*	Black-faced Cuckoo-shrike							✓	
Corvus bennetti	Little Crow							✓	
Corvus orru	Torresian Crow							✓	✓
Coturnix pectoralis	Stubble Quail							✓	
Coturnix ypsilophora	Brown Quail							✓	
Cracticus nigrogularis	Pied Butcherbird							✓	✓
Cracticus tibicen	Australian Magpie							✓	✓
Cracticus torquatus	Grey Butcherbird							✓	
Cygnus atratus	Black Swan							✓	
Dacelo leachii	Blue-winged Kookaburra							✓	
Dendrocygna arcuata	Chestnut Whistling Duck							✓	
Dendrocygna eytoni	Plumed Whistling Duck							✓	

Species		Conservation Status			Database searches				ELA 2013 survey
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	
Dicaeum hirundinaceum	Mistletoebird							✓	
Dromaius novaehollandiae	Emu							✓	
Elanus axillaris	Black-shouldered Kite								✓
Emblema pictum	Painted Finch							✓	✓
Epthianura tricolor	Crimson Chat							✓	
Eremiornis carteri	Spinifex-bird							✓	✓
Eurostopodus argus	Spotted Nightjar							✓	
Falco berigora subsp. *berigora*	Brown Falcon							✓	✓
Falco cenchroides	Australian Kestrel							✓	✓
Falco hypoleucos	Grey Falcon			S1					✓
Falco longipennis	Australian Hobby							✓	
Falco peregrinus	Peregrine Falcon	LC		S4			✓	✓	
Fulica atra	Eurasian Coot							✓	
Gallirallus philippensis	Buff-banded Rail							✓	
Geopelia cuneata	Diamond Dove							✓	
Geopelia striata placida	Peaceful Dove							✓	✓
Geophaps plumifera	Spinifex Pigeon							✓	✓
Gerygone fusca	Western Gerygone							✓	✓
Grallina cyanoleuca	Magpie-lark							✓	✓
Haliaeetus leucogaster	White-bellied Sea-Eagle		M	S3			✓	✓	
Haliastur sphenurus	Whistling Kite							✓	✓
Hamirostra melanosternon	Black-breasted Buzzard							✓	
Himantopus himantopus	Black-winged Stilt							✓	
Hirundo ariel	Fairy Martin							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Hirundo neoxena	Welcome Swallow							✓	
Lacustroica whitei	Grey Honeyeater							✓	
Lalage tricolor	White-winged Triller							✓	
Lichenostomus keartlandii	Grey-headed Honeyeater								✓
Lichenostomus penicillatus	White-plumed Honeyeater								✓
Lichenostomus virescens	Singing Honeyeater								✓
Lichmera indistincta	Brown Honeyeater							✓	
Malacorhynchus membranaceus	Pink-eared Duck							✓	
Malurus lamberti	Variegated Fairy-wren							✓	
Malurus leucopterus	White-winged Fairy-wren							✓	
Malurus sp.	Fairy-wren (unmarked female)								✓
Manorina flavigula	Yellow-throated Miner							✓	✓
Megalurus gramineus	Little Grassbird							✓	
Melithreptus gularis	Black-chinned Honeyeater							✓	
Melopsittacus undulatus	Budgerigar							✓	
Merops ornatus	Rainbow Bee-eater		M	S3		✓	✓	✓	✓
Milvus migrans	Black Kite							✓	✓
Mirafra javanica	Horsfield's Bushlark							✓	
Neochmia ruficauda subclarescens	Star Finch (western)			P4				✓	
Ninox connivens	Barking Owl							✓	
Ninox novaeseelandiae subsp. boobook	Boobook Owl							✓	
Nycticorax caledonicus	Rufous Night Heron							✓	
Nymphicus hollandicus	Cockatiel							✓	✓
Ocyphaps lophotes	Crested Pigeon							✓	✓

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Oreoica gutturalis	Crested Bellbird							✓	✓
Pachycephala rufiventris	Rufous Whistler							✓	✓
Pardalotus rubricatus	Red-browed Pardalote							✓	
Pardalotus striatus	Striated Pardalote							✓	
Pelecanus conspicillatus	Australian Pelican							✓	✓
Petroica goodenovii	Red-capped Robin							✓	
Phalacrocorax carbo	Great Cormorant							✓	
Phalacrocorax sulcirostris	Little Black Cormorant							✓	
Phalacrocorax varius	Pied Cormorant							✓	
Phaps chalcoptera	Common Bronzewing							✓	
Platalea flavipes	Yellow-billed Spoonbill							✓	
Platalea regia	Royal Spoonbill							✓	✓
Platycercus zonarius	Australian Ringneck							✓	
Plegadis falcinellus	Glossy Ibis			M			✓	✓	
Podargus strigoides	Tawny Frogmouth							✓	
Podiceps cristatus	Great Crested Grebe							✓	
Poliocephalus poliocephalus	Hoary-headed Grebe							✓	
Pomatostomus superciliosus	White-browed Babbler							✓	
Pomatostomus temporalis	Grey-crowned Babbler							✓	✓
Porphyrio porphyrio	Purple Swamphen							✓	
Porzana pusilla	Baillon's Crake							✓	
Porzana tabuensis	Spotless Crake							✓	
Psophodes occidentalis	Chiming Wedgebill							✓	
Recurvirostra novaehollandiae	Red-necked Avocet							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Rhipidura leucophrys	Willie Wagtail							✓	✓
Smicrornis brevirostris	Weebill							✓	✓
Stictonetta naevosa	Freckled Duck							✓	
Stiltia isabella	Australian Pratincole							✓	
Sugomel niger	Black Honeyeater							✓	
Tachybaptus novaehollandiae	Australasian Grebe							✓	
Tadorna tadornoides	Australian Shelduck							✓	
Taeniopygia guttata	Zebra Finch							✓	✓
Threskiornis molucca	Australian White Ibis							✓	
Threskiornis spinicollis	Straw-necked Ibis							✓	
Todiramphus pyrrhopygius	Red-backed Kingfisher							✓	✓
Todiramphus sanctus	Sacred Kingfisher							✓	✓
Tringa glareola	Wood Sandpiper		M	S3			✓	✓	
Tringa nebularia	Common Greenshank		M	S3			✓	✓	
Tringa stagnatilis	Marsh Sandpiper		M	S3			✓	✓	
Turnix velox	Little Button-quail							✓	✓
Tyto alba subsp*. delicatula*	Barn Owl							✓	
Bos taurus	Cattle							✓	✓
Camelus dromedarius	Camel					✓		✓	✓
Canis lupus	Dog/ Dingo					✓		✓	✓
Chalinolobus gouldii	Gould's Wattled Bat							✓	✓
Dasycercus blythi	Brush-tailed Mulgara	LC		P4					✓
Dasykaluta rosamondae	Little Red Kaluta							✓	
Dasyurus hallucatus	Northern Quoll	EN	EN	S1		✓			

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Equus asinus	Donkey					✓		✓	
Equus caballus	Horse					✓			
Felis catus	Cat					✓		✓	
Macroderma gigas	Ghost Bat	VU		P4	✓		✓	✓	
Macropus robustus	Euro							✓	✓
Macropus rufus	Red Kangaroo							✓	
Macrotis lagotis	Greater Bilby	VU	VU	VU	✓	✓			
Mus musculus	House Mouse					✓		✓	
Ningaui timealeyi	Pilbara Ningaui							✓	
Notomys alexis	Spinifex Hopping-mouse							✓	
Notoryctes caurinus	Northern Marsupial Mole	DD	EN	EN	✓	✓			
Nyctophilus geoffroyi	Lesser Long-eared Bat							✓	
Nyctophilus sp.	Long-eared Bat								✓
Oryctolagus cuniculus	Rabbit					✓		✓	✓
Petrogale lateralis lateralis	Black-footed Rock-wallaby	NT		S1			✓	✓	
Petrogale rothschildi	Rothschild's Rock Wallaby								✓
Pseudantechinus roryi	Rory's Pseudantechinus							✓	
Pseudantechinus woolleyae	Woolley's Pseudantechinus							✓	
Pseudomys chapmani	Western Pebble-mound Mouse	LC		P4			✓	✓	✓
Pseudomys hermannsburgensis	Sandy Inland Mouse							✓	
Rhinonicteris aurantia	Pilbara Leaf-nosed Bat	LC	VU	VU		✓			NC
Saccolaimus flaviventris / Chaerephon jobensis	Yellow-bellied Sheath-tailed Bat / Northern Free-tailed Bat							✓	NC
Scotorepens greyii	Little Broad-nosed Bat							✓	✓
Sminthopsis macroura	Stripe-faced Dunnart							✓	

Species		Conservation Status			Database searches				
Species name	Common name	IUCN	EPBC Act	WC Act/ DEC	IUCN	EPBC	DEC	NatureMap	**ELA 2013 survey**
Sminthopsis youngsoni	Lesser Hairy-footed Dunnart							✓	
Taphozous australis	Coastal Sheath-tailed Bat								✓
Taphozous georgianus	Common Sheath-tailed Bat							✓	✓
Tachyglossus aculeatus	Short-beaked Echidna							✓	✓
Vespadelus finlaysoni	Finlayson's Cave Bat							✓	✓
Vulpes vulpes	Red Fox					✓			
Zyzomys argurus	Common Rock-rat							✓	

✓ = Recorded during survey .
NC = identification not confirmed based on bat call recordings.
M = species listed as 'migratory' under the EPBC Act.
VU = species listed as 'vulnerable' under either the IUCN red list or EPBC Act.
EN = species listed as 'endangered' under either the IUCN red list or EPBC Act.
CE = species listed as 'critically endangered' under either the IUCN red list or EPBC Act.
S1 = Schedule 1: Fauna that is rare or is likely to become extinct listed under the WC Act.
S2 = Schedule 2: Fauna presumed to be extinct under the WC Act.
S3 = Schedule 3: Migratory birds protected under an international agreement listed under the WC Act.
S4 = Schedule 4 : specially protected fauna under the WC Act.
P1 = poorly known taxa.
P2 = poorly known taxa.
P3 = poorly known taxa.
P4 = Rare, Near Threatened and other taxa in need of monitoring

Appendix C: Conservation significant fauna desktop review

Species	Conservation Status			Current survey (ELA 2013)	Previous surveys																							
	IUCN	FEDERAL	STATE		Ecologia 1995	Ecologia 2004a	Ecologia 2004b	Ecologia 1996a	Ecologia 1996b	Eco Logical 2012	ENV 2006	ENV 2007a	ENV 2007b	ENV 2009a	ENV 2009b	ENV 2011a	ENV 2011b	ENV 2011c	ENV 2012	Biologic 2009	Biologic 2013	Biota 2001	GHD 2008a	GHD 2008b	Outback Ecology 2009a	Outback Ecology 2009b	Outback Ecology 2009c	Onshore & Biologic 2009
Reptiles																												
Burrowing Skink (*Lerista macropisthopus* subsp. *remota)*			P2			x				x		x	x		x											x	x	
Gane's Blind Snake *(Ramphotyphlops ganei)*			P1	x		x				x	x	x	x	x	x	x	x	x	x		x		x	x	x	✓	x	x
Great Desert Skink *(Liopholis kintorei)*		VU																								x	x	
Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni)*		VU	S1	✓		x	✓	✓	x	x	✓	x	x	x	x	✓		x	x			✓	x	x	x	x	x	x
Spotted Ctenotus (Ctenotus uber subsp. *johnstonei)*			P2	x			x				x			x							x							
Birds																												
Australian Bustard (*Ardeotis australis*)			P4	x		x	x			✓	x	x	x	x	x	✓	✓	✓	✓		x		x	x	✓	✓	x	✓
Black-tailed Godwit (*Limosa limosa*)		M	S3							✓						✓	✓	✓	✓						✓	x		
Bar-tailed Godwit (*Limosa lapponica*)		M	S3							✓						✓	✓	✓	✓						✓	x		
Bush-stone Curlew (*Burhinus grallarius*)			P4	x	x		x			x	x	x	x	x	x	x	x	x	x		x				✓	x	x	x
Cattle Egret (*Ardea ibis*)		M	S3	x						x						x	x				x		x	x	x	x	x	x
Caspian Tern (*Sterna caspia*)		M																							x			
Common Greenshank (*Tringa nebularia*)		M	S3	x						x											x				x			
Common Sandpiper (*Tringa hypoleucos*)		M	S3	x					x	x					x	x	x	✓	x		x				x	x	x	x

Species	Conservation Status			Current survey (ELA 2013)	Previous surveys																							
	IUCN	FEDERAL	STATE		Ecologia 1995	Ecologia 2004a	Ecologia 2004b	Ecologia 1996a	Ecologia 1996b	Eco Logical 2012	ENV 2006	ENV 2007a	ENV 2007b	ENV 2009a	ENV 2009b	ENV 2011a	ENV 2011b	ENV 2011c	ENV 2012	Biologic 2009	Biologic 2013	Biota 2001	GHD 2008a	GHD 2008b	Outback Ecology 2009a	Outback Ecology 2009b	Outback Ecology 2009c	Onshore & Biologic 2009
Curlew Sandpiper (*Calidris ferruginea*)		M	S3	x																	x				x	x		
Flock Bronzewing (*Phaps histrionica*)			P4								x	x	x															
Fork-tailed Swift (*Apus pacificus*)		M	S3	x		✓	x		x	x	x				x	x	✓	x	x		x		x		x	x	x	x
Glossy Ibis (*Plegadis falcinellus*)		M	S3	x													x				x				x	x		
Great Egret (*Ardea modesta*)		M	S3	x					x	✓				x	x	x	x	✓	✓		x	✓	x	x		x	x	x
Grey Falcon (*Falco hypoleucos*)			S1	✓					x	x	x	x	x	x								✓	x	x		x	x	x
Little Curlew (*Numenius minutus*)		M	S3																			✓				x		
Long-toed Stint (*Calidris subminuta*)		M	S3	x																	x			x	x	x	x	x
Marsh Sandpiper (*Tringa stagnatilis*)		M	S3	x						x											x				x	x		
Night Parrot (*Pezoporus occidentalis*)	EN	EN	S1			x	x			x	x	x	x														x	
Oriental Plover (*Charadrius veredus*)		M	S3	x						x						x			x		x		x	x	x	x	x	x
Pectoral Sandpiper (*Calidris melanotos*)		M	S3																					x		x	x	x
Peregrine Falcon (*Falco peregrinus*)			S4	x	✓	x	x		✓	x	x	x	✓	x	x	✓	x	x	✓					✓	x	x	x	
Princess Parrot (*Polytelis alexandrae*)			P4		✓	✓			✓							✓			✓					✓			x	
Rainbow Bee-eater (*Merops ornatus*)		M	S3	✓		✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	x	✓	✓	✓	x		x	x	✓	✓	x	x
Red-necked Stint (*Calidris ruficollis*)		M	S3	x																	x				x	x		
Sharp-tailed Sandpiper (*Calidris acuminata*)		M	S3	x			✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	x			x	x	x	x	x
Star Finch (*Neochmia ruficauda subclarescens*)			P4	x						x	✓	x	x	x	✓	✓	x	x	x	✓					x	✓	x	✓
Striated Grass-wren (*Amytornis striatus whitei*)			P4	x							✓	✓	✓			✓				✓					x	x	x	

Species	Conservation Status			Current survey (ELA 2013)	Previous surveys																						
	IUCN	FEDERAL	STATE		Ecologia 1995	Ecologia 2004a	Ecologia 2004b	Ecologia 1996a	Ecologia 1996b	Eco Logical 2012	ENV 2006	ENV 2007a	ENV 2007b	ENV 2009a	ENV 2009b	ENV 2011a	ENV 2011b	ENV 2011c	ENV 2012	Biologic 2009	Biologic 2013	Biota 2001	GHD 2008a	GHD 2008b	Outback Ecology 2009a	Outback Ecology 2009b	Outback Ecology 2009c	Onshore & Biologic 2009
White-bellied Sea-eagle (*Haliaeetus leucogaster*)		M	S3	**x**							✓	✓	✓			✓				✓	x				x	x		
Wood Sandpiper (*Tringa glareola*)		M	S3	**x**					x	x						x	x	x	x		x				x	x		
Mammals																												
Black-flanked Rock Wallaby (*Petrogale lateralis lateralis)*		VU	S1	**x**			x			x	x		x		x	✓					x		x	x	x	x	x	x
Ghost Bat (*Macroderma gigas*)	VU		P4	**x**		✓	✓	✓	✓	x	✓	x	x	x	x	✓	x	x	x		x	✓		x	x	x	x	x
Greater Bilby (*Macrotis lagotis*)	VU	VU	S1	**x**		x				x	x										x		x	x		x	x	x
Lakeland Downs Mouse (*Leggadina lakedownensis*)			P4									x																
Lesser Stick-nest Rat (*Leporillus apicalis*)	CE		S2																							x x		
Long-tailed Dunnart (*Sminthopsis longicaudata*)			P4							x	x		x	x	x	x				x	x	✓		x		x	x	x
Brush-tailed Mulgara (*Dasycercus blythi*)			P4	✓																		✓						
Mulgara (*Dasycercus cristicauda*)		VU	S1							x	x		x														x	
Northern Marsupial Mole (*Notoryctes caurinus*)		EN	S1	**x**																							x	
Northern Quoll (*Dasyurus hallucatus*)	EN	EN	S1	**x**		x				x	x	x	x			x	x	x	x		x							x
Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*- Pilbara Form)		VU	S1	**NC**		x	x			x	x			x	x	x	x	x	x		x	✓	x	x	x	x	x	x
Spectacled Hare Wallaby (*Lagorchestes conspicillatus leichardti*)			P3		✓	✓	✓	✓	✓	x	x	x	x			✓						✓			x	x	x	
Western Pebble-mound Mouse			P4	✓	✓	✓	✓	✓	✓	x	✓	x	x	x	x	✓	✓	x	✓	x	x	✓	✓	✓	✓	✓	x	✓

Species	Conservation Status			Current survey (ELA 2013)	Previous surveys																						
	IUCN	FEDERAL	STATE		Ecologia 1995	Ecologia 2004a	Ecologia 2004b	Ecologia 1996a	Ecologia 1996b	Eco Logical 2012	ENV 2006	ENV 2007a	ENV 2007b	ENV 2009a	ENV 2009b	ENV 2011a	ENV 2011b	ENV 2011c	ENV 2012	Biologic 2009	Biologic 2013	Biota 2001	GHD 2008a	GHD 2008b	Outback Ecology 2009a	Outback Ecology 2009b	Outback Ecology 2009c	Onshore & Biologic 2009
(*Pseudomys chapmani*)																											

✓ = Recorded during survey .
NC = species identification not confirmed based on bat call data
x= not recorded during survey but noted within desktop review of this report.
xx = likely to be erroneous record for Pilbara region.
M = species listed as 'migratory' under the EPBC Act.
VU = species listed as 'vulnerable' under either the IUCN red list or EPBC Act.
EN = species listed as 'endangered' under either the IUCN red list or EPBC Act.
CE = species listed as 'critically endangered' under either the IUCN red list or EPBC Act.
S1 = Schedule 1: Fauna that is rare or is likely to become extinct listed under the WC Act.
S2 = Schedule 2: Fauna presumed to be extinct under the WC Act.
S3 = Schedule 3: Migratory birds protected under an international agreement listed under the WC Act.
S4 = Schedule 4 : specially protected fauna under the WC Act.
P1 = poorly known taxa.
P2 = poorly known taxa.
P3 = poorly known taxa.
P4 = Rare, Near Threatened and other taxa in need of monitoring.

Appendix D: Fauna photographs

Pilbara Olive Python

(EPBC Act Vulnerable, WC Act Schedule 1)

Potential Brush-tailed Mulgara burrows

(DEC Priority 4)

Brush-tailed Mulgara scat outside a burrow

(DEC Priority 4)

Active Western Pebble-mound Mouse mound

(DEC Priority 4)

Rainbow Bee-eater

(EPBC Act Migratory, WC Act Schedule 3)

Disuded Rainbow Bee-eater burrows

(EPBC Act Migratory, WC Act Schedule 3)

Appendix E: Habitat assessment data forms

FAUNA HABITAT SURVEY DATA SHEET 1

Location: Ninga **Site # (waypoint #):** 001 **Date:** 10/05/2013

Observer: RBC, EL **GPS Location:** 794038E 7418739N

Search time: 7:30am **Photo #:** 2201 **Site Dimensions:** 50 x 50 m

Broad Habitat: 1. Rivers and major creeks. Riparian habitat. Major creeks and rivers associated with the Fortescue system supporting fringing Eucalyptus/Acacia woodlands, mixed hummock and tussock grasslands on alluvial sandy clays.

Landscape position: Low

Broad Floristic Formation: Riparian emergent reeds / Cyperus / Chloris / Typhas. Some Eucalyptus, Acacia and Melaleuca.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallee: 0
Shrubs >2m: 5
Shrubs <2m: 5
Hummock grasses: 0
Tussock grasses: 0
Herbs: 5

Photo 1: Habitat Type 1 Waypoint #001 Ninga ELA 10052013

Soil type & colour: red
Rock type & size: coarse river sand / loam
Rocky outcrops: None

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size**: 1 cm
Fallen logs (% cover): 1 **Average size**: 15 cm
Hollow-bearing trees (abundance): 1 **Average size:** 15 cm
Dead stags (abundance)**:** 3 **Average Dimension:** 5 m x 20 cm

Water bodies (present/absent): No surface water but damp creek bed

Caves (present/absent): Absent

Nests or Roosts (present/absent): *Eucalyptus camaldulensis*, hollows, shrubs. Typha / sedges / reeds

Disturbances (present/absent): Weed (couch), some low herbs, livestock.

Ecological processes important to habitat (present/absent): Seasonal water flow and erosion.

FAUNA HABITAT SURVEY DATA SHEET 2

Location: Ninga **Site # (waypoint #):** 004 **Date:** 10/05/2012

Observer: RBC, EL **GPS Location:** 793223E 7420335N

Search time: 9:05am **Photo #:** 2202 **Site Dimensions:** 50 x 50 m

Broad Habitat: 1. Riparian habitat. Major creeks and rivers associated with the Fortescue system supporting fringing *Eucalyptus/Acacia* woodlands, mixed hummock and tussock grasslands on alluvial sandy clays.

Landscape position: Low

Basic Floristic Formation: Riparian, *Eucalyptus camaldulensis*, *Acacia* spp., *Melaleuca* spp., *Cyperus* sedges, *Triodia* grasses.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 10
Trees <10m: 10
Mallees: 0
Shrubs >2m: 15
Shrubs <2m: 5
Hummock grasses: 5
Herbs: <1
Tussock grasses: 30

Photo 2: Habitat Type 1 Waypoint #004 Ninga ELA 10052013

Soil type & colour: Red coarse RV sand
Rock type: Calcrete, ironstone wash
Rock size: >15 cm pebble
Rocky outcrops: Calcrete in creek bed

Leaf litter (% cover): 7
Twig litter (% cover): 2 **Average size**: 1 cm
Fallen logs (% cover): 4 **Average size**: 15 cm
Hollow-bearing trees (abundance): 8 **Average size:** 20 cm
Dead stags (abundance): 2 **Average Dimension**: 10m x 7cm

Water bodies (present/absent): No surface water but seasonally flooding. No moisture.

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): Abundant trees, canopy, and hollows. Sparse shrub layer (for nesting).

Disturbances (present/absent): Cattle, some 4x4 vehicle tracks, Buffel grass

Ecological processes important to habitat (present/absent): Seasonal water flow, erosion, deposition.

FAUNA HABITAT SURVEY DATA SHEET 3

Location: Ninga **Site # (waypoint #)**: 017 **Date:** 11/5/2013

Observer: EL / RBC **GPS Location:** 802599E 7418968N

Search time: 2:00pm **Photo #:** 2265-2266 **Site Dimensions:** 20 x 20 m

Broad Habitat: 1. Riparian habitat. Major creeks and rivers associated with the Fortescue system supporting fringing Eucalyptus/Acacia woodlands, mixed hummock and tussock grasslands on alluvial sandy clays.

Landscape position: Low

Broad Floristic Formation: Sparse *Eucalyptus camaldulensis* over *Acacia* shrubs, over *Triodia* grasses including exotic grasses & forbs.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallees: 0
Shrubs >2m: 10
Shrubs <2m: 15
Hummock grasses: 5
Herbs: <5
Tussock grasses: 20

Photo 3: Habitat Type 1 Waypoint # 017 Ninga ELA 11052013

Soil type & colour: Red coarse river sand
Rock type: Mixed river stones
Rock size: 5 cm
Rocky outcrops: No

Leaf litter (% cover): 15
Twig litter (% cover): <5 **Average size**: 5-10mm
Fallen logs (% cover): 4 **Average size**: 5-10 cm
Hollow bearing trees (abundance): None **Average size:** N/A
Dead stags (abundance): None **Average Dimension**: N/A

Water bodies (present/absent): Seasonal creek, dry at time of survey.

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): Few Eucalypts and dense shrubland. One nest present.

Disturbances (present/absent): Buffel grass

Ecological processes important to habitat (present/absent): Seasonal rain and flooding, fire and erosion.

FAUNA HABITAT SURVEY DATA SHEET 4

Location: Ninga **Site # (waypoint #)**: 024 **Date:** 12/5/2013

Observer: RBC/EL **GPS Location:** -804543E 7415918N

Search time: 9:30am **Photo #:** 2283-2285 **Site Dimensions:** 20 x 20 m

Broad Habitat: 2. Shrubland plains. Open sandy clam loam and pebble clay loam plains supporting sparse mixed *Eucalyptus* and *Corymbia* woodlands over open mixed *Acacia* and *Grevillia* shrubland over open *Triodia* hummock grasslands, and sparse low mixed grass and shrubs.

Landscape position: Low

Broad Floristic Formation: Open / sparse *Corymbia* over mixed low *Acacia* shrubland over *Triodia* and mixed grasses.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallee: <5
Shrubs >2m: 5
Shrubs <2m: 5
Hummock grasses: 30
Herbs: 0
Tussock grasses: 1

Photo 4: Habitat Type 2 Waypoint # 24 Ninga ELA 12052013

Soil type & colour: Red stony clay loam
Rock type: Mixed ironstone
Rock size: 10-50 mm
Rocky outcrops: nil

Leaf litter (% cover): 5
Twig litter (% cover): 1 **Average size:** 10mm
Fallen logs (% cover): 0 **Average size**: N/A
Hollow bearing trees (abundance): 0 **Average size:** N/A
Dead stags (abundance): 2 **Average Dimension:** 5 m x 20 cm

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): None visible

Disturbances (present/absent): Light cattle activity, some tracks.

Ecological processes important to habitat (present/absent): Occasional flooding and seasonal rainfall

FAUNA HABITAT SURVEY DATA SHEET 5

Location: Ninga **Site # (waypoint #)**: 023 **Date:** 11/05/2013

Observer: RBC/EL **GPS Location:** 802499E 7416904N

Search time: 08:00am **Photo #:** 2280-2282 **Site Dimensions:** 20 x 20 m

Broad Habitat: 2. Shrubland plains. Open sandy clam loam and pebble clay loam plains supporting sparse mixed Eucalyptus and Corymbia woodlands over open mixed *Acacia* and *Grevillia* shrubland over open *Triodia* hummock grasslands, and sparse low mixed grass and shrubs.

Landscape position: Low

Broad Floristic Formation: Scattered trees of *Eucalyptus* sp. over high open shrubland of *Grevillea* and *Acacia* spp. over hummock grassland of *Triodia* spp. on red stony clay on plains and lower slopes.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 1
Trees <10m: 5
Mallees: 5
Shrubs >2m: 10
Shrubs <2m: 5
Hummock grasses: <5
Herbs: 0
Tussock grasses: 5

Photo 5: Habitat Type 2 Waypoint # 023 Ninga ELA 11052013

Soil type & colour: Red clay loam on fine gravel
Rock type: scattered mixed pebbles (ironstone)
Rock size: 5-10 mm
Rocky outcrops: nil

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size:** 10mm
Fallen logs (% cover): 3 **Average size:** 12 cm (diameter)
Hollow bearing trees (abundance): 2 **Average size:** 5 cm (diameter)
Dead stags (abundance): 1 mallee **Average Dimension:** 10 cm / 4 m

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): None visible

Disturbances (present/absent): Fire

Ecological processes important to habitat (present/absent): fire, seasonal rainfall

FAUNA HABITAT SURVEY DATA SHEET 6

Location: Ninga **Site # (waypoint #)**: 008 **Date:** 10/05/2013

Observer: RBC/EL **GPS Location:** 793943E 7419753N

Search time: 12:08pm **Photo #:** 2214-2216 **Site Dimensions:**

Broad Habitat: 2. Shrubland plains. Open sandy clam loam and pebble clay loam plains supporting sparse mixed Eucalyptus and Corymbia woodlands over open mixed Acacia and Grevillia shrubland over open Triodia hummock grasslands, and sparse low mixed grass and shrubs.

Landscape position: Low

Broad Floristic: Sparse *Corymbia* / mixed *Acacia* shrubland over *Triodia* on sandy loam.

Vegetation (% cover)

Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 1
Mallees: 0
Shrubs >2m: 10
Shrubs <2m: <5
Hummock grasses: 40
Herbs: <1
Tussocks grasses: 10

Photo 6: Habitat type 2 Waypoint 008 Ninga ELA 10052013

Soil type, depth & colour: Red sandy loam
Rock type: N/A
Rock size: N/A
Rocky outcrops: N/A

Leaf litter (% cover): <5
Twig litter (% cover): < **Average size**: 5 mm
Fallen logs (% cover): 1 **Average size**: 10
Hollow bearing trees (abundance): 2 **Average size:** 2 – 10 cm
Dead stags (abundance):0 **Average Dimension**: N/A

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): Corymbia, shrubs and Triodia

Disturbances (present/absent): Camels, cattle and Buffel grass

Ecological processes important to habitat (present/absent): Occasional flooding

FAUNA HABITAT SURVEY DATA SHEET 7

Location: Ninga **Site # (waypoint 3)**: 056 **Date:** 14/05/2013

Observer: RBC / EL **GPS Location:** 798421E 7418700N

Search time: 10:13am **Photo #:** 2339-2341 **Site Dimensions:** 20 x 20 m

Broad Habitat: 3. Low pebble hills. Pebble strewn slopes and low hills with shallow clay soils supporting open *Triodia* hummock grasslands and low sparse to scattered mixed *Acacia* shrublands.

Landscape Position: Low

Broad Floristic Formation: Sparse *Acacia* shrubland over *Triodia* and occasional grasses.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: <1
Trees <10m: <1
Mallees: 0
Shrubs >2m: 1
Shrubs <2m: 1
Hummock grasses: 30
Herbs: 1
Tussock grasses: <1

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Photo 7: Habitat type 3 Waypoint # 056 Ninga ELA 14052013

Soil type & colour: Shallow pebble clay
Rock type: Ironstone
Rock size: 1 – 5 cm
Rocky outcrops: nil

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size**: 5 – 10 mm
Fallen logs (% cover): 0 **Average size**: N/A
Hollow bearing trees (abundance): 0 **Average size:** N/A
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): None visible. Potentially some in *Triodia*.

Disturbances (present/absent): Tracks, drill lines in area.

Ecological processes important to habitat (present/absent): Fire and summer rainfall

FAUNA HABITAT SURVEY DATA SHEET 8

Location: Ninga **Site # (Waypoint #)**: 022 **Date:** 12/05/2013

Observer: RBC / EL **GPS Location:** 803768E 7417159N

Search time: 7:34am **Photo #:** 2277-2279 **Site Dimensions**: 20 x 20 m

Broad Habitat: 3. Low pebble hills. Pebble strewn slopes and low hills with shallow clay soils supporting open *Triodia* hummock grasslands and low sparse to scattered mixed *Acacia* shrublands.

Landscape Position: Low - mid

Broad Floristic Formation: Occasional *Corymbia* and open, mixed, sparse *Acacia* shrubland over low *Acacia* shrubs and *Triodia*.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: <5
Mallees: 0
Shrubs >2m: 5
Shrubs <2m: 10
Hummock grasses: 30
Herbs: <1
Tussock grasses: <1

Photo 8: Habitat Type 3 Waypoint # 022 Ninga ELA 12052013

Soil type & colour: Poorly formed shallow clay with ironstone pebbles
Rock type: Ironstone
Rock size: Average 3 cm (1-6 cm)
Rocky outcrops: nil

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size**: 5 mm
Fallen logs (% cover): 1 **Average size**: 5 cm
Hollow bearing trees (abundance): 1 **Average size**: 5 cm diam hollow
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Absent but adjacent to ephemeral drainage lines.

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): Acacia shrubs and sparse trees.

Disturbances (present/absent): Old exploration track, otherwise no disturbance.

Ecological processes important to habitat (present/absent): fire, seasonal rainfall

FAUNA HABITAT SURVEY DATA SHEET 9

Location: Ninga **Site # (Waypoint #)**: 016 **Date:** 11/05/2013

Observer: RBC / EL **GPS Location:** 802875E 7418883N

Search time: 11:26am **Photo #:** 2244-2246 **Site Dimensions**: 20 x 20 m

Broad Habitat: 3. Low pebble hills. Pebble strewn slopes and low hills with shallow clay soils supporting open *Triodia* hummock grasslands and low sparse to scattered mixed *Acacia* shrublands.

Landscape Position: Low - mid

Broad Floristic Formation: Open mixed *Acacia* shrubland over *Triodia* on stony clay.

Vegetation (% cover)
Trees >30m: nil
Trees 10-30m: 0
Trees <10m: 1
Mallees: 0
Shrubs >2m: 15
Shrubs <2m: 15
Hummock grasses: 40
Herbs: <1
Tussock grasses: <1

Photo 9: Habitat Type 3 Waypoint # 016 Ninga ELA 11/05/2013

Soil type & colour: Stony, poorly formed, shallow red clay
Rock type: Unknown
Rock size: 5-10 cm
Rocky outcrops: Yes, small amount

Leaf litter (% cover): <1
Twig litter (% cover): 1 **Average size**: 0.5 cm
Fallen logs (% cover): 1 **Average size**: 5 cm
Hollow bearing trees (abundance): 0 **Average size**: N/A
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Absent, but close to drainage line.

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): Few trees, numerous low shrubs

Disturbances (present/absent): Nil

Ecological processes important to habitat (present/absent): fire, seasonal rainfall

FAUNA HABITAT SURVEY DATA SHEET 10

Location: Ninga **Site # (Waypoint #)**: 054 **Date:** 14/05/2013

Observer: RBC / EL **GPS Location:** 798618E 7419946N

Search time: 8:30am **Photo #:** 2332-2334 **Site Dimensions:** 20 x 20 m

Broad Habitat: 4. Rocky hills tops and ridges of with very poorly formed skeletal clay soil supporting sparse Grevillea/Acacia shrublands and Triodia hummock grasslands on ironstone pebbles and outcropping.

Landscape Position: Upper

Broad Floristic Formation: Open low stunted *Eucalyptus*, over low *Acacia* shrubs and *Triodia*, sparse grasses.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallees: 0
Shrubs >2m: 0
Shrubs <2m: 15
Hummock grasses: 30
Herbs: <1
Tussock grasses: 5

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Photo 10: Habitat Type 4 Waypoint # 054 Ninga ELA 14/05/2013

Soil type & colour: Red, very poorly formed stony clay
Rock type: Ironstone
Rock size: 5-10 cm
Rocky outcrops: Yes

Leaf litter (% cover): <1
Twig litter (% cover): 1 **Average size**: 1 cm
Fallen logs (% cover): 1 **Average size**: 15 cm
Hollow bearing trees (abundance): 0 **Average size:** N/A
Dead stags (abundance):1 **Average Dimension**: 3 m x 10 cm

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): None visible. Sparse *Eucalyptus* and spinifex.

Disturbances (present/absent): None visible

Ecological processes important to habitat (present/absent): Fire and seasonal rainfall

FAUNA HABITAT SURVEY DATA SHEET 11

Location: Ninga **Site # (Waypoint #)**: 031 **Date:** 13/05/2013

Observer: RBC / EL **GPS Location:** 796926E 7419993N

Search time: 9:12am **Photo #:** 2323-2325 **Site Dimensions:** 20 x 20 m

Broad Habitat: 4. Rocky hills tops and ridges of with very poorly formed skeletal clay soil supporting sparse Grevillea/Acacia shrublands and Triodia hummock grasslands on ironstone pebbles and outcropping.

Landscape Position: Upper

Broad Floristic Formation: Open stunted low *Eucalyptus*, over sparse mixed *Acacia* over *Triodia* and grasses.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 15
Mallees: 0
Shrubs >2m: 1
Shrubs <2m: 2-3
Hummock grasses: 25
Herbs: <1
Tussock grasses: 10

Photo missing due to camera error

Photo 11: Habitat Type 4 Waypoint # 031 Ninga ELA 13052013

Soil type & colour: Very shallow, poorly formed clay
Rock type: Ironstone
Rock size: 20 – 100 mm
Rocky outcrops: Yes

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size**: 0.5 cm
Fallen logs: 0 **Average size:** N/A
Hollow bearing trees (abundance): 0 **Average size:** N/A
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): None visible. Low *Eucalyptus* and occasional shrubs and *Triodia*.

Disturbances (present/absent): None visible

Ecological processes important to habitat (present/absent): Annual season rainfall and fire

FAUNA HABITAT SURVEY DATA SHEET 12

Location: Ninga **Site # (Waypoint #)**: 005 **Date:** 10/05/2013

Observer: RBC / EL **GPS Location:** 794048E 7419230N

Search time: 10:23am **Photo #:** 2203-2205 **Site Dimensions:** 50 x 50 m

Broad Habitat: 4. Rocky hills tops and ridges of with very poorly formed skeletal clay soil supporting sparse Grevillea/Acacia shrublands and Triodia hummock grasslands on ironstone pebbles and outcropping.

Landscape Position: Upper

Broad Floristic Formation: Sparse, snappy gum. Open *Acacia* shrubland over *Triodia* and occasional *Ficus*.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallees: 0
Shrubs >2m: 5
Shrubs <2m: 5
Hummock grasses: 40
Herbs: <1
Tussock grasses: 10

Soil type & colour: Shallow, poorly formed clay
Rock type: Ironstone
Rock size: 5-10 cm
Rocky outcrops: Yes (Ironstone)

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size**: 1 cm (diameter)
Fallen logs: 2 **Average size:** 10 cm
Hollow bearing trees (abundance): 1 **Average size:** 5 cm
Dead stags (abundance): 2 **Average Dimension**: 10 cm x 7 m

Water bodies (present/absent): Absent

Caves / Subterranean roosts (present/absent): Absent

Nests or Roosts (present/absent): Few trees and shrubs.

Disturbances (present/absent): Previous exploration, old dozer/driller tracks

Ecological processes important to habitat (present/absent): Fire

FAUNA HABITAT SURVEY DATA SHEET 13

Location: Ninga **Site # (Waypoint #)**: 055 **Date:** 14/05/2013

Observer: RBC / EL **GPS Location:** 798142E 7419610N

Search time: **Photo #:** 2335-2337 **Site Dimensions:** 20 x 20 m

Broad Habitat: 5. Canyons, cliffs and breakaways supporting mixed open shrublands and mixed hummock and tussock grasslands on shallow stony clay soils, often with rocky outcropping.

Landscape Position: Mid-level elevation

Broad Floristic Formation: Sparse, *Eucalyptus* woodland over occasional *Acacia* over *Triodia* and mixed grasses and herbs.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallees: 0
Shrubs >2m: 1
Shrubs <2m: 2
Hummock grasses: 35
Herbs: <1
Tussock grasses: 1

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Photo 13: Habitat Type 5 Waypoint # 055 Ninga ELA 14052013

Soil type & colour: Stony shallow alluvial clay
Rock type: Ironstone
Rock size: 10-40 cm
Rocky outcrops: Yes

Leaf litter (% cover): 5
Twig litter (% cover): 1 **Average size**: 5 mm
Fallen logs: 0 **Average size:** N/A
Hollow bearing trees (abundance): 0 **Average size:** N/A
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Season creek flow, currently dry

Caves / Subterranean roosts (present/absent): Yes

Nests or Roosts (present/absent): None visible but potential cliff / rock faces and Eucalypts.

Disturbances (present/absent): Nil

Ecological processes important to habitat (present/absent): Seasonal water flow and fire

FAUNA HABITAT SURVEY DATA SHEET 14

Location: Ninga **Site # (Waypoint #)**: 014 **Date:** 11/05/2013

Observer: RBC / EL **GPS Location:** 802756E 7418527N

Search time: 10:20am **Photo #:** 2236-2237 **Site Dimensions:** 100 x 100 m

Broad Habitat: 5. Canyons, cliffs and breakaways supporting mixed open shrublands and mixed hummock and tussock grasslands on shallow stony clay soils, often with rocky outcropping.

Landscape Position: Upper

Broad Floristic Formation: Sparse, *Eucalyptus* / *Acacia* over *Triodia*.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallees: <1
Shrubs >2m: 1
Shrubs <2m: <1
Hummock grasses: 50
Herbs: 0
Tussock grasses: <1

Photo 14: Habitat Type 5 Waypoint # 014 Ninga ELA 11052013

Soil type & colour: Very shallow, poorly developed, red clay, heavy gravel / pebbles
Rock type: Ironstone
Rock size: 5 cm
Rocky outcrops: Yes

Leaf litter (% cover): <1
Twig litter (% cover): <1 **Average size**: 5-10 mm
Fallen logs: 4 **Average size:** 10
Hollow bearing trees (abundance): 2 **Average size:** 8 cm
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Nil

Caves / Subterranean roosts (present/absent): Potentially – numerous fissures

Nests or Roosts (present/absent): Trees (Eucalyptus) and cliff walls

Disturbances (present/absent):

Ecological processes important to habitat (present/absent): Fire and seasonal rain

FAUNA HABITAT SURVEY DATA SHEET 15

Location: Ninga **Site # (Waypoint #)**: 007 **Date:** 10/05/2013

Observer: RBC / EL **GPS Location:** 794058E 7419322N

Search time: 11:00am **Photo #:** 2210-2211 **Site Dimensions:** 80 x 20 m

Broad Habitat: 5. Canyons, cliffs and breakaways supporting mixed open shrublands and mixed hummock and tussock grasslands on shallow stony clay soils, often with rocky outcropping.

Landscape Position: Upper - mid

Broad Floristic Formation: *Eucalyptus* / *Acacia* woodland / shrubland over low shrubs and *Triodia* and other grasses.

Vegetation (% cover)
Trees >30m: 0
Trees 10-30m: 0
Trees <10m: 5
Mallees: 0
Shrubs >2m: 15-20
Shrubs <2m: 1
Hummock grasses: 30
Herbs: <1
Tussock grasses: 10

Photo 15: Habitat Type 5 Waypoint # 007 Ninga ELA 10052013

Soil type & colour: Very shallow, poorly formed red clay
Rock type: Ironstone
Rock size: 1-20 cm
Rocky outcrops: Yes

Leaf litter (% cover): 2
Twig litter (% cover): 1 **Average size**: 1 cm
Fallen logs: 1 **Average size:** 10 cm
Hollow bearing trees (abundance): 0 **Average size:** N/A
Dead stags (abundance): 0 **Average Dimension**: N/A

Water bodies (present/absent): Empty, temporary rocky gorge. No water present.

Caves / Subterranean roosts (present/absent): One potentially deep cave. 1 m x 0.5 m entrance, depth 5 m (narrow). Photo # 2207-2209

Nests or Roosts (present/absent): Trees and shrubs

Disturbances (present/absent): Buffel grass in gully. Feral bee hive.

Ecological processes important to habitat (present/absent): As per Hills processes. Seasonal rain creating temporary pools

Appendix F: Bat call analysis report

Specialised Zoological

Bat call identification

from Ninga, WA

Type:	Acoustic analysis
Prepared for:	Eco Logical Australia
Date:	14 June 2013
Job No.:	SZ310
Prepared by:	Kyle Armstrong and Yuki Konishi Specialised Zoological ABN 92 265 437 422 Tel 0404 423 264 kyle.n.armstrong@gmail.com http://www.szool.com.au

SUMMARY

Bat identifications from acoustic recordings are provided from Ninga, near Newman, in the Pilbara region of Western Australia. At least seven species of bat were identified as being present (**Tables 1 and 2**). Further details are provided below, and representative call sequence portions are illustrated in **Figure 1**, as recommended by the Australasian Bat Society (ABS 2006). Further data are available should verification be required.

COMMENTS ON IDENTIFICATIONS

The calls resembling those of the Pilbara leaf-nosed bat *Rhinonicteris aurantia* were fragmented and thus the identification of this species at the site is ambiguous. There were four call sequences with pulse fragments above 100 kHz on 12/5/2013, as observed in ZCA files. It is also possible that these call fragments derive from Finlayson's cave bat *Vespadelus finlaysoni*, which makes ultra-high frequency (<100 kHz) calls when in the confines of a cave entrance (**Figure 1c**).

Some call types of the northern free-tailed bat *Chaerephon jobensis* and the yellow-bellied sheath-tailed bat *Saccolaimus flaviventris* are similar, and either species could have been present based on the recordings.

Two call sequences were attributed to a species of long-eared bat *Nyctophilus* sp. These are typically difficult to identify to species, and candidates in the Pilbara include the northern long-eared bat *N. amhemensis*, the lesser long-eared bat *N. geoffroyi* and the pallid long-eared bat *N. daedalus*.

The species of *Taphozous* present was most likely the common sheath-tailed bat *Taphozous georgianus*, but the presence of Hill's sheath-tailed bat *T. hilli* is also possible. There is much overlap between the call variables of these two species (McKenzie and Bullen 2003) and identification from the external morphology of captured individuals is a more reliable method.

METHODS

Signals as recorded with an AnaBat SD2 bat detector were downloaded via CFC Read 4.3s software and examined in AnalookW 3.8s software. The frequency division ratio was set to a factor of 8 to maximise resolution of short duration, low amplitude broadband calls (e.g. those of the ghost bat *Macroderma gigas*). Identification to species was made from two sets of AnaBat data: 1. the individual sequence files produced during interpretation by CFC Read software, which are organised into folders representing a single night's recording; and 2. the

continuous representation of the AnaBat recordings in ZCA and MAP files, which show all of the signals detected by the AnaBat microphone but which have not been parsed into individual sequence files according to default interpretation parameters. Identifications were made according to information in McKenzie and Bullen (2009), and were based on recognition of diagnostic pulse shapes and characteristic pulse frequency. The analytical methods are consistent with those recommended in State and Commonwealth guidelines (DEWHA 2010; Environmental Protection Authority and Department of Environment and Conservation 2010; DSEWPC 2013). Nomenclature follows Armstrong and Reardon (2006).

References

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McKenzie, N.L. and Bullen, R.D. (2003). Identifying Little Sandy Desert bat species from their echolocation calls. *Australian Mammalogy* 25: 73–80.

McKenzie, N.L. and Bullen, R.D. (2009). The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. *Records of the Western Australian Museum* Supplement 78: 123–155.

TABLE 1. Species identified in the present survey from all sites combined.

EMBALLONURIDAE	
Common sheath-tailed bat	*Taphozous georgianus*
VESPERTILIONIDAE	
Gould's wattled bat	*Chalinolobus gouldi*
Little broad-nosed bat	*Scotorepens greyii*
Finlayson's cave bat	*Vespadelus finlaysoni*
MOLOSSIDAE	
White-striped free-tailed bat	*Tadarida australis*
Ambiguous	
EMBALLONURIDAE/MOLOSSIDAE	
Northern free-tailed bat / Yellow-bellied sheath-tailed bat	*Chaerephon jobensis* / *Saccolaimus flaviventris*
HIPPOSIDERIDAE	
Pilbara leaf-nosed bat	*Rhinonicteris aurantia*
VESPERTILIONIDAE	
Unidentified long-eared bat	*Nyctophilus* sp.

TABLE 2. Species identifications, with the degree of confidence indicated by a code. Date and serial/unit correlates with site; see Table 1 for full species names.

	C. gouldii	*C. jobensis* / *S. flaviventris*	*Nyctophilus* sp.	*R. australia*	*S. greyii*	*T. australis*	*T. georgianus*	*V. finlaysoni*
Date								
SM2BAT 82413								
10/05/2013	◆	NC	NC	—	◆	—	—	◆
11/05/2013	**No**	**Data**						
12/05/2013	◆	NC	—	NC	—	◆	◆	◆
13/05/2013	—	—	—	—	—	—	◆	◆
14/05/2013	◆	—	—	—	—	◆	—	—

Definition of confidence level codes:

— Not detected.

◆ Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the *Comments on Identifications* section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

SZ310: *Bat call identification from Ninga, WA*

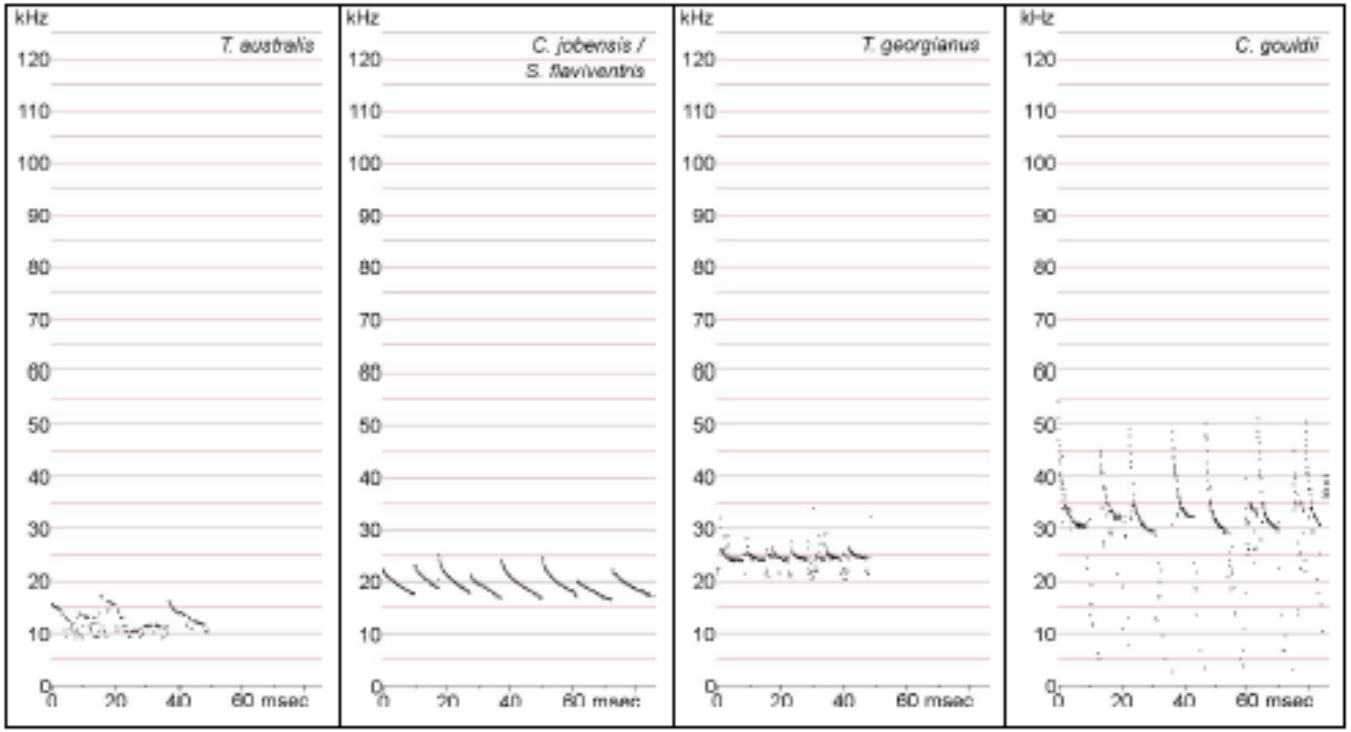

FIGURE 1A. Representative call sequence portions of the species identified (time is compressed between each pulse) (*continued over ...*)

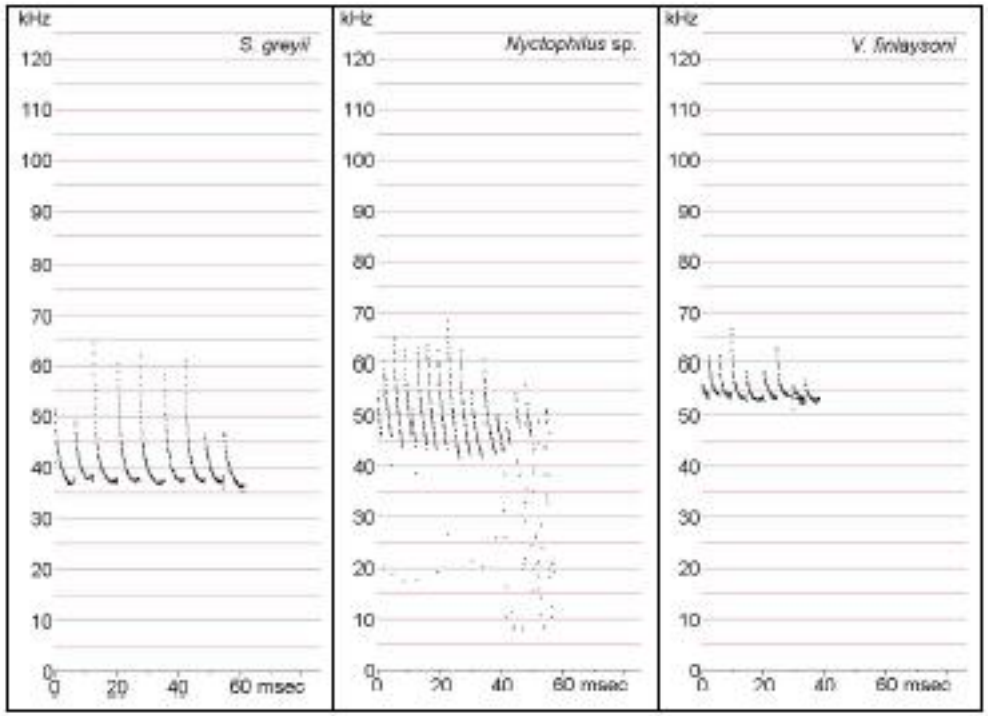

FIGURE 1B. Representative call sequence portions of the species identified, *continued*.

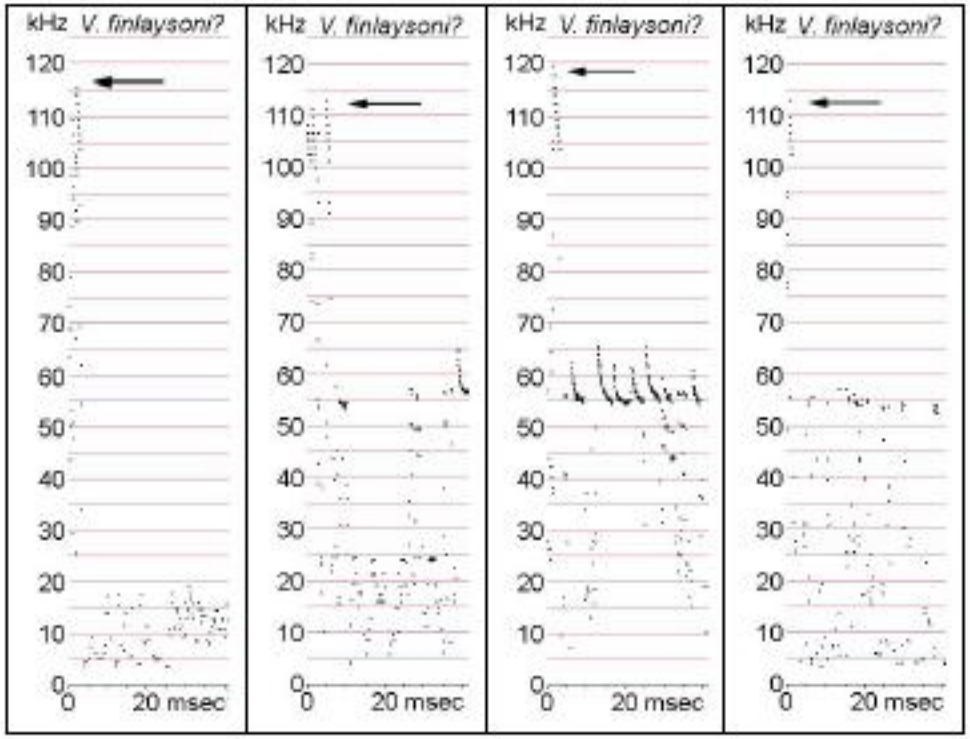

FIGURE 1C. Representative call sequence portions of the species identified, *continued*.

Appendix G: Database search results

DEC Threatened fauna database search results.

Buffer: 20 km. Centre: 23° 19' 21" S and 119° 57' 16" E

Family	Name	Vernacular	Code
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	S1
Boidae	*Liasis olivaceus* subsp. *barroni*	Pilbara Olive Python	S1
Macropodidae	*Petrogale lateralis* subsp. *lateralis*	Black-footed Rock-wallaby	S1
Falconidae	*Falco peregrinus*	Peregrine Falcon	S4
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	M
Ardeidae	*Ardea ibis*	Cattle Egret	M
Ardeidae	*Ardea modesta*	Eastern Great Egret	M
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	M
Scolopacidae	*Calidris ruficollis*	Red-necked Stint	M
Scolopacidae	*Calidris subminuta*	Long-toed Stint	M
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	M
Meropidae	*Merops ornatus*	Rainbow Bee-eater	M
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	M
Scolopacidae	*Tringa glareola*	Wood Sandpiper	M
Scolopacidae	*Tringa nebularia*	Common Greenshank	M
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	M
Otididae	*Ardeotis australis*	Australian Bustard	P4
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	P4
Megadermatidae	*Macroderma gigas*	Ghost Bat	P4
Muridae	*Pseudomys chapmani*	Western Pebble-mound Mouse	P4
Scincidae	*Ctenotus uber* subsp. *johnstonei*	Spotted Ctenotus	P2
Typhlopidae	*Ramphotyphlops ganei*	blind snake	P1

S1 = Listed under schedule 1 of the *Wildlife Conservation Act 1950* as fauna that is rare or likely to become extinct.
S4 = Listed under schedule 4 of the *Wildlife Conservation Act 1950* as other specially protected fauna.
M = species listed as 'migratory' under the EPBC Act.
P1 = poorly known taxa.
P2 = poorly known taxa.
P3 = poorly known taxa.
P4 = Rare, Near Threatened and other taxa in need of monitoring.

NatureMap database search results

Buffer: 20 km. Centre: 23˚ 19’ 21” S and 119˚ 57’ 16” E

Species Name	Conservation Code
Acanthagenys rufogularis (Spiny-cheeked Honeyeater)	
Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)	
Acanthiza chrysorrhoa (Yellow-rumped Thornbill)	
Acanthiza robustirostris (Slaty-backed Thornbill)	
Acanthiza uropygialis (Chestnut-rumped Thornbill)	
Accipiter cirrocephalus (Collared Sparrowhawk)	
Accipiter fasciatus (Brown Goshawk)	
Acrocephalus australis (Australian Reed Warbler)	
Actitis hypoleucos (Common Sandpiper)	M
Aegotheles cristatus (Australian Owlet-nightjar)	
Amphibolurus longirostris (long-snouted Water Dragon)	
Amytornis striatus (Striated Grasswren)	
Amytornis striatus subsp. *whitei* (Striated Grasswren)	
Anas gracilis (Grey Teal)	
Anas rhynchotis (Australasian Shoveler)	
Anas superciliosa (Pacific Black Duck)	
Anseranas semipalmata (Magpie Goose)	
Antaresia perthensis (Pygmy Python)	
Antaresia stimsoni (Stimson's Python)	
Anthus australis (Australian Pipit)	
Aquila audax (Wedge-tailed Eagle)	
Ardea ibis (Cattle Egret)	M
Ardea intermedia (Intermediate Egret)	
Ardea modesta (Eastern Great Egret)	M
Ardea novaehollandiae (White-faced Heron)	
Ardea pacifica (White-necked Heron)	
Ardeotis australis (Australian Bustard)	P4
Artamus cinereus (Black-faced Woodswallow)	
Artamus minor (Little Woodswallow)	
Artamus personatus (Masked Woodswallow)	
Artamus superciliosus (White-browed Woodswallow)	
Aspidites melanocephalus (Black-headed Python)	
Aythya australis (Hardhead)	
Bos taurus (European Cattle)	
Burhinus grallarius (Bush Stone-curlew)	P4
Cacatua roseicapilla (Galah)	
Cacatua sanguinea (Little Corella)	
Cacomantis pallidus (Pallid Cuckoo)	
Calidris acuminata (Sharp-tailed Sandpiper)	M

Species Name	Conservation Code
Calidris ferruginea (Curlew Sandpiper)	S1
Calidris ruficollis (Red-necked Stint)	M
Calidris subminuta (Long-toed Stint)	M
Camelus dromedarius (Dromedary Camel)	
Canis lupus (Dog)	
Canis lupus subsp. *dingo* (Dingo)	
Carlia munda (Rainbow Skink)	
Carlia triacantha (Rainbow Skink)	
Certhionyx variegatus (Pied Honeyeater)	
Chalinolobus gouldii (Gould's Wattled Bat)	
Charadrius melanops (Black-fronted Dotterel)	
Charadrius ruficapillus (Red-capped Plover)	
Chenonetta jubata (Australian Wood Duck)	
Cheramoeca leucosternus (White-backed Swallow)	
Chrysococcyx basalis (Horsfield's Bronze Cuckoo)	
Chrysococcyx osculans (Black-eared Cuckoo)	
Cincloramphus cruralis (Brown Songlark)	
Cincloramphus mathewsi (Rufous Songlark)	
Circus approximans (Swamp Harrier)	
Circus assimilis (Spotted Harrier)	
Cladorhynchus leucocephalus (Banded Stilt)	
Climacteris melanura subsp. *wellsi* (Black-tailed Treecreeper)	
Colluricincla harmonica subsp. *rufiventris* (Grey Shrike-thrush)	
Coracina novaehollandiae subpallida (Black-faced Cuckoo-shrike)	
Corvus bennetti (Little Crow)	
Corvus orru (Torresian Crow)	
Coturnix pectoralis (Stubble Quail)	
Coturnix ypsilophora (Brown Quail)	
Cracticus nigrogularis (Pied Butcherbird)	
Cracticus tibicen (Australian Magpie)	
Cracticus torquatus (Grey Butcherbird)	
Cryptoblepharus ustulatus	
Ctenophorus caudicinctus (Ring-tailed Dragon)	
Ctenophorus isolepis (Crested Dragon, Military Dragon)	
Ctenophorus maculatus (Spotted Military Dragon)	
Ctenophorus nuchalis (Central Netted Dragon)	
Ctenophorus reticulatus (Western Netted Dragon)	
Ctenotus ariadnae (Skink)	
Ctenotus duricola (Skink)	
Ctenotus grandis (Skink)	
Ctenotus helenae (Skink)	
Ctenotus leonhardii (Skink)	

Species Name	Conservation Code
Ctenotus pantherinus (Leopard Ctenotus)	
Ctenotus rubicundus (Skink)	
Ctenotus saxatilis (Rock Ctenotus)	
Ctenotus uber (Skink)	
Ctenotus uber subsp. *johnstonei* (Spotted Ctenotus)	P2
Cyclodomorphus melanops subsp. *melanops* (Slender Blue-tongue)	
Cyclorana maini (Sheep Frog)	
Cygnus atratus (Black Swan)	
Dacelo leachii (Blue-winged Kookaburra)	
Dasykaluta rosamondae (Little Red Kaluta)	
Delma butleri (Legless Lizard)	
Delma haroldi (Legless Lizard)	
Delma nasuta (Legless Lizard)	
Delma pax (Legless Lizard)	
Demansia psammophis (Yellow-faced Whipsnake)	
Dendrocygna arcuata (Chestnut Whistling Duck)	
Dendrocygna eytoni (Plumed Whistling Duck)	
Dicaeum hirundinaceum (Mistletoebird)	
Diplodactylus conspicillatus (Fat-tailed Gecko)	
Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)	
Dromaius novaehollandiae (Emu)	
Egernia cygnitos (Western Pilbara Spiny-tailed Skink)	
Egernia formosa	
Emblema pictum (Painted Finch)	
Epthianura tricolor (Crimson Chat)	
Equus asinus (Donkey)	
Eremiornis carteri (Spinifex-bird)	
Eurostopodus argus (Spotted Nightjar)	
Falco berigora subsp. *berigora* (Brown Falcon)	
Falco cenchroides (Australian Kestrel)	
Falco longipennis (Australian Hobby)	
Falco peregrinus (Peregrine Falcon)	S4
Felis catus (Cat)	
Fulica atra (Eurasian Coot)	
Furina ornata (Moon Snake)	
Gallirallus philippensis (Buff-banded Rail)	
Gehyra Pilbara (Dtella Gecko)	
Gehyra punctata (Dtella Gecko)	
Gehyra variegata (Dtella Gecko)	
Geopelia cuneata (Diamond Dove)	
Geopelia striata placida (Peaceful Dove)	
Geophaps plumifera (Spinifex Pigeon)	

Species Name	Conservation Code
Gerygone fusca (Western Gerygone)	
Grallina cyanoleuca (Magpie-lark)	
Haliaeetus leucogaster (White-bellied Sea-Eagle)	M
Haliastur sphenurus (Whistling Kite)	
Hamirostra melanosternon (Black-breasted Buzzard)	
Heteronotia binoei (Bynoe's Gecko)	
Himantopus himantopus (Black-winged Stilt)	
Hirundo ariel (Fairy Martin)	
Hirundo neoxena (Welcome Swallow)	
Lacustroica whitei (Grey Honeyeater)	
Lalage tricolor (White-winged Triller)	
Lerista bipes (Burrowing Skink)	
Lerista muelleri (Burrowing Skink)	
Lerista neander (Burrowing Skink)	
Lerista zietzi (Burrowing Skink)	
Lialis burtonis (Burton’s Legless Lizard)	
Liasis olivaceus subsp. *barroni* (Pilbara Olive Python)	S1
Lichmera indistincta (Brown Honeyeater)	
Litoria rubella (Desert Tree Frog)	
Lucasium stenodactylum	
Lucasium wombeyi	
Macroderma gigas (Ghost Bat)	P4
Macropus robustus (Euro)	
Macropus rufus (Red Kangaroo)	
Malacorhynchus membranaceus (Pink-eared Duck)	
Malurus lamberti (Variegated Fairy-wren)	
Malurus leucopterus (White-winged Fairy-wren)	
Manorina flavigula (Yellow-throated Miner)	
Megalurus gramineus (Little Grassbird)	
Melithreptus gularis (Black-chinned Honeyeater)	
Melopsittacus undulatus (Budgerigar)	
Menetia greyii (Common Dwarf Skink)	
Merops ornatus (Rainbow Bee-eater)	M
Milvus migrans (Black Kite)	
Mirafra javanica (Horsfield's Bushlark)	
Morethia ruficauda subsp. *Exquisite* (Fire-tail Skink)	
Mus musculus (House Mouse)	
Neobatrachus kunapalari (Kunapalari Frog)	
Neochmia ruficauda subsp. *clarescens* (Star Finch)	
Nephrurus wheeleri subsp. *Cinctus* (Knob-tailed Gecko)	
Ningaui timealeyi (Pilbara Ningaui)	
Ninox connivens (Barking Owl)	

Species Name	Conservation Code
Ninox novaeseelandiae subsp. *boobook* (Boobook Owl)	
Notomys alexis (Spinifex Hopping-mouse)	
Nycticorax caledonicus (Rufous Night Heron)	
Nyctophilus geoffroyi (Lesser Long-eared Bat)	
Nymphicus hollandicus (Cockatiel)	
Ocyphaps lophotes (Crested Pigeon)	
Oedura marmorata (Marbled Velvet Gecko)	
Oreoica gutturalis (Crested Bellbird)	
Oryctolagus cuniculus (Rabbit)	
Pachycephala rufiventris (Rufous Whistler)	
Pardalotus rubricatus (Red-browed Pardalote)	
Pardalotus striatus (Striated Pardalote)	
Pelecanus conspicillatus (Australian Pelican)	
Petrogale lateralis subsp. *lateralis* (Black-footed Rock-wallaby)	S1
Petroica goodenovii (Red-capped Robin)	
Phalacrocorax carbo (Great Cormorant)	
Phalacrocorax sulcirostris (Little Black Cormorant)	
Phalacrocorax varius (Pied Cormorant)	
Phaps chalcoptera (Common Bronzewing)	
Platalea flavipes (Yellow-billed Spoonbill)	
Platalea regia (Royal Spoonbill)	
Platycercus zonarius (Australian Ringneck)	
Platyplectrum spenceri (Centralian Burrowing Frog)	
Plegadis falcinellus (Glossy Ibis)	M
Podargus strigoides (Tawny Frogmouth)	
Podiceps cristatus (Great Crested Grebe)	
Poliocephalus poliocephalus (Hoary-headed Grebe)	
Pomatostomus superciliosus (White-browed Babbler)	
Pomatostomus temporalis (Grey-crowned Babbler)	
*Porphyrio porphyrio (*Purple Swamphen)	
Porzana pusilla (Baillon's Crake)	
Porzana tabuensis (Spotless Crake)	
Pseudantechinus roryi (Rory's Pseudantechinus)	
Pseudantechinus woolleyae (Woolley's Pseudantechinus)	
Pseudomys chapmani (Western Pebble-mound Mouse)	P4
Pseudomys hermannsburgensis (Sandy Inland Mouse)	
Pseudonaja mengdeni (Western Brown Snake)	
Pseudonaja nuchalis (Gwardar, Northern Brown Snake)	
Pseudophryne douglasi (Gorge Toadlet)	
Psophodes occidentalis (Western Wedgebill, Chiming Wedgebill)	
Pygopus nigriceps (Hooded Scaly-foot)	
Ramphotyphlops ammodytes (Blind Snake)	

Species Name	Conservation Code
Ramphotyphlops ganei (blind snake)	P1
Ramphotyphlops grypus (Blind Snake)	
Ramphotyphlops hamatus (Blind Snake)	
Recurvirostra novaehollandiae (Red-necked Avocet)	
Rhipidura leucophrys (Willie Wagtail)	
Rhynchoedura ornata (Western Beaked Gecko)	
Saccolaimus flaviventris (Yellow-bellied Sheath-tailed Bat)	
Scotorepens greyii (Little Broad-nosed Bat)	
Smicrornis brevirostris (Weebill)	
Sminthopsis macroura (Stripe-faced Dunnart)	
Sminthopsis youngsoni (Lesser Hairy-footed Dunnart)	
Stictonetta naevosa (Freckled Duck)	
Stiltia isabella (Australian Pratincole)	
Strophurus elderi (Jewelled Gecko)	
Strophurus wellingtonae (Spiny-tailed Gecko)	
Sugomel niger (Black Honeyeater)	
Tachybaptus novaehollandiae (Australasian Grebe)	
Tachyglossus aculeatus (Short-beaked Echidna)	
Tadorna tadornoides (Australian Shelduck, Mountain Duck)	
Taeniopygia guttata (Zebra Finch)	
Taphozous georgianus (Common Sheath-tailed Bat)	
Threskiornis molucca (Australian White Ibis)	
Threskiornis spinicollis (Straw-necked Ibis)	
Tiliqua multifasciata (Central Blue-tongue)	
Todiramphus pyrrhopygius (Red-backed Kingfisher)	
Todiramphus sanctus (Sacred Kingfisher)	
Tringa glareola (Wood Sandpiper)	M
Tringa nebularia (Common Greenshank)	M
Tringa stagnatilis (Marsh Sandpiper)	M
Turnix velox (Little Button-quail)	
Tyto alba subsp. *delicatula* (Barn Owl)	
Uperoleia russelli (Northwest Toadlet)	
Uperoleia saxatilis (Pilbara Toadlet)	
Varanus acanthurus (Spiny-tailed Monitor)	
Varanus caudolineatus	
Varanus gouldii (Bungarra or Sand Monitor)	
Varanus pilbarensis (Pilbara Rock Monitor)	
Varanus tristis (Black-tailed Monitor)	
Vermicella snelli (Bandy Bandy)	
Vespadelus finlaysoni (Finlayson's Cave Bat)	
Zyzomys argurus (Common Rock-rat)	

S1 = Listed under schedule 1 of the *Wildlife Conservation Act 1950* as fauna that is rare or likely to become extinct.
S4 = Listed under schedule 4 of the *Wildlife Conservation Act 1950* as other specially protected fauna.
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P1 = poorly known taxa.
P2 = poorly known taxa.
P3 = poorly known taxa.
P4 = Rare, Near Threatened and other taxa in need of monitoring.

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