



biologic

Jinidi Vertebrate Fauna Survey

BHP Billiton Iron Ore Pty Ltd

October 2011





DOCUMENT STATUS				
Revision No.	Author	Review / Approved for Issue	Approved for Issue to	
			Name	Date
1	Stewart Ford	Morgan O'Connell	Stephen White	04.06.11
2	Stewart Ford	Morgan O'Connell	Breanne Menezies	26.07.11
3	Sharron Perks Morgan O'Connell Stewart Ford	Stewart Ford	Belinda Barnett	23.08.11
4	Stewart Ford	Stewart Ford	Belinda Barnett	15.09.11
Final	Stewart Ford	Stewart Ford	Belinda Barnett	07.10.11

“IMPORTANT NOTE”

Apart from fair dealing for the purposes of private study, research, criticism, or review as permitted under the Copyright Act, no part of this report, its attachments or appendices may be reproduced by any process without the written consent of Biologic Environmental Survey Pty Ltd (“Biologic”). All enquiries should be directed to Biologic.

We have prepared this report for the sole purposes of BHP Billiton Pty Ltd (“Client”) for the specific purpose only for which it is supplied. This report is strictly limited to the Purpose and the facts and matters stated in it and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter.

In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

This report is presented without the assumption of a duty of care to any other person (other than the Client) (“Third Party”). The report may not contain sufficient information for the purposes of a Third Party or for other uses. Without the prior written consent of Biologic:

- a) this report may not be relied on by a Third Party; and
- b) Biologic will not be liable to a Third Party for any loss, damage, liability or claim arising out of or incidental to a Third Party publishing, using or relying on the facts, content, opinions or subject matter contained in this report.

If a Third Party uses or relies on the facts, content, opinions or subject matter contained in this report with or without the consent of Biologic, Biologic disclaims all risk and the Third Party assumes all risk and releases and indemnifies and agrees to keep indemnified Biologic from any loss, damage, claim or liability arising directly or indirectly from the use of or reliance on this report.

In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.



TABLE OF CONTENTS

Executive Summary.....	6
1 Introduction.....	8
2 Environment	10
2.1 Biogeography	10
2.2 Climate	10
2.3 Vegetation	11
2.4 Hydrology	12
2.5 Land use	12
3 Methods.....	14
3.1 Compliance	14
3.2 Literature and database review.....	14
3.3 Field assessment	15
3.3.1 Walking transects.....	15
3.3.2 Bat recordings.....	16
3.3.3 Habitat assessment	16
3.4 Level of assessment	17
3.5 Assessment of conservation significance	18
3.6 Taxonomy and nomenclature	19
4 Vertebrate fauna and fauna habitats.....	20
4.1 Review of previous surveys	20
4.2 Supplementary field survey.....	20
4.3 Fauna species recorded in the Study Area from 2005-2011	20
4.3.1 Native mammals	26
4.3.2 Birds.....	27
4.3.3 Reptiles	27
4.3.4 Amphibians	28
4.3.5 Introduced fauna.....	28



4.4	Fauna habitats of the Study Area	28
5	Significant fauna and fauna habitats	32
5.1	Conservation significant fauna	32
5.1.1	Literature and database review	32
5.1.2	Conservation significant fauna recorded	33
5.1.3	Conservation significant fauna potentially occurring	40
5.1.4	Other conservation significant fauna	45
5.2	Locally significant fauna	45
5.3	Pilbara endemics.....	46
5.4	Important fauna habitats	46
6	Summary	50
7	References	51

FIGURES

Figure 1.1:	Regional location	9
Figure 2.1:	Average monthly temperature and rainfall observations at Newman Airport in the year prior to the survey plotted against long-term averages (BOM, 2011)	11
Figure 4.1:	Previous survey locations	25
Figure 4.2:	Fauna habitats	31
Figure 5.1:	Conservation significant fauna locations	34
Figure 5.2:	Significant fauna habitats.....	49

TABLES

Table 2.1:	Vegetation types recorded at Jinidi and their relative amount and distribution within reserves and public lands (Sheperd <i>et al.</i> , 2002), table from Onshore (2011)	12
Table 2.2:	Active mines near the Study Area	13
Table 3.1:	Databases used for the review	14
Table 3.2:	Fauna habitat significance assessment criteria.....	17
Table 3.3:	Conservation significance assessment guidelines	19
Table 4.1:	Details of surveys conducted in the region.....	21
Table 4.2:	Details of surveys conducted in the Study Area	22



Table 4.3:	Overall survey effort from all surveys in the Study Area.....	26
Table 4.4:	Fauna habitats of the Study Area	29
Table 5.1:	Conservation significant fauna recorded in the Study Area.....	38
Table 5.2:	Conservation significant fauna potentially occurring in the Study Area.....	43
Table 5.3:	Conservation significant fauna unlikely to occur.....	45
Table 5.4:	Pilbara endemics	46
Table 5.5:	Fauna habitat significance scores	47

APPENDICES

Appendix A:	Conservation status codes	55
Appendix B:	Fauna recorded in the Study Area and region	57
Appendix C:	Results of fauna habitat assessments	70
Appendix D:	Locations of conservation significant fauna recorded	72
Appendix E:	Details of overhangs and caves recorded in the Study Area.....	77



EXECUTIVE SUMMARY

Biologic Environmental Survey (Biologic) was commissioned by BHP Billiton Iron Ore Pty Ltd to undertake a Level 1 vertebrate fauna survey and comprehensive literature and database review of the Jinidi Mining Lease (AML7000244), hereafter referred to as the Study Area.

The purpose of the review was to:

- Undertake a comprehensive literature and database review of previous fauna surveys and records within the Study Area;
- Undertake a supplementary field survey to map fauna habitat within the Study Area and verify the outcomes of previous surveys;
- Conduct targeted surveys for fauna of conservation significance within the Study Area, including a reassessment of previous records of conservation significant fauna;
- Undertake an assessment of the conservation significance of habitat within the Study Area for vertebrate fauna, and in particular species of conservation significance; and,
- Provide a contemporary review of vertebrate fauna within the Study Area, with data consolidated from all surveys undertaken to date.

A fauna habitat assessment and targeted survey for significant vertebrate fauna was conducted within the Study Area from the 14th – 20th of March and 6th – 10th April, 2011. This is the third baseline assessment undertaken within the Study Area, the others being a two-season Level 2 survey (Ecologia, 2006) and a single-season Level 2 survey (ENV, 2010b). Additionally, two Level 2 surveys have overlapped parts of the Study Area (ENV, 2010a; OES, 2010a) and a third survey targeting Northern Quoll according to DSEWPaC (2011c) guidelines was also conducted within the Study Area (Biologic, 2011b).

The total survey effort within the Study Area exceeds the EPA's (2004) requirements for a Level 2 baseline fauna survey.

A total of 192 vertebrate fauna species have been recorded in the Study Area to date, consisting of 27 native and five introduced mammal species, 85 bird species, 73 reptile species and two amphibian species.

Eight conservation significant species have been recorded within the Study Area:

- Pilbara Leaf-nosed Bat (*Rhinionictoris aurantia*) – EPBC Act Vulnerable and WC Act Schedule 1;
- Ghost Bat (*Macroderma gigas*) – DEC Priority 4 and IUCN Vulnerable;
- Western Pebble-mound Mouse (*Pseudomys chapmani*) – DEC Priority 4;
- Australian Bustard (*Ardeotis australis*) – DEC Priority 4 and IUCN Near Threatened;
- Fork-tailed Swift (*Apus pacificus*) – EPBC Act Migratory and WC Act Schedule 3;



- Rainbow Bee-eater (*Merops ornatus*) – EPBC Act Migratory and WC Act Schedule 3;
- Pilbara Olive Python (*Liasis olivaceus barroni*) – EPBC Act Vulnerable and WC Act Schedule 1; and,
- *Ramphotyphlops ganeii*, an unnamed blindsnake – DEC Priority 1.

Based on the fauna habitats available within the Study Area and their distribution in the surrounding region, an additional six conservation significant species may occur.

- Northern Quoll (*Dasyurus hallucatus*) – EPBC Act Endangered, WC Act Schedule 1 and IUCN Endangered;
- Eastern Great Egret (*Ardea modesta*) – EPBC Act Migratory and WC Act Schedule 3;
- Peregrine Falcon (*Falco peregrinus*) – WC Act Schedule 4;
- Grey Falcon (*Falco hypoleucos*) – DEC Priority 4 and IUCN Near Threatened;
- Bush Stone-curlew (*Burhinus grallarius*) – DEC Priority 4 and IUCN Near Threatened; and,
- Star Finch, western subspecies (*Neochmia ruficauda subclarescens*) – DEC Priority 4 and IUCN Near Threatened.

Six broad fauna habitats were identified within the Study Area:

- Calcrete Plain;
- Drainage Areas;
- Gorges and Gullies;
- Hill Crests and Slopes;
- Major Drainage Line; and,
- Mulga Association.

These habitats were assessed for the likelihood that they may support conservation significant fauna and therefore represent 'important fauna habitats'. Areas of important fauna habitat were identified as some areas of Gorge/Gully habitat, particularly where rockpools and/or caves were present. Major Drainage Line was also identified as important, but represents a negligible proportion of the Study Area. The Study Area contained a relatively higher number of deep permanent and ephemeral rock pools than have been found by Biologic elsewhere in the region; in contrast, the number of caves suitable for conservation significant bats was considered to be relatively low relative to other areas of the region.



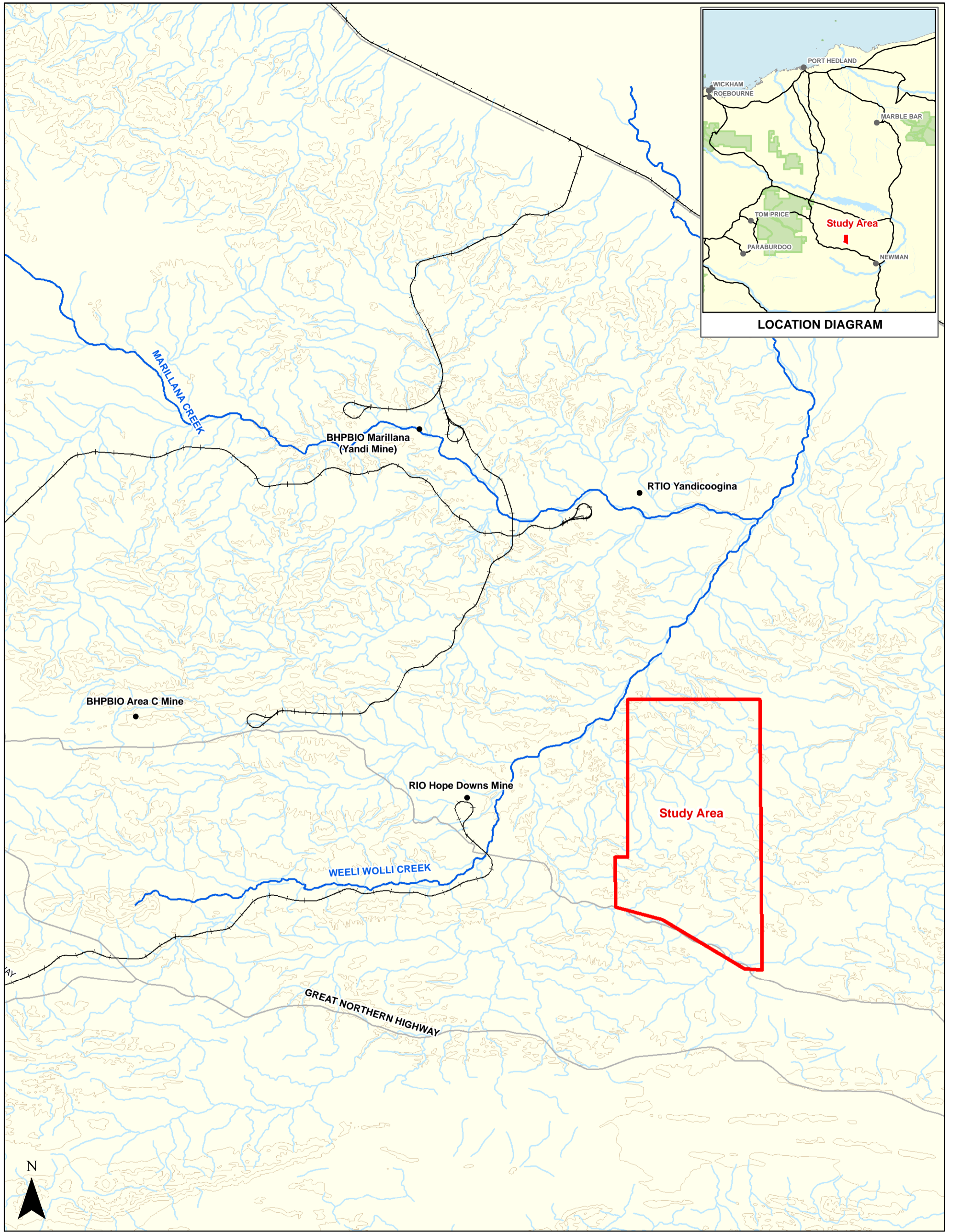
1 INTRODUCTION

BHP Billiton Iron Ore Pty Ltd's (BHPBIO's) Jinidi Mining Lease (AML7000244) is located approximately 55 km north-west of Newman in the central Pilbara, Western Australia (Figure 1.1). It is located 28 km east of the nearest BHPBIO mine at Area C.

Biologic Environmental Survey (Biologic) was commissioned by BHPBIO to undertake a Level 1 (EPA, 2004) vertebrate fauna survey and comprehensive literature and database review of the Jinidi Mining Lease, hereafter referred to as the Study Area.

The purpose of the review was to:

- Undertake a comprehensive literature and database review of previous fauna surveys and records within the Study Area;
- Undertake a supplementary field survey to map fauna habitat within the Study Area and verify the outcomes of previous surveys;
- Conduct targeted surveys for fauna of conservation significance within the Study Area, including a reassessment of previous records of conservation significant fauna;
- Undertake an assessment of the conservation significance of habitat within the Study Area for vertebrate fauna, and in particular species of conservation significance; and,
- Provide a contemporary review of vertebrate fauna within the Study Area, with data consolidated from all surveys undertaken to date.





2 ENVIRONMENT

2.1 Biogeography

The Study Area falls within the Pilbara biogeographical region as defined by the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway and Cresswell, 1995). The Pilbara is subdivided into four subregions, and the Study Area lies in the Hamersley subregion (PIL-3), which forms the southern section of the Pilbara Craton (Kendrick, 2001). Approximately 14.1% of the PIL-3 Hamersley subregion lies within reserve areas; a large component of this is Karijini National Park which is approximately 50 km west of the Study Area. This subregion is characterised by mountainous areas of Proterozoic sedimentary ranges and plateaus, dissected by gorges. The vegetation of the subregion is dominated by *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils on the ranges, and swathes of mulga woodland over bunch grasses on fine-textured soils (Kendrick, 2001). Also within the Pilbara bioregion IBRA identifies River Gum woodlands fringing drainage lines.

2.2 Climate

The Pilbara region has a semi-desert to tropical climate with highly variable, mostly summer rainfall. The average over the broader Pilbara area ranges from about 200 to 350 mm, although rainfall may vary widely from year to year (Australian Natural Resource Atlas, 2008).

The Pilbara climate is heavily influenced by tropical cyclones that develop over the Indian Ocean in the north of Australia. These sometimes cross the north-west coastline, bringing heavy rainfall to inland regions of the Pilbara. Average maximum summer temperatures are typically in the range of 35°C to 40°C and winter maximum temperatures are generally between 22°C and 30°C (BOM, 2011).

Long-term climatic data is not available for Jinidi; however, the Bureau of Meteorology (BOM) weather station at Newman Airport (Station 007176, located 65 km to the south-east) has been used as a reference point for climatic observations in the Study Area (BOM, 2011). The average monthly temperature and rainfall observations at Newman Airport in the year prior to the survey are plotted against the longer-term averages in Figure 2.1.

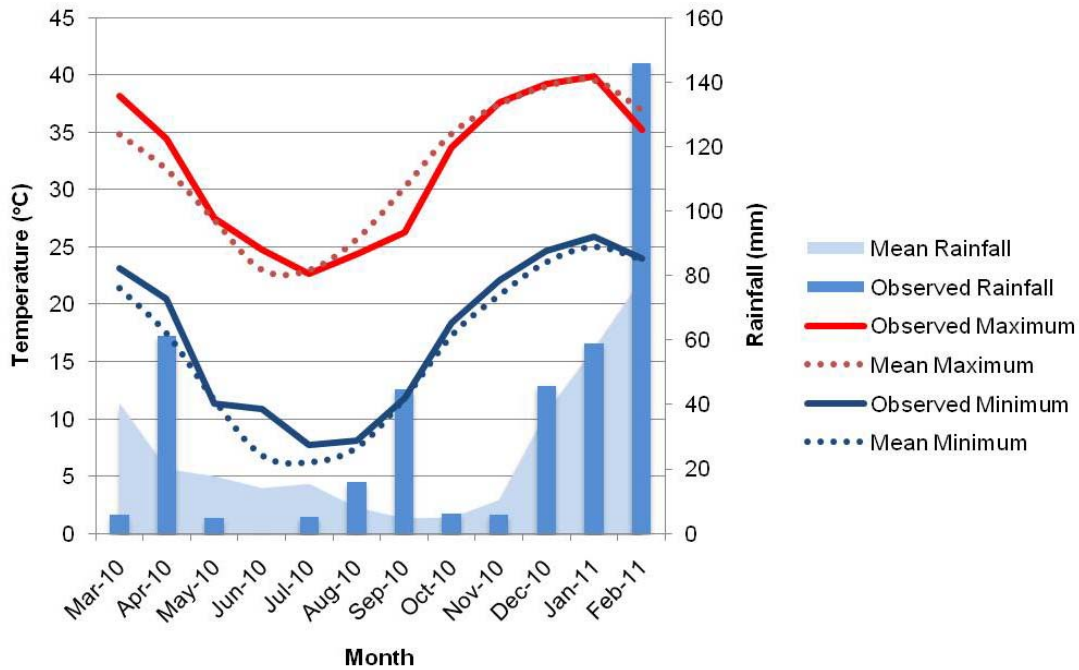


Figure 2.1: Average monthly temperature and rainfall observations at Newman Airport in the year prior to the survey plotted against long-term averages (BOM, 2011)

2.3 Vegetation

Broad scale vegetation mapping of the Pilbara has been undertaken by Burbidge (1995) and Beard (1975). This was further refined by Sheperd *et al.* (2002) to account for clearing in the intensive land use zones. According to Beard (1975) the Study Area lies within the Fortescue Botanical District and within the Eremaean Botanical Province. The main broad vegetation types identified by Beard (1975), and their relative abundance and distribution within reserves and public lands, are shown in Table 2.1.



Table 2.1: Vegetation types recorded at Jinidi, their relative amount and distribution within reserves and public lands (Sheperd *et al.*, 2002). Table from Onshore (2011).

Code	Description	Pre-European extent remaining	% Remaining IUCN Class I – IV reserves	% Remaining Other Reserves	% Remaining DEC Managed Public lands
a ₁ Li	Low woodland; Mulga	99.9	2.0	0.3	2.5
e ₁₆ Lrt ₃ Hi	Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>	100.0	8.9	0.2	1.0

2.4 Hydrology

The Study Area is located in a sub-catchment of Weeli Wolli Spring Catchment (URS-Parsons Brinckerhoff, 2011). From a fauna perspective, the most important hydrological feature is Weeli Wolli Spring, which provides a permanent water source for fauna. The spring is the only known surface water outlet from a large catchment (1370 km² in area) which includes the Study Area (HDMS, 2000), but there may be springs upstream as well, e.g. at 'Ben's Oasis' (B. Barnett, *pers. comm.*). The narrow gorge and shallow bedrock at this point form a restricted outlet to the catchment, bringing the water table to the surface. Monitoring of historical flows by the Western Australian Department of Water indicated spring baseflow in the range 4.4–10 megalitres per day (ML/day), representing a catchment yield of just over 1 mm/year or about 0.3% of annual rainfall. Any excess surface water above this baseflow is exported as surface flow through the gorge into the Fortescue Valley (J. Barnett, *pers. comm.*). The spring, pools and shallow water table in the vicinity of the spring support phreatophytic woodland, including large Silver Cadjeput (*Melaleuca argentea*), for several kilometres along Weeli Wolli Creek upstream and downstream of the entrance to the gorge.

It is understood that dewatering for mining at Hope Downs, which commenced in 2007, has intercepted the natural groundwater throughflow to Weeli Wolli Spring, and the pools and spring are now maintained by discharge of excess dewatering abstraction into the creek.

2.5 Land use

The dominant land uses in the subregion including grazing, native pastures, conservation, urban areas and mining (Kendrick, 2001), as well as recreation and tourism. Several mines (Table 2.2) and their associated infrastructure are currently active in the central Pilbara in close proximity to the Study Area and more are expected to come online in the next few years, e.g. Hope Downs 4.



Table 2.2: Active mines near the Study Area

Mine Site	Distance to Jinidi
Area C	28 km west
Hope Downs	8 km west
West Angelas	50 km west
Yandi	22 km north
Rhodes Ridge	11 km east

Pastoral leases account for 60% of the land area within the Pilbara. Of late, the pastoral industry has become increasingly dependent on live export of cattle through Port Hedland. Degradation associated with fire frequencies, Buffel Grass and overgrazing is a common feature of the region (McKenzie *et al.*, 2009). Part of the Study Area intersects the BHPBIO-managed Marillana pastoral lease.

Tourism is becoming an increasingly important industry in the Pilbara region. In 2006 Tourism contributed AUD 0.2 billion to the Pilbara economy (Anon., 2006).



3 METHODS

3.1 Compliance

This review and field survey was carried out in a manner consistent with the Western Australian Environmental Protection Authority (EPA) and WA Department of Environment and Conservation (DEC) requirements for the environmental surveying and reporting of fauna:

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

Survey guidelines released by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities for bats (DEWHA, 2010a), birds (DEWHA, 2010b), amphibians (DEWHA, 2010c) and reptiles (DSEWPaC, 2011a) were also considered.

3.2 Literature and database review

A number of databases were accessed to determine the potential fauna of the Study Area. These were:

- DSEWPaC Protected Matters Database Search Tool (DSEWPaC, 2011b);
- DEC NatureMap, which incorporates threatened fauna (DEC, 2011) and results of the Pilbara Biological Survey; and,
- Birds Australia Birddata database (Birds Australia, 2011).

Details of these database searches are given in Table 3.1.

Table 3.1: Databases used for the review

Provider	Database	Parameters
Department of Sustainability, Environment, Water, Population and the Communities (DSEWPaC, 2011b)	Protected Matters Database Search Tool. Accessed February 2011	Circle of radius 10 km centred on the point 119.26833 -22.99722.
Department of Environment and Conservation (DEC, 2011)	NatureMap. Accessed February 2011	Circle of radius 20 km centred on the point 119°16'05"E 22°59'49"S..
Birds Australia (Birds Australia, 2011)	Birdata. Accessed February 2011.	Ten minute square containing the point 119.27317, -23.00827.



A review was conducted of all vertebrate fauna surveys undertaken within and surrounding the Study Area. To date, six fauna surveys have been undertaken within or overlapping the Study Area boundary (Ecologia, 2006; ENV, 2010a, b; OES, 2010), including recent surveys targeting significant fauna (this report), and targeted surveys for Northern Quoll (Biologic, 2011b). Additionally, a number of surveys have been conducted in nearby areas and provide a regional context for the fauna recorded at Jinidi. Regional surveys reviewed for this report were:

- Hope Downs Biological Survey (Ecologia, 1997);
- Mining Area C Biological Survey (Ecologia, 1998a);
- Weeli Wolli Creek Biological Assessment Survey (Ecologia, 1998b);
- Packsaddle Range Biological Survey (Ecologia, 2004a);
- Area C Deposits D, E and F Biological Survey (Ecologia, 2004b);
- Area C Deposit R Fauna Assessment (ENV, 2007a);
- Area C West Fauna Assessment (ENV, 2007b);
- Area C EMP Revision 4: Deposits A, D, P1 and P3 (OES, 2008);
- South Flank Fauna Assessment (ENV, 2008);
- Hope Downs 4 Mining Area Fauna Survey (Ninox, 2009);
- Hope Downs 4 Targeted Northern Quoll Survey (Biota, 2009);
- Camp Hill Level 1 Fauna Survey (Biologic, 2010);
- Area C and Surrounds Vertebrate Fauna Survey (Biologic, 2011a); and,
- Southern Flank Vertebrate Fauna Survey (Biologic, *in prep.* a).

In addition, Level 2 vertebrate fauna surveys are currently being undertaken by Biota Environmental Science (Biota) immediately adjacent to the southern boundary of the Study Area and to the west of the Study Area (Biota *in prep.*). Preliminary data from these surveys have been included in this report.

3.3 Field assessment

A fauna habitat assessment and targeted survey for significant fauna was undertaken by Dr Stewart Ford and Mr Thomas Rasmussen from 14-20 March and 06-10 April, 2011. The survey targeted species identified during the database review and other species considered likely to occur based on the experience of the zoologists.

3.3.1 Walking transects

Search methods included 75.2 person hours of walking transects of fauna habitats known to support significant species, such as:

- Gullies and gorges – for Ghost Bat (*Macroderma gigas*; DEC Priority 4 and IUCN Vulnerable), Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*; EPBC Act Vulnerable)



and WC Act Schedule 1), Pilbara Olive Python (*Liasis olivaceus barroni*; EPBC Act Vulnerable and WC Act Schedule 1) and Northern Quoll (*Dasyurus hallucatus*; EPBC Act Endangered, WC Act Schedule 1 and IUCN Endangered);

- Vertical cliff faces – for ledges capable of providing nesting sites for Peregrine Falcon (*Falco peregrinus*; WC Act Schedule 4);
- Drainage lines – for Peregrine Falcon and Grey Falcon (*Falco hypoleucos*; DEC Priority 4 and IUCN Near Threatened), Bush Stone-curlew (*Burhinus grallarius*; DEC Priority 4 and IUCN Near Threatened) and species listed as Migratory under the EPBC Act, such as the Eastern Great Egret (*Ardea modesta*; EPBC Act Migratory and WC Act Schedule 3) and the Rainbow Bee-eater (*Merops ornatus*; EPBC Act Migratory and WC Act Schedule 3); and,
- Open areas – for Australian Bustard (*Ardeotis australis*; DEC Priority 4 and IUCN Near Threatened).

During walking transects opportunistic searches for cryptic reptile and amphibian species were conducted by both surveyors and 34.7 person hours of bird surveys were conducted. All reptiles, amphibians and birds encountered by the zoologists within the Study Area were recorded. The GPS locations of species of conservation significance were recorded. All GPS locations are reported in the WGS 84 datum.

3.3.2 Bat recordings

Bat records were undertaken at three locations most likely to be attractive to Pilbara Leaf-nosed Bat and Ghost Bat (deeply incised gullies with large rock pools) over several nights, totalling 174.3 hrs of bat recording. Units used were a Titley AnaBat™ SD1 (SD1) and a Wildlife Acoustics Song Meter (SM2). Recordings were analysed by Mr Bob Bullen of BatCall WA.

3.3.3 Habitat assessment

Onshore (2011) has recently completed a review of vegetation and flora surveys conducted within the Study Area. Fauna habitat maps have been derived from vegetation boundaries defined by Onshore (2011) and are based on field observations and fauna habitat assessments conducted by Biologic (current study).

Twenty-seven fauna habitat assessments were conducted. Habitats in the Study Area were assessed using methodology and terminology adapted from the *Australian Soil and Land Survey Field Handbook* (CSIRO, 2009) and modified to suit the survey requirements. The characteristics recorded during the habitat assessments were:

- Site information, photo and location (WGS84);
- Landform: slope, relative inclination of slope, morphological type and landform type;



- Vegetation: disturbance, condition, leaf litter %, twig litter %, wood litter, dead stags and hollow bearing trees per 2500m², broad floristic formation, tree, shrub and grass structure (each at tall, mid and low strata), dominant trees, shrubs, grasses and herbs;
- Land surface: microrelief, sheet erosion, rill erosion, gully erosion, gully depth, abundance and size of coarse fragments, rock outcropping, waterbodies, comments on nests, burrows, roosts and diggings;
- Soil: texture, colour, water status and strength; and,
- Substrate: substrate form, rock type and comments on geology.

Fauna habitats were also assessed for the likelihood that they may support conservation significant fauna, and therefore represent 'important fauna habitats'. All major fauna habitats present within the Study Area were sampled and scored (High, Medium or Low) according to the criteria shown in Table 3.2. The importance of each fauna habitat for conservation significant fauna is discussed in Section 5.4.

Table 3.2: Fauna habitat importance assessment criteria

Score	Criteria
High	1) Used by EPBC Act listed threatened fauna or WC Act Schedule 1 or 4 fauna for breeding, shelter or core foraging habitat, OR 2) Habitat for species listed as above is present in the Study Area, and there are records of that species within 50 km of the Study Area. If limited surveys have been undertaken in the vicinity of the Study Area then a precautionary approach will be used and the species will be considered likely to be present, OR 3) Uncommon habitat is critical habitat for a population of DEC listed Priority fauna. For example, if habitat is limited in the region and the habitat in the Study Area forms a significant portion of the known habitat for a Priority species, it would be scored as High significance.
Medium	1) Habitat supports DEC listed Priority fauna that are largely restricted to that habitat type within the Study Area. OR 2) Habitat supports EPBC Act listed Migratory and WC Act Schedule 3 fauna. OR 3) Habitat supports a particularly diverse and uncommon faunal assemblage. Habitat that occurs throughout region, and does not occur in small or isolated areas, is excluded.
Low	Habitat is widespread, common, and does not solely support any significant fauna.

Caves noted in previous reports were revisited during the current survey and assessed for their ability to provide habitat for Ghost Bat and Pilbara Leaf-nosed Bat.

3.4 Level of assessment

The level of survey undertaken was a Level 1 baseline fauna survey (EPA, 2004). The total survey effort within the Study Area exceeds the EPA's requirements for a Level 2 baseline



fauna survey. This is based on a two-season Level 2 survey (Ecologia, 2006), a single-season Level 2 survey (ENV, 2010b), a Level 1 targeted survey for conservation significant fauna (Biologic, current survey), and a targeted survey for Northern Quoll (Biologic, 2011b) having been conducted in the Study Area. The Northern Quoll survey was conducted in accordance the DSEWPaC's *Referral Guidelines for the Endangered Northern Quoll, Dasyurus hallucatus* (DSEWPaC, 2011c).

3.5 Assessment of conservation significance

Within Western Australia, native fauna are protected under the *Wildlife Conservation Act 1950* (WC Act), and in general terms, any action that has the potential to impact on native fauna or its habitat needs to be approved by relevant State and/or Federal departments as dictated by the Western Australian *Environmental Protection Act 1986* and the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Certain fauna considered to be at risk of extinction or decline are afforded extra protection under these acts. For the purposes of this report, these species are called 'conservation significant species'. A summary of applicable legislation and status codes is provided in Table 3.3. Details of conservation status codes are provided in Appendix A. The WC Act was most recently updated with the *Wildlife Conservation (Specially Protected Fauna) Notice 2010*.

A number of migratory bird and marine species are prioritised for conservation under the EPBC Act or international agreements. In addition the International Union for Conservation of Nature (IUCN) compiles a Red List on which species at risk are listed (IUCN, 2011).

Some species for which there is insufficient information available for inclusion under the EPBC or WC acts are listed as Priority fauna by the DEC. Priority fauna are generally considered by the EPA and the DEC as species of conservation significance for all environmental impact assessments.

In this report, some species have been identified as having 'local' significance. Locally significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, isolated outlying populations, species which may be undescribed (EPA, 2004), or species that are rare in the Pilbara but are not otherwise formally recognised at a State or Federal level.



Table 3.3: Conservation significance status codes

Level	Agreement, Act or List	Status Codes
International	<p>The IUCN Red List lists species at risk under nine categories.</p> <p>Migratory taxa listed under the following international conventions are generally listed as Migratory or Marine under the federal <i>Environment Protection and Biodiversity Conservation Act 1999</i> (see below):</p> <ul style="list-style-type: none"> • Japan-Australia Migratory Bird Agreement (JAMBA); • China-Australia Migratory Bird Agreement (CAMBA); and, • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). 	<p>IUCN Extinct IUCN Extinct in the Wild IUCN Critically Endangered IUCN Endangered IUCN Vulnerable IUCN Near Threatened IUCN Least Concern IUCN Data Deficient IUCN Not Evaluated</p>
Federal	<p><i>Environment Protection and Biodiversity Conservation Act 1999</i></p> <p>DSEWPaC lists threatened fauna, which are determined by the Threatened Species Scientific Committee (TSSC) according to criteria set out in the Act. The Act lists fauna that are considered to be of conservation significance under one of eight categories.</p>	<p>Extinct Extinct in the Wild Critically Endangered Endangered Vulnerable Conservation Dependent Migratory Marine</p>
State	<p><i>Wildlife Conservation Act 1950</i></p> <p>At a state level, native fauna are protected under the <i>Wildlife Conservation Act 1950</i>. Species in need of conservation are given a ranking ranging from Critically Endangered to Vulnerable.</p>	<p>Schedule 1 Schedule 2 Schedule 3 Schedule 4</p>
State	<p>DEC Priority list</p> <p>The DEC produces a list of Priority species and ecological communities (PECs) that have not been assigned statutory protection under the <i>Wildlife Conservation Act 1950</i>. This system gives a ranking from Priority 1 to Priority 5.</p>	<p>Priority 1 Priority 2 Priority 3 Priority 4 Priority 5</p>

3.6 Taxonomy and nomenclature

Taxonomy and nomenclature of checklists of WA mammals, reptiles and amphibians published by the Western Australian Museum (WAM) was adopted (WAM, 2009). For birds, the current Birds Australia checklist, based on the most recent review of the systematics and taxonomy of Australian birds (Christidis and Boles, 2008) was used.



4 VERTEBRATE FAUNA AND FAUNA HABITATS

4.1 Review of previous surveys

Database searches and literature reviews indicated that 268 vertebrate fauna species have the potential to occur within the Study Area (Appendix B). This list comprises 32 species of native mammals, nine introduced mammal species, 125 species of birds, 96 species of reptiles and six species of amphibians. These species have either been recorded in the region of the Hamersley range surrounding Jinidi, or in the Study Area itself.

Details of previous surveys within the region are given in Table 4.1, while those within or partly within the Study Area are considered in Table 4.2.

The review of previous surveys and databases suggested that 18 species of conservation significance have either been recorded or potentially occur within the Study Area. These species are discussed further in Section 5.1.2.

4.2 Supplementary field survey

During the current survey, 12 native and three introduced mammal, 59 bird, 16 reptile and two amphibian species were recorded, totalling 92 species. Five of these were species of conservation significance and are discussed in Section 5.1.2. The EPBC Act Vulnerable and WC Act Schedule 1 Pilbara Olive Python (scat record) recorded in the current survey is the first record for the Study Area.

4.3 Fauna species recorded in the Study Area from 2005-2011

The total vertebrate fauna survey effort for the Study Area (where it has been possible to determine this from previous reports) is summarised in Table 4.3. Combining data from the current survey with previous surveys in the Study Area (Ecologia, 2006; ENV, 2010b; relevant sites within OES, 2010), 27 native and five introduced mammal species, 85 bird species, 73 reptile species and two amphibian species have been recorded, totalling 192 species (Appendix B).

The locations at which trapping sites, fauna habitat assessments and targeted search transects have been undertaken within the Study Area are shown in Figure 4.1.



Table 4.1: Details of surveys conducted in the region

Report	Consultant	Year	Survey Type	Approximate Distance and Direction from Study Area	Significant Species	Significant Features
Hope Downs Biological Survey	Ecologia	1997	Level 2	Adjacent to the west	Peregrine Falcon, Western Pebble-mound Mouse	-
Mining Area C Biological Survey	Ecologia	1998a	Level 2	20 km westward	Peregrine Falcon, Rainbow Bee-eater, Western Pebble-mound Mouse	-
Weeli Wolli Creek Biological Assessment Survey	Ecologia	1998b	Level 2	1.5 km westward	Australian Bustard, Peregrine Falcon, <i>Ramphotyphlops ganeii</i> , Rainbow Bee-eater, Western Pebble-mound Mouse	Weeli Wolli Springs (listed by DEC as a Priority Ecological Community)
Packsaddle Range Biological Survey	Ecologia	2004a	Level 2	17 km westward	Grey Falcon, Western Pebble-mound Mouse, Star Finch (western subspecies)	-
Area C: Deposits D, E and F Biological Survey	Ecologia	2004b	Level 2	29 km westward	Star Finch (western subspecies), Western Pebble-mound Mouse	-
Area C R-deposit Fauna Assessment	ENV	2007a	Level 2	17 km westward	Pilbara Leaf-nosed Bat, <i>Ramphotyphlops ganeii</i> , Rainbow Bee-eater, Western Pebble-mound Mouse	-
Area C West Fauna Assessment	ENV	2007b	Level 2	45 km westward	Bush Stone-curlew, Rainbow Bee-eater, Western Pebble-mound Mouse	-
Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits	OES	2008	Level 2	24 km westward	Australian Bustard, Fork-tailed Swift, Pilbara Olive Python, Rainbow Bee-eater, Western Pebble-mound Mouse	-
Area C South Flank Deposit Fauna Assessment	ENV	2008b	Level 1	24 km westward	Australian Bustard, Grey Falcon, Rainbow Bee-eater, Western Pebble-mound Mouse	-
Hope Downs 4 Mining Area – Fauna Survey 2008	Ninox	2009	Level 2	Infrastructure corridor runs along the southern boundary	Australian Bustard, Chocolate Wattled Bat (locally significant), Peregrine Falcon, Rainbow Bee-eater, Western Pebble-mound Mouse	-
Biological survey: South Parmelia Exploration Leases	Onshore-Biologic	2009	Level 1 Fauna	Adjacent to the south	Pilbara Olive Python, Western Pebble-mound Mouse	-
Area C and Surrounds Vertebrate Fauna Study	Biologic	2011a	Level 2	17 km westward	Australian Bustard, Fork-tailed Swift, Ghost Bat, Peregrine Falcon, <i>Ramphotyphlops ganeii</i> , Rainbow Bee-eater, Western Pebble-mound Mouse	-
Southern Flank Vertebrate Fauna Assessment	Biologic	<i>in prep. a</i>	Level 2	24 km westward	Australian Bustard, Ghost Bat, Northern Quoll, Peregrine Falcon, Pilbara Leaf-nosed Bat and <i>Ramphotyphlops ganeii</i> , Rainbow Bee-eater, Western Pebble-mound Mouse	Coolibah - Lignum Flats (listed by DEC as a Priority Ecological Community)



Table 4.2: Details of surveys conducted in the Study Area

Title	Jirridi Biological Survey	Jinayri Mining Lease Vertebrate Fauna Survey	Jinayri Access Road Vertebrate Fauna Survey (part)	Area C to Jinidi to Mt. Newman Railway Line (part)	Targeted Northern Quoll Survey (part)	Jinidi Vertebrate Fauna Survey (current survey)
Survey information						
Consultant	Ecologia	ENV	ENV	OES	Biologic	Biologic
Year	2006	2010	2010	2010	2011	Current survey
Type	Two season Level 2	Single season Level 2	Single season Level 2	Two season Level 2	Targeted Northern Quoll Survey	Single season Level 1
Relevance to the Study Area	Within the Study Area.	Within the Study Area.	Part of the survey area and bat recording sites within the Study Area, but no trapping sites within the Study Area.	4 sites within the Study Area.	17 sites within the Study Area.	Within the Study Area.
Duration	17 – 31 Oct 2005 and 27 – 5 Apr 2006	5 – 18 Mar 2008	20 – 30 Mar 2009	20 Oct – 1 Nov 2008 and 5 – 29 Mar 2009	20 Jun -1 Jul 2011 and 8 – 19 Jul 2011	15 – 20 Mar 2011 and 6 – 10 Apr 2011
No. of trapping sites	6	6	None in Study Area	4 in Study Area	17 in Study Area	No trapping
Site composition ¹	Linear transect. Per site: 5 pipes, five buckets, 2 funnels, 20 medium Elliots, 2 cages.	Linear transect. Per site: up to 10 bucket, 2 pots, 2 funnels, 10 medium Elliots, 10 cages.	N/A	2 Linear transects. Per site: 10 pit traps (buckets or pipes), 20 funnels, 20 Elliots, 2 cages.	2 km linear transect. Per site: 5 large Elliots, 15 cages placed 100 m apart.	N/A
Trapping nights	Phase 1 - 10 nights Phase 2 - 8 nights	Up to 13 nights	N/A	7-14 nights	7 nights	N/A
Trapping effort						
Cage nights	216	670	0	70	1785	0
Elliott nights ²	2160	670	0	700	595 (large)	0
Funnel nights	1062	1340	0	700	0	0
Pot nights	0	1340	0	0	0	0
Bucket nights	540	670	0	175 ³	0	0
PVC pipe nights	540	0	0	175 ³	0	0

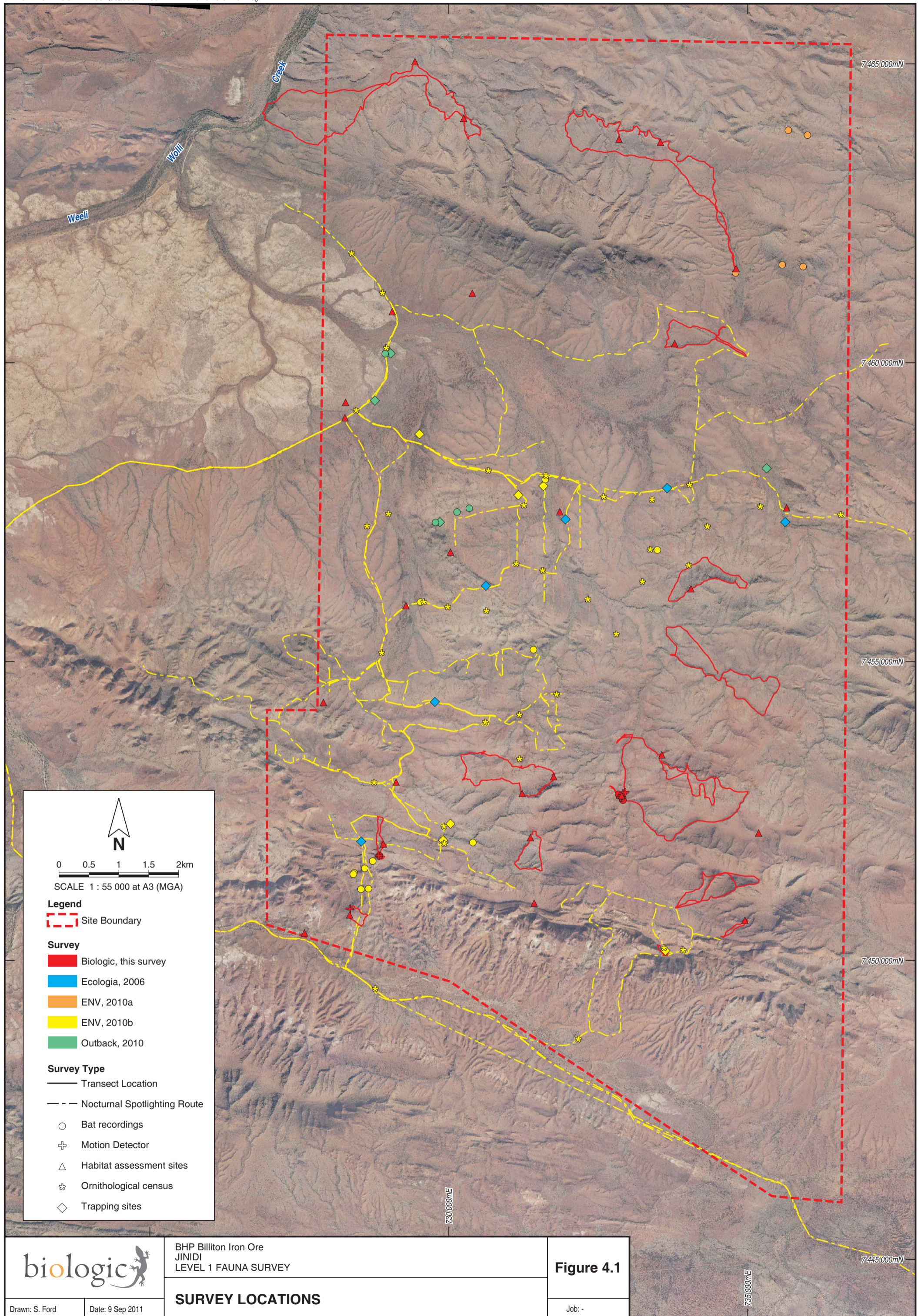


Title	Jirridi Biological Survey	Jinayri Mining Lease Vertebrate Fauna Survey	Jinayri Access Road Vertebrate Fauna Survey (part)	Area C to Jinidi to Mt. Newman Railway Line (part)	Targeted Northern Quoll Survey (part)	Jinidi Vertebrate Fauna Survey (current survey)
Total trap nights	4518	4690	0	1820	2380	0
Bird surveys (hrs)	40	24.75	Unclear	Min. 5.3	0	34.7
Bird survey methods	20 min 2 ha search	Opportunistic	Unclear	20 min search within 100 m radius	N/A	Transects
Diurnal searches (hrs)	62.6	40	Unclear	11	0	75.2
Nocturnal searches (hrs)	33.2	38	Unclear	Unknown	0	Not conducted
Bat survey nights	Unclear	Unclear	12	4	0	
Bat survey hours	16.6	93.3	96 ⁴	32 ⁴	0	174.3
Bat survey methods	AnaBat	AnaBat	AnaBat	AnaBat	N/A	AnaBat SD1 and Wildlife Acoustics SM2
Results						
Mammals (native)	19	21	Unknown	13	2	13
Mammals (introduced)	3	5	Unknown	0	1	2
Birds	70	65	Unknown	44	2	59
Reptiles	48	60	Unknown	41	0	16
Amphibians	2	1	Unknown	0	0	2
Total	142	152	Unknown	98	5	92
Conservation significant species recorded in the Jinidi Study Area	Ghost Bat (AnaBat), Western Pebble-mound Mouse (mounds), Fork-tailed Swift, Rainbow Bee-eater, Australian Bustard	Orange Leaf-nosed Bat (AnaBat), <i>Ramphotyphlops ganei</i> , Ghost Bat (AnaBat), Western Pebble-mound Mouse (mounds), Rainbow Bee-eater, Australian Bustard	Western Pebble-mound Mouse (mounds)	No species of conservation significance were recorded in Study Area	No species of conservation significance were recorded	Ghost Bat (scats), Western Pebble-mound Mouse (mounds), Fork-tailed Swift, Rainbow Bee-eater, Pilbara Olive Python



Title	Jirridi Biological Survey	Jinayri Mining Lease Vertebrate Fauna Survey	Jinayri Access Road Vertebrate Fauna Survey (part)	Area C to Jinidi to Mt. Newman Railway Line (part)	Targeted Northern Quoll Survey (part)	Jinidi Vertebrate Fauna Survey (current survey)
Number of conservation significant species	5	6	1	0	0	5
Notes			This study has been included in the Appendix as a regional report because it is unclear which records were from the Study Area.		This study has not been included in Figure 4.1. See report for site locations.	Round Top Hill, the large hill dominating the northern part of the Study Area, was not surveyed due to heritage restrictions.

1. All Elliott and cage traps were baited with universal bait.
2. All Elliots referred to are Medium Elliots, unless otherwise stated.
3. Number of pit days only were given. Data has been divided equally between number of bucket days and number of PVC pipe nights.
4. Assuming 8 hours per night.



N

0 0.5 1 1.5 2km
 SCALE 1 : 55 000 at A3 (MGA)

Legend

Site Boundary

Survey

- Biologic, this survey
- Ecologia, 2006
- ENV, 2010a
- ENV, 2010b
- Outback, 2010

Survey Type

- Transect Location
- Nocturnal Spotlighting Route
- Bat recordings
- Motion Detector
- Habitat assessment sites
- Ornithological census
- Trapping sites



BHP Billiton Iron Ore
 JINIDI
 LEVEL 1 FAUNA SURVEY

SURVEY LOCATIONS

Drawn: S. Ford

Date: 9 Sep 2011

Figure 4.1

Job: -



Table 4.3: Overall survey effort from all surveys in the Study Area

Survey	All surveys in the Study Area
No. of Trapping Sites	33
Cage Nights	2741
Medium Elliott Nights	3530
Large Elliott Nights	595
Funnel Nights	3102
Pot Nights	1340
Bucket Nights	2963
PVC Pipe Nights	2293
Total Trap Nights	13328
Diurnal Search (hrs)	188.8
Nocturnal search (hrs)	71.2
Bird surveys (hrs)	Min. 104.75
Bat recordings (hrs)	608.2

Note that a survey overlying part of the Study Area (ENV, 2010a) was excluded from the table above because the survey effort expended within it could not be determined.

4.3.1 Native mammals

Of the 33 native mammals that may occur within the Study Area, 27 species from nine families have been recorded to date.

Considering the Study Area as a whole, six mammal species have been recorded in all of the surveys within the Study Area: the Euro (*Macropus robustus*), Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*), Common Sheath-tailed Bat (*Taphozous georgianus*), Gould's Wattleed Bat (*Chalinolobus gouldii*), Little Broad-nosed Bat (*Scotorepens greyii*) and Finlayson's Cave Bat (*Vespadelus finlaysoni*). Nine species were recorded in only one of the surveys in the Study Area to date: the Short-beaked Echidna (*Tachyglossus aculeatus*), Lesser Hairy-footed Dunnart (*Sminthopsis youngsoni*), Rothschild's Rock Wallaby (*Petrogale rothschildi*), Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*), Hill's Sheath-tailed Bat (*Taphozous georgianus*), Eastern Long-eared Bat (*Nyctophilus bifax daedalus*), White-striped Free-tailed Bat (*Tadarida australis*), Spinifex Hopping-mouse (*Notomys alexis*) and Desert Mouse (*Pseudomys desertor*). The Short-beaked Echidna and Rothschild's Rock Wallaby recorded in the current study represent new records for the Study Area.



4.3.2 Birds

One-hundred and twenty five bird species potentially occur in the Study Area, of which 85 species, from 35 families, have been recorded to date.

Bird species that have been recorded during all surveys conducted to date in the Study Area are the Crested Pigeon (*Ocyphaps lophotes*), Spinifex Pigeon (*Geophaps plumifera*), Diamond Dove (*Geopelia cuneata*), Brown Goshawk (*Accipiter fasciatus*), Brown Falcon (*Falco berigora*), Little Button-quail (*Turnix velox*), Budgerigar (*Melopsittacus undulatus*), Horsfield's Bronze-Cuckoo (*Chalcites basalus*), Western Bowerbird (*Ptilonorhynchus guttatus*), Variegated Fairy-wren (*Malurus lamberti*), Rufous-crowned Emu-wren (*Stipiturus ruficeps*), Weebill (*Smicronis brevirostris*), Chestnut-rumped Thornbill (*Acanthiza uropygialis*), Red-browed Pardalote (*Pardalotus rubricatus*), Striated Pardalote (*Pardalotus striatus*), Singing Honeyeater (*Lichenostomus virescens*), Grey-headed Honeyeater (*Lichenostomus keartlandi*), Yellow-throated Miner (*Manorina flavigula*), Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*), Brown Honeyeater (*Lichmera indistincta*), Black-faced Cuckoo-shrike (*Coracina novaehollandiae*), White-winged Triller (*Lalage sueurii*), Rufous Whistler (*Pachycephala rufiventris*), Grey Shrike-thrush (*Colluricincla harmonica*), Crested Bellbird (*Oreoica gutturalis*), Black-faced Woodswallow (*Artamus cinereus*), Little Woodswallow (*Artamus minor*), Pied Butcherbird (*Cracticus nigrogularis*), Australian Magpie (*Cracticus tibicen*), Willie Wagtail (*Rhipidura leucophrys*), Torresian Crow (*Corvus orru*), Hooded Robin (*Melanodryas cucullata*), Spinifexbird (*Eremiornis carteri*), Zebra Finch (*Taeniopygia guttata*) and Painted Finch (*Emblema pictum*). These 35 common species account for almost half of the bird species recorded in the Study Area.

Seventeen species have been recorded in only one of the surveys within the Study Area: Black-shouldered Kite (*Elanus axillaris*), Square-tailed Kite (*Lophoictinia isura*), Collared Sparrowhawk (*Accipiter cirrocephalus*), Spotted Harrier (*Circus assimilis*), Australian Hobby (*Falco longipennis*), Mulga Parrot (*Psephotus varius*), Southern Boobook (*Ninox novaeseelandiae*), Blue-winged Kookaburra (*Dacelo leachii*), Sacred Kingfisher (*Todiramphus sanctus*), Slaty-backed Thornbill (*Acanthiza robustirostris*), White-plumed Honeyeater (*Lichenostomus penicillatus*), Masked Woodswallow (*Artamus personatus*), Grey Fantail (*Rhipidura albiscapa*), Little Crow (*Corvus bennetti*), Horsfield's Bushlark (*Mirafra javanica*), Brown Songlark (*Cincloramphus cruralis*) and Tree Martin (*Petrochelidon nigricans*). One of these species, Brown Songlark, was recorded for the first time in the current survey.

4.3.3 Reptiles

Of the 96 reptiles that may occur in the Study Area, 73 have been recorded to date. Two species have been recorded in all of the surveys conducted within the Study Area: the dragon *Amphibolurus longirostris* and the Ring-tailed Dragon (*Ctenophorus caudicinctus*). Thirty-four



species have only been recorded in one of the surveys to date: Fat-tailed Gecko (*Diplodactylus conspicillatus*), *Lucasium wombeyi*, *Strophurus ciliaris*, *Gehyra pilbara*, *G. purpurascens*, Unbanded Delma (*Delma butleri*), Pilbara Delma (*Delma elegans*), *D. nasuta*, *D. pax*, *D. tincta*, Hooded Scaly foot (*Pygopus nigriceps*), *Ctenotus duricola*, *C. hanloni*, *C. helenae*, *C. piankai*, *C. serventyi*, Narrow-banded Sand Swimmer (*Eremiascincus fasciolatus*), Broad-banded Sand Swimmer (*E. richardsonii*), *Proablepharus reginae*, Short-tailed Pygmy Monitor (*Varanus brevicauda*), Bungarra or Sand Monitor (*V. gouldii*), Yellow-spotted Monitor (*V. panoptes*), Pilbara Rock Monitor (*V. pilbarensis*), *Ramphotyphlops ganei*, *R. grypus*, Stimson's Python (*Antaresia stimsoni*), Black-headed Python (*Aspidites melanocephalus*), Pilbara Olive Python (*Liasis olivaceus barroni*), Pilbara Death Adder (*Acanthophis wellsii*), Yellow-faced Whipsnake (*Demansia psammophis*), Moon Snake (*Furina ornata*), Inland Hooded Snake (*Parasuta monachus*), Western Brown Snake (*Pseudonaja mengdeni*) and *Vermicella snelli*.

The records of Pilbara Rock Monitor and the Pilbara Olive Python in the current survey represent new records for the Study Area.

4.3.4 Amphibians

Two of the six potentially occurring amphibians have been recorded to date within the Study Area. The Desert Tree Frog (*Litoria rubella*) was recorded by ENV (2010b) and in the current survey, and Main's Frog (*Cyclorana maini*) was recorded for the first time in the current survey.

4.3.5 Introduced fauna

Five introduced species have been recorded within the Study Area. The Dog/Dingo (*Canis lupus dingo/familiaris*) has been recorded in all surveys, the Cow (*Bos taurus*) has been recorded in three surveys, the House Mouse (*Mus musculus*) and Cat (*Felis catus*) have been recorded in two surveys, and the Camel (*Camelus dromedarius*) was recorded in one survey.





4.4 Fauna habitats of the Study Area

Six major fauna habitats are present within the Study Area (Table 4.4). Data from fauna habitat assessments are presented in Appendix C and the habitat map is Figure 4.2.



Crest and Slope habitat was the most common fauna habitat type, accounting for more than two thirds of the total Study Area. Drainage Areas were also common, representing just over a quarter of the Study Area. The other habitats (Calcrete Area, Gorge/Gully, Major Drainage Line and Mulga Association) made up the remaining natural fauna habitat. The amount of Major Drainage Line habitat within the Study Area is negligible, but is more extensive at Weeli Wolli Creek immediately to the west.



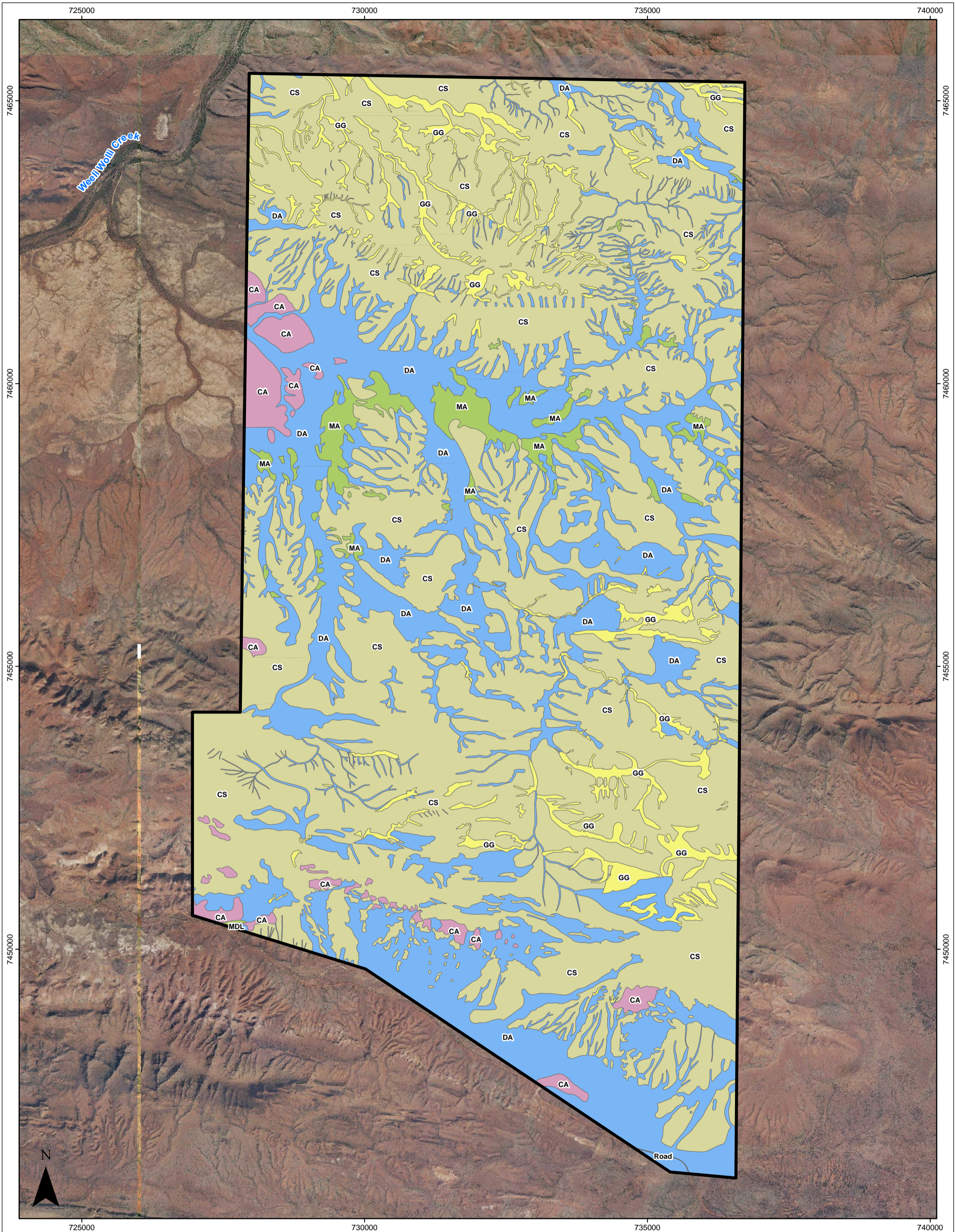
Table 4.4: Fauna habitats of the Study Area

Habitat	Area and % of Study Area	Introduction	Distinguishing habitat characteristics	Extent outside Study Area	Fauna habitat sensitivity	Significant species associated with habitat	Vegetation type*	Photo
Calcrete Area	345 ha 2.22%	This calcareous soil type is located predominantly in the west of the Study Area, but there are small patches of calcrete associated with the ridge in the south as well.	The vegetation occurring on calcrete areas differs from that of the surroundings, presumably due to the differences in soil type. Trees are isolated and the shrub layer tends to be sparse, with a low hummock grassland (<i>Triodia</i> sp.) dominant.	This habitat extends to the west of Weeli Wolli Spring and has also been recorded at Prairie Downs (Onshore-Biologic, 2010). Areas of calcrete such as this are uncommon habitats in the Hamersley subregion.	Low This habitat is not considered to be overly sensitive as it does not support a particularly diverse or endemic faunal assemblage, despite being unique habitat.	Habitat is used by the Australian Bustard (DEC listed Priority 4 species), but is not likely to support a significant population of this species as it is not restricted to this habitat type.	6c	
Crest/Slope	9930 ha 64.04%	This habitat is created by the rocky outcrops and gravelly substrate where <i>Eucalyptus leucophloia</i> low trees and hummock forming grasses dominate.	More than two thirds of the Study Area consists of fauna habitats on hilltops and hillslopes. These fauna habitats tend to be more open and structurally simple than other fauna habitats, and are dominated by varying species of spinifex. A common feature of these habitats is a rocky substrate, often with exposed bedrock, and skeletal red soils.	A very common habitat feature in the region, occurring wherever there are ridges and low rises.	Low Crests and slopes are the least sensitive environments because they account for most of the Study Area, are not overly impacted by activities in the vicinity or water drawdown, and do not provide habitat for a particularly diverse or unique fauna assemblage.	Crest/Slope habitat supports local populations of Western Pebble-mound Mouse, listed as a Priority 4 species by the DEC. The species is largely restricted to this habitat type. The blind snake <i>Ramphotyphlops ganeii</i> , listed as Priority 1 by DEC, also occurs in this habitat type.	2a, 4b, 4c, 6a, 6b, 6d, 6g, 6h	
Drainage Area	4244 ha 27.38%	Characterised by <i>Eucalyptus xerothermica</i> and <i>Corymbia hamersleyana</i> woodland over broad-leafed acacia shrubland on sandy loam soils sometimes with exposed rocky areas.	Drainage Areas are low lying, gently sloping areas around minor drainage lines. These can have the greatest overall vegetation density, complexity and diversity, and because they tend to occur on accretional or depositional areas, often have deeper and richer soils than other fauna habitats. Grasses tend to be dominated by tussock grasses rather than spinifex, or Buffel Grass * <i>Cenchrus ciliaris</i> where this has been introduced.	A common habitat in the Pilbara. Identified in vegetation mapping in regional reports referenced.	Medium Drainage areas contain more diverse vegetation and fauna communities than calcrete, hillcrest or hillslope communities. They are sensitive to upstream clearing, alteration of surface and subsurface hydrology, weed infestation and grazing. Drainage Area provides habitat for a number of conservation significant fauna.	Bush-stone Curlew (DEC Priority 4) may shelter during the day in areas of thicker vegetation associated with drainage areas and <i>Ramphotyphlops ganeii</i> (DEC Priority 1) are likely to utilise this habitat type. Pilbara Olive Pythons (EPBC Act Vulnerable and WC Act Schedule 1) utilise drainage areas for dispersal.	5, 6e, 6f, 7	
Gorge/Gully	496 ha 3.20%	Gorges and gullies are loose terms used to describe the rugged, steep-sided valleys incised into the surrounding landscape. Gorges tend to be deeply incised, with vertical cliff faces, while gullies are more open (but not as open as Drainage Area).	Gorges and gullies tend to be very rocky, with large rock fragments and more rock outcropping than other fauna habitats. Caves are most often encountered in this habitat type. At Jinidi, rockpools are a common feature of this fauna habitat. Vegetation can be dense and complex in areas of soil deposition or sparse and simple where erosion has occurred. Although they account for only a small proportion of the total Study Area, Gorge/Gully habitats are common in the northern and eastern sections of the Study Area.	Gorges and gullies are a common feature of the Hamersley subregion, but because they tend to be narrow, linear features, they represent a small proportion of the total land area.	High Although gorges and gullies support low numbers of individuals and lower fauna diversity, they contain features such as rockpools and caves, point features that are rare in the landscape and important to fauna occupying this and other fauna habitats in surrounding habitats. Gorges and gullies also support a number of conservation significant fauna. Their small area relative to the size of the Study Area also contributes to the sensitivity of this habitat.	The Gorge/Gully habitats of the Study Area provide habitat for Pilbara Olive Python (listed as Vulnerable under the EPBC Act and Schedule 1 under the WC Act) and the DEC-listed Priority 1 species <i>Ramphotyphlops ganeii</i> . Only one large, significant cave was found with evidence of long-term Ghost Bat (DEC Priority 4) use. Caves are not a common feature at Jinidi and it is likely that the single recording of Orange Leaf-nosed Bat (EPBC Act Vulnerable) was an itinerant individual passing through the area.	3	



Habitat	Area and % of Study Area	Introduction	Distinguishing habitat characteristics	Extent outside Study Area	Fauna habitat sensitivity	Significant species associated with habitat	Vegetation type*	Photo
Major Drainage Line	1.04 ha 0.01%	The unnamed creek with <i>Eucalyptus camaldulensis</i> / <i>E. victrix</i> just outside the southern margin drains into Weeli Wolli Creek to the east of the Study Area. The creek is ephemeral, flowing only during wet periods.	Mature River Red Gums and Coolibahs and open, sandy or gravelly riverbeds distinguish this habitat type from more minor Drainage Area habitats. The eucalypt species typically contain a number of significant tree hollows used by parrots and owls for roosting and nesting. In ungrazed areas, the vegetation adjacent to the main channel or channels is denser, taller and more diverse than adjacent terrain.	Major drainage lines drain large areas of catchment, and because they tend to be relatively narrow, linear features, they represent a small proportion of the total land area.	High Creeks and rivers support a relatively high diversity of bird species and provide nesting hollows for species that are rare in other habitats. They are sensitive to disturbance upstream, changes to surface and subsurface hydrology and regional climatic fluxes. They are also prone to weed infestation and are often overgrazed; in these ways they have the sensitivity of broader Drainage Area habitat. However, the length of time taken for the habitat to mature to this stage is long, lasting several decades, and their area is much smaller.	Supports EPBC Act-listed Migratory bird species such as Rainbow Bee-eater and possibly Eastern Great Egret as well as a high diversity of bird species. Provides potential breeding and/or foraging sites for Grey Falcon (DEC Priority 4) and Peregrine Falcon (listed under Schedule 4 of the WC Act) which has been recorded utilising this habitat within the Study Area. Provides habitat and dispersal opportunities for Pilbara Olive Python (listed as Vulnerable under the EPBC Act and Schedule 1 under the WC Act).	1	
Mulga Association	353 ha 2.28%	This habitat includes woodlands and other ecosystems in which Mulga (<i>Acacia aneura</i>) is dominant. It forms predominantly on floodplains and broad drainage zones in patches of uniform density or as disintegrating groves. Patches of Mulga occur throughout the Study Area, and are a feature of some slopes of the southern ridge.	This habitat type is characterised by the dominance of Mulga, either as the principal acacia or mixed with <i>A. pruinocarpa</i> , <i>A. citrinoviridis</i> and/or eucalypt or corymbia species.	The Study Area is near the northern extent of mulga distribution in Western Australia, but mulga woodlands cover much of the region and extend south and east across the central arid zone of the continent.	High Mulga is an arid-adapted habitat that can take a number of decades to reach maturity. It is fire and weed sensitive and often overgrazed. It supports a unique and diverse assemblage of fauna that are endemic to or prefer mulga habitats. Mulga habitats can be markedly altered by changes to surface water flows. Within the Study Area this is an uncommon habitat type.	<i>Ramphotyphlops ganei</i> (DEC Priority 1) and Bush Stone-Curlew (DEC Priority 4) may occur in mulga woodland. Mulga also supports a number of species that are endemic to this habitat type.	2b, 2c	

*Vegetation type is as mapped in Onshore (2011).



Griffin Spatial & Mapping
 2 Epacris Elbow Pelican Point
 Bundury WA 6230
 griffinspatial@bigpond.com
 +61 (0) 8 9725 3213

Legend	
	Study Area
	Road
	MDL - Major Drainage Line
	MA - Mulga Association
	CS - Crests and Slopes
	GG - Gorges and Gullies
	DA - Drainage Area
	CA - Calcrete Area

biologic
 ENVIRONMENTAL SCIENCE

BIOLOGIC ENVIRONMENTAL SCIENCE	Date: 9 Sept. 2011
Sheet Size: A3	Status: FINAL
Drawn by: GSM	Requested by: SF
Internal Reference: Jinidi Fauna Habitats	

JINIDI
 FAUNA HABITATS
 FIGURE 4.2

0 1,000 2,000 3,000 4,000
 Meters
 1:60,000
 Datum: GDA94
 Projection: MGA Zone 50



5 SIGNIFICANT FAUNA AND FAUNA HABITATS

5.1 Conservation significant fauna

5.1.1 Literature and database review

Based on database searches and previous surveys in the region, a total of 18 species of conservation significance comprising four native mammals, 12 birds and two reptiles have the potential to occur in the Study Area. Native mammals identified in the review were:

- Northern Quoll, *Dasyurus hallucatus* (EPBC Act Endangered, WC Act Schedule 1);
- Ghost Bat (DEC Priority 4, IUCN Vulnerable);
- Pilbara Leaf-nosed Bat, *Rhynonictis aurantia* (EPBC Act Vulnerable, WC Act Schedule 1); and,
- Western Pebble-mound Mouse, *Pseudomys chapmani* (DEC Priority 4).

The following conservation significant birds potentially occur in the Study Area:

- Fork-tailed Swift, *Apus pacificus* (EPBC Act Migratory, WC Act Schedule 3);
- Eastern Great Egret, *Ardea modesta* (EPBC Act Migratory, WC Act Schedule 3);
- Cattle Egret, *Ardea ibis* (EPBC Act Migratory, WC Act Schedule 3);
- Grey Falcon, *Falco hypoleucos* (DEC Priority 4, IUCN Near Threatened);
- Peregrine Falcon, *Falco peregrinus* (WC Act Schedule 4);
- Australian Bustard, *Ardeotis australis* (DEC Priority 4, IUCN Near Threatened);
- Bush Stone-curlew, *Burhinus grallarius* (DEC Priority 4, IUCN Near Threatened);
- Oriental Plover, *Charadrius veredus* (EPBC Act Migratory, WC Act Schedule 3);
- Major Mitchell's Cockatoo, *Lophochroa leadbeateri* (WC Act Schedule 4);
- Night Parrot, *Pezoporus occidentalis* (EPBC Act Endangered and Migratory, WC Act Schedule 1, IUCN Critically Endangered);
- Rainbow Bee-eater, *Merops ornatus* (EPBC Act Migratory, WC Act Schedule 3); and,
- Star Finch, *Neochmia ruficauda subclaescens* (DEC Priority 4, IUCN Near Threatened).

Two conservation significant reptiles potentially occur in the Study Area:

- The unnamed blindsnake *Ramphotyphlops ganei* (DEC Priority 1); and,
- Pilbara Olive Python, *Liasis olivaceus barroni* (EPBC Act Vulnerable, WC Act Schedule 1).

Of these potentially occurring species, three mammals, three birds and both reptile species have been recorded in the Study Area (see Section 5.1.2). The remaining species have been classified according to their likelihood of occurrence in Sections 5.1.3 and 5.1.4.



Significant habitats were identified during the literature review. Weeli Wollie Creek to the west of the Study Area was identified in numerous reports (Ecologia, 2006; Onshore-Biologic, 2009) as a significant location. The springs and associated vegetation were acknowledged as important fauna resource in the area due to permanent water and the system was identified as in need of specific management measures (Onshore-Biologic, 2009). Caves recorded by ENV (2010b) as potentially providing habitat to significant bat species were reassessed and considered not to be suitable for conservation significant bat species; however, two additional caves with evidence of Ghost Bat were identified by Biologic within the Study Area (see Section 5.4).

5.1.2 Conservation significant fauna recorded

Eight species of conservation significant fauna have been recorded in the Study Area. The locations at which they were recorded are shown on Figure 5.1 and presented in Appendix D. Below, each of the species recorded is presented in taxonomic order and discussed, with a summary provided in Table 5.1.

Mammals

- **Pilbara Leaf-nosed Bat**

The Pilbara Leaf-nosed Bat is classified as Vulnerable under the EPBC Act and Schedule 1 under the WC Act. The Pilbara Leaf-nosed Bat has a very limited ability to conserve heat and water and requires very hot (28 – 32 °C) and humid (96 – 100%) roost sites in caves and/or mines (Armstrong, 2001). Such caves are relatively uncommon in the Pilbara (Armstrong and Anstee, 2000; Armstrong, 2001, 2006), which limits the availability of diurnal roosts for this species. The few known roosts of this species are concentrated in five disused mines in the eastern Pilbara, and one gorge system in Barlee Range Nature Reserve (DEWHA, 2010a), which are thought to contain most of the region's population. None of the caves recorded in the Study Area were deemed to be suitable for Pilbara Leaf-nosed Bat.

The species is often encountered in flight foraging in gorges and gullies and along watercourses well away from disused underground mines (Armstrong 2001, 2006). There is a single record of a Pilbara Leaf-nosed Bat in the Study Area: a passing call recorded on a bat detector by ENV (2010b). This bat is likely to have been foraging in the area rather than resident (ENV, 2010b).

Legend

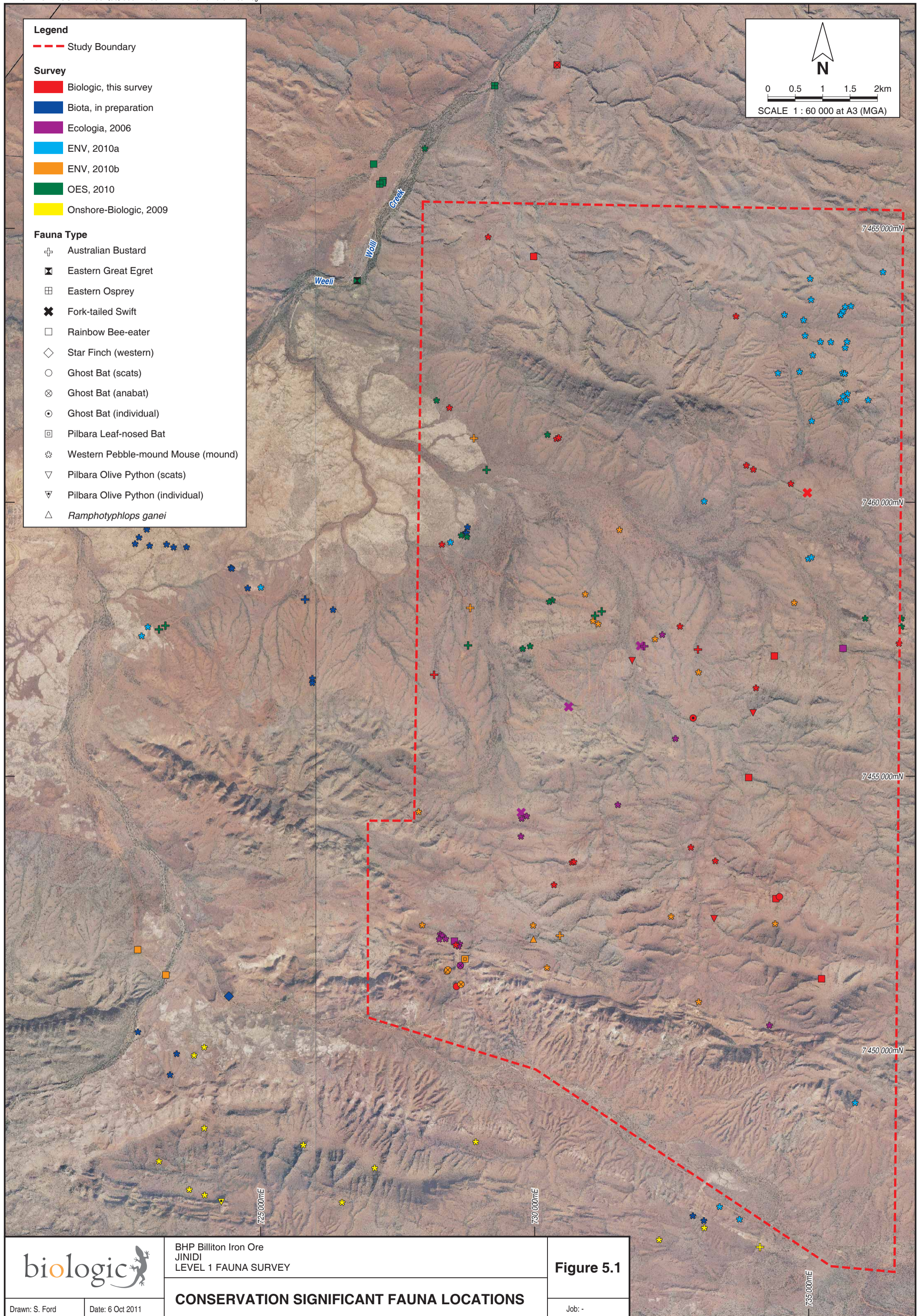
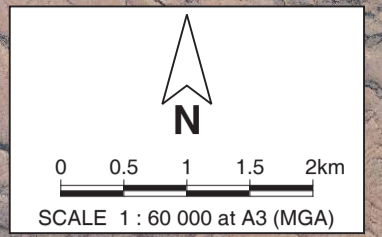
--- Study Boundary

Survey

- Biologic, this survey
- Biota, in preparation
- Ecologia, 2006
- ENV, 2010a
- ENV, 2010b
- OES, 2010
- Onshore-Biologic, 2009

Fauna Type

- + Australian Bustard
- ⊠ Eastern Great Egret
- ⊠ Eastern Osprey
- ⊠ Fork-tailed Swift
- Rainbow Bee-eater
- ◇ Star Finch (western)
- Ghost Bat (scats)
- ⊗ Ghost Bat (anabat)
- ⊙ Ghost Bat (individual)
- ⊠ Pilbara Leaf-nosed Bat
- ⊗ Western Pebble-mound Mouse (mound)
- ▽ Pilbara Olive Python (scats)
- ▽ Pilbara Olive Python (individual)
- △ *Ramphotyphlops ganei*



BHP Billiton Iron Ore
JINIDI
LEVEL 1 FAUNA SURVEY

CONSERVATION SIGNIFICANT FAUNA LOCATIONS

Figure 5.1



- **Ghost Bat**

The Ghost Bat is listed as Vulnerable by the IUCN and as Priority 4 by the DEC. The Ghost Bat formerly occurred over a wide area of central, northern and southern Australia but has declined significantly in the southern parts of its range in the last 200 years (DEWHA, 2010a). It now occurs in only a few highly disjunct sites across northern Australia and in Western Australia is now confined to the Kimberly and Pilbara.

The distribution of Ghost Bats is influenced by the availability of suitable caves and mines for roost sites. Ghost Bats in the Pilbara roost in deep, complex caves beneath bluffs of low rounded hills composed of Marra Mamba or Brockman Iron Formation, granite rock piles and abandoned mines (Armstrong and Anstee, 2000). They roost either individually or in colonies up to 1500 (Churchill, 2008) and move between a number of caves, both seasonally and as dictated by weather changes. During breeding, female Ghost Bats congregate into maternity roosts generally selecting very warm caves during pregnancy and lactation (Hutson *et al.*, 2001).

Suitable caves for the species were present in the Study Area (Appendix E), but were relatively uncommon compared with surrounding areas in the region such as Packsaddle Range, where more extensive gully and gorge systems are present. During the current survey, an individual was recorded at one location and scats were recorded from two locations. Ghost Bats were also recorded using bat detectors at a number of locations in the Study Area (Ecologia, 2006; ENV, 2010b; see Figure 5.1).

- **Western Pebble-mound Mouse**

The Western Pebble-mound Mouse is currently listed as Priority 4 by the DEC. This species has experienced a significant decline in its range through the Gascoyne and Murchison, and is now considered endemic to the Pilbara (van Dyck and Strahan, 2008). This species almost exclusively occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (van Dyck and Strahan, 2008).

Suitable habitat for this species is common in the Study Area in Crest/Slope habitat and is also common in the surrounding region. The characteristic mounds constructed by colonies of these mice have been recorded throughout the Study Area in all surveys (Ecologia, 2006; ENV, 2010b; Biologic, current survey), including the South Parmelia project (Onshore-Biologic, 2009) and part of the Area C to Jinayri to Mount Newman Railway survey (OES, 2010).



Birds

- **Fork-tailed Swift**

This species is entirely aerial within the Pilbara. It is listed as Migratory under the EPBC Act because it breeds in north-east and east Asia, wintering in Australia and southern New Guinea (Johnstone and Storr, 1998). It is also listed under the WC Act as Schedule 3. Fork-tailed Swifts forage above the Study Area sporadically in the summer months, associated with thunderstorms and cyclonic systems (Johnstone and Storr, 1998); individuals or small groups have been recorded on four occasions flying over the Study Area (Ecologia, 2006; current study).

- **Australian Bustard**

The Australian Bustard is listed as Near Threatened by the IUCN and Priority 4 by the DEC. It occurs across most of mainland Australia, but is listed in WA primarily due to a decline in its range in the south of the State. It is a nomadic species, occurring in open or lightly wooded grasslands, including spinifex plains (Johnstone and Storr, 1998). Suitable habitat is common in the Study Area and in the surrounding region, and it has been recorded in several locations within the Study Area (Ecologia, 2006; ENV; 2010b; OES; 2010; Biologic, 2011b).

- **Rainbow Bee-eater**

The Rainbow Bee-eater is listed as Migratory under the EPBC Act and Schedule 3 under the WC Act. The demographics of the species are complex, with populations in WA being resident, breeding visitors, post-nuptial nomads, passage migrants and winter visitors (Johnstone and Storr, 1998). Many individuals move northwards to overwinter in Indonesia. The Rainbow Bee-eater prefers lightly wooded, preferably sandy habitat near water (Johnstone and Storr, 1998). This habitat is uncommon in the Study Area, but more common in the surrounding area, particularly at the adjacent Weeli Wolli Creek. Several records of the Rainbow Bee-eater exist for the Study Area (Ecologia, 2006; ENV, 2010b; Biologic, this survey).



Reptiles

- **An unnamed blind snake**

The blind snake *Ramphotyphlops ganeii* is endemic to the Pilbara and is listed as Priority 1 by the DEC. Like other blind snakes, it is insectivorous, feeding on termites and their eggs, and larvae and pupae of ants (Wilson and Swan, 2010). As it is fossorial, this species is rarely encountered. *R. ganeii* is associated with moist gorges and gullies (Wilson and Swan, 2010) and a wide range of other habitats, from mulga woodland (Biologic, 2010) to rocky scree slopes (Biologic, *in prep.* b).

Based on this, most of the Study Area and its surroundings represents suitable habitat for the species. Within the Study Area, a single individual was recorded in Gorge/Gully habitat by ENV (2010b).

- **Pilbara Olive Python**

The Pilbara Olive Python is listed as Vulnerable under the EPBC Act and Schedule 1 under the WC Act. This species is primarily nocturnal and tends to shelter in small caves or under vegetation during the day, although it is occasionally active after sunrise, particularly in the warmer summer months (DSEWPaC, 2011a). In the winter months, adult pythons can sometimes be found basking in the morning sun (Pearson 2001 in DSEWPaC, 2011a). The breeding season of the Pilbara Olive Python extends from June to August, when males will travel several kilometres in search of a mate (DSEWPaC, 2011a).

The Pilbara Olive Python is known from a number of sites throughout the Pilbara and is associated with drainage systems, including areas with localised drainage and semi-permanent watercourses (DSEWPaC, 2011a). In the Hamersley subregion, the Pilbara Olive Python is most often encountered in the vicinity of permanent waterholes in rocky ranges or among riverine vegetation (Pearson, 1993; DSEWPaC, 2011a). Deep rocky gullies with perennial water pools occur within the Study Area and provide habitat for this species. Such habitats are also a characteristic of gorges and gullies in the surrounding region (Biologic, 2011a). The species may also occur to the south of the Study Area in Major Drainage Line habitat.

During the current study Pilbara Olive Python scats were found at three locations associated with Gorge/Gully habitats in the east of the Study Area. Additionally, one individual was recorded approximately 6 km to the south-west of the Study Area at South Parmelia by Onshore-Biologic (2009), as well as further west on the Hope Downs access road *en route* to the Study Area (Biologic, unpublished observation).



Table 5.1: Conservation significant fauna recorded in the Study Area

Name	Conservation Status	Preferred Habitat	Extent of habitat in the Study Area and region	Records
Mammals				
Pilbara Leaf-nosed Bat	EPBC Act: Vulnerable WC Act: Schedule 1	Hot, humid roost caves. Forages in Gorge/Gully habitat and along watercourses, particularly where water is present.	None of the caves in the Study Area were deemed to be suitable for Pilbara Leaf-nosed Bat. The extent of suitable habitat for this species in the surrounding region is unknown.	A single call record from the Study Area (ENV, 2010b). Record was deemed to be an itinerant individual (B. Bullen, <i>pers. comm.</i>). No suitable caves for this species have been recorded within the Study Area
Ghost Bat	DEC Priority List: Priority 4 IUCN: Vulnerable	Roosts in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong and Anstee, 2000).	Suitable caves for the species were present in the Study Area, but were relatively uncommon compared with surrounding areas in the region supporting more extensive gully and gorge systems.	An individual was recorded at one location and scats were recorded from an additional two caves in this survey. Ghost Bats were also recorded using bat detectors at a number of locations (Ecologia, 2006; ENV, 2010b).
Western Pebble-mound Mouse	DEC Priority List: Priority 4	Gentler slopes of rocky ranges where ground is covered with a stony mantle and vegetated by spinifex, often with sparse overstorey of eucalypts and scattered shrubs (Van Dyck and Strahan, 2008).	Much of the Study Area is covered by suitable Crest/Slope habitat for this species. Suitable habitat for this species is also common in the surrounding region.	Numerous records from all surveys in the Study Area (Ecologia, 2006; ENV, 2010b; Biologic, 2011) and part of the Area C to Jinayri to Mount Newman Railway survey (OES, 2010).
Birds				
Fork-tailed Swift	EPBC Act: Migratory WC Act: Schedule 3	Species is entirely aerial in the region and does not utilise fauna habitats directly.	All aerial habitats in the Study Area and region may be used.	The species has been recorded from four locations above the Study Area (Ecologia, 2006; Biologic, this survey).
Australian Bustard	DEC Priority List: Priority 4 IUCN: Near Threatened	Open or lightly wooded grasslands (Johnstone and Storr, 1998).	Suitable habitat is common in the Study Area and in the surrounding region.	The species has been recorded several times within the Study Area (Ecologia, 2006; ENV, 2010b; OES, 2010), including the most recent survey (Biologic, 2011b).



Name	Conservation Status	Preferred Habitat	Extent of habitat in the Study Area and region	Records
Rainbow Bee-eater	EPBC Act: Migratory WC Act: Schedule 3	Lightly wooded, preferably sandy country near water (Johnstone and Storr, 1998).	This habitat is uncommon in the Study Area, but more common in the surrounding area, particularly at the adjacent Weeli Wolli Creek.	Recorded from several locations within the Study Area (Ecologia, 2006; ENV, 2010b; Biologic, this survey).
Reptiles				
<i>Ramphotyphlops ganei</i>	DEC Priority List: Priority 1	Fossorial. <i>R. ganei</i> is associated with moist gorges and gullies (Wilson and Swan, 2010) and a wide range of other habitats, from mulga woodland (Biologic, 2010) to rocky scree slopes (Biologic, <i>in prep.</i> b)	Much of the Study Area would appear to be suitable as the species inhabits diverse habitats which are common within it. This species has also been recorded widely in the surrounding region, which contains similar habitats.	A single individual was recorded in gorge habitat by ENV (2010b).
Pilbara Olive Python	EPBC Act: Vulnerable WC Act: Schedule 1	Associated with drainage systems including areas with localised drainage and semi-permanent watercourses (DSEWPac, 2011a). In the Hamersley subregion, most often in the vicinity of permanent waterholes in rocky ranges or riverine vegetation (Pearson, 1993; DSEWPac, 2011a).	Deep rocky gullies near permanent water occur within the Study Area and provide habitat for this species. Such habitats are also a characteristic of gorges and gullies in the surrounding region. The species may also occur to the south of the Study Area in Major Drainage Line habitat.	During the current study, scat piles belonging to this species were found at three locations, associated with Gorge/Gully habitats in the east of the Study Area, suggestive of resident individuals. Additionally, one individual was recorded 6 km to the south-west of the Study Area at South Parmelia by Onshore-Biologic (2009), as well as on the Hope Downs access road <i>en route</i> to the Study Area (Biologic, unpublished observation).



5.1.3 Conservation significant fauna potentially occurring

Based on the fauna habitats present in the Study Area, and their distribution in the surrounding region, an additional six conservation significant species (one mammal and five birds) were considered to have the potential to occur.

These species are discussed below, and a summary table is included following the discussions (Table 5.2).

Mammal

- **Northern Quoll**

The Northern Quoll is listed as Endangered by the IUCN, Endangered under the EPBC Act and as Schedule 1 under the WC Act. Northern Quolls have experienced significant declines in eastern and northern Australia, mainly due to an expansion of the Cane Toad's range; these are ingested resulting in death. They may decline if Cane Toads invade the Pilbara. At present they are locally common in the north (within 150 km of the coast) and uncommon in the south.

Northern Quolls favour rocky areas such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines and treed creek lines, as well as structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs (DSEWPaC, 2011c). Much of the Study Area is unsuitable as core feeding or breeding habitat for the species but small areas of suitable Gorge/Gully habitat with rock pools, boulder piles and denser vegetation than the surrounding landscape are present. Similar habitats are present in many areas of the Hamersley Range. The nearest confirmed record is from Hope Downs, approximately 15 km west of the Study Area (Biota, 2011). The Study Area lies at the southern edge of the species range in the Pilbara (DSEWPaC, 2011c). 3756 cage or large Elliott trapping nights have been conducted in the Study Area and nearby areas (less than 2 km from the boundary), suggesting that the Northern Quoll is either not present in the Study Area or is in very low densities.

Birds

- **Eastern Great Egret**

The Eastern Great Egret is listed as Migratory under the EPBC Act, and is described as dispersive and migratory in parts of its range (DEWHA, 2010b), with some regular seasonal movements. It occurs in shallows of rivers and freshwater wetlands (Pizzey and Knight, 2006), breeding in wooded swamps and river pools with *Eucalyptus camaldulensis* and *Melaleuca argentea* (Johnstone and Storr, 1998). This habitat does not occur in the Study Area but is present at nearby Weeli Wolli Creek to the west where pools are present. During



wet conditions, egrets could be attracted to temporary pools that form in Drainage Area or Gorge/Gully habitats.

The species was not recorded on any surveys within the Study Area but was recorded 3 km to the north-west of the Study Area by OES (2010) at Weeli Wolli Creek.

- **Peregrine Falcon**

The Peregrine Falcon is listed as Vulnerable under the EPBC Act and Schedule 1 under the WC Act, and is considered rare or scarce over much of its range, including the Pilbara (Johnstone and Storr, 1998). Inland it is most often encountered along cliffs above rivers, ranges and wooded watercourses and lakes, where it seeks out its main prey: birds on the wing (Johnstone and Storr, 1998). Nests on rocky ledges in tall, vertical cliff faces and tall trees associated with drainage lines.

The Study Area contains suitable hunting habitats for Peregrine Falcon, primarily associated with areas of higher relief, such as associated with Round Top Hill (the large hill dominating the northern part of the Study Area), and Major Drainage Line habitat to the south and west of the Study Area is also likely to attract the species. However, no areas with cliffs or trees suitable for breeding were observed in the Study Area.

Peregrine Falcon has been recorded regularly in the region in recent times (Biologic, 2010, 2011, *in prep. a*).

- **Grey Falcon**

The Grey Falcon is classified as Priority 4 by the DEC and as Near Threatened by the IUCN. This species appears to have a distribution centred on ephemeral or permanent drainage lines (Garnett and Crowley, 2000) with numerous records from the Fortescue Marsh region. Grey Falcons prefer sparsely-treed, open plains and drainage lines for hunting (Slater *et al.*, 2009). They nest in the abandoned nest of a raptor or corvid (Slater *et al.*, 2009) in trees or man-made structures. Grey Falcons are unlikely to breed within the Study Area, which has limited tall eucalypt trees for breeding as most Major Drainage Line habitat is outside of the Study Area boundary to the south, and to the west at Weeli Wolli Creek. It could potentially hunt in the Study Area, but is more likely to hunt over adjacent creeks.

The Grey Falcon has been recorded in the region at nearby Packsaddle Range (Ecologia, 2004a) and Area C Southern Flank Deposit (ENV, 2008).

- **Bush Stone-curlew**

The Bush Stone-curlew is classified as Priority 4 by DEC and as Near Threatened by the IUCN. This species has a widespread distribution but has significantly declined in range south of the Pilbara. Home range studies have not been conducted in the Pilbara but in arid Eastern



Australia this species occupies a large, permanent home range of about 250–600 ha, which contracts to a much smaller area (10–25 ha) during breeding (DEWHA, 2010b).

The Bush Stone-curlew is a nocturnal, essentially ground-dwelling bird that inhabits drainage channels and woodland with significant woody debris, fallen timber, or similar material that can provide it with shelter during the day. Birds are highly cryptic and can be difficult to detect outside of the breeding season, when their wailing calls may be heard.

Thicker areas of the Mulga Association and Drainage Area habitats in the Study Area and wider region are suitable for the species.

The Bush Stone-curlew has not been recorded in the vicinity of the Study Area but due to its cryptic nature may be difficult to detect. It has been recorded at Packsaddle (Ecologia, 2004b) and Area C West (Biologic, *in prep.* c).

- **Star Finch (western subspecies)**

The 'western' population of the Star Finch (western subspecies) is considered by the DEC to represent a separate subspecies (*N. r. subclarescens*), distinct from Kimberley and Northern Territory birds (*N. r. clarescens*). These birds are generally uncommon and patchily distributed in the Pilbara and are listed as Priority 4 by the DEC and as Near Threatened by the IUCN. The Star Finch prefers areas of dense vegetation, such as reedbeds (Johnstone and Storr, 2004) and woodlands near water (Slater *et al.*, 2009).

Small areas of suitable woodland habitat associated with larger drainage channels are present in the south of the Study Area while rockpools in Gorge/Gully habitat provide potentially attractive habitat. This subspecies was recorded Biota (*in prep.*) approximately 2 km west of the Study Area in Major Drainage Line habitat as well as at a number of locations along Weeli Wollie Creek to the west (Biologic, *in prep.* d).



Table 5.2: Conservation significant fauna potentially occurring in the Study Area

Name	Significance	Preferred Habitat	Extent of habitat in the Study Area and region	Records
Northern Quoll	EPBC Act: Endangered WC Act: Schedule 1 IUCN: Endangered	Northern Quolls favour rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines and treed creek lines, as well as structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs (DSEWPaC, 2011c).	Much of the Study Area is unsuitable as core feeding or breeding habitat for the species but small areas of suitable Gorge/Gully habitat with rock pools, boulder piles and denser vegetation than the surrounding landscape are present (see Section 5.1.1). Similar habitats are present in many areas of the Hamersley Range.	The nearest record is from Hope Downs, approximately 15 kms west of the Study Area (Biota, 2011). The Study Area lies at the southern edge of the species range in the Pilbara (DSEWPaC, 2011c). The Study Area and close surrounds (within 2 km of the boundary) have received 3756 trap nights of cage or large Elliotts suggesting that the Northern Quoll is currently not present in the Study Area or occurs in very low densities.
Eastern Great Egret	EPBC Act: Migratory WC Act: Schedule 3	Occurs in shallows of rivers and freshwater wetlands (Pizzey and Knight, 2006); breeding habitat includes wooded swamps and river pools with <i>Eucalyptus camaldulensis</i> and <i>Melaleuca argentea</i> (Johnstone and Storr, 1998)	The most suitable habitat is located at Weeli Wolli Creek and Weeli Wolli Springs, where shallow permanent waters are present. During wet conditions, egrets could be attracted to temporary pools that form in Drainage Area or Gorge/Gully habitats.	The species was not recorded on any surveys within the Study Area but was recorded 3 km to the north-west of the Study Area by OES (2010) at Weeli Wolli Creek.
Peregrine Falcon	EPBC Act: Vulnerable WC Act: Schedule 1	Cosmopolitan, will hunt in any habitat, soaring at height or from a perch; often near cliffs (Slater <i>et al.</i> , 2009). Nests on rocky ledges in tall, vertical cliff faces and tall trees associated with drainage lines.	All habitats of the Study Area are suitable for hunting Peregrine Falcon, but there are no areas likely to be suitable for nesting. Peregrines are likely to hunt in the Study Area at times.	Peregrine Falcon has been recorded regularly in the region in recent times (Biologic, 2010, 2011a, <i>in prep.</i> a).
Grey Falcon	DEC Priority List: Priority 4 IUCN: Near Threatened	Prefers sparsely-treed, open plains and drainage lines for hunting (Slater <i>et al.</i> , 2009). Nests in the abandoned nest of a raptor or corvid (Slater <i>et al.</i> , 2009) in trees or man-made structures.	Open, sparse areas are not a dominant feature of the Study Area, but the species may be attracted to the birdlife associated with Weeli Wolli Creek nearby.	The Grey Falcon has been recorded in the region at nearby Packsaddle Range (Ecologia, 2004a) and Area C South Flank Deposit (ENV, 2008).



Name	Significance	Preferred Habitat	Extent of habitat in the Study Area and region	Records
Bush Stone-curlew	EPBC Act: Migratory WC Act: Schedule 3 IUCN: Near threatened	A nocturnal, essentially ground-dwelling bird that inhabits drainage channels and woodland with significant woody debris, fallen timber, or similar material that can provide it with shelter during the day. Birds are highly cryptic and difficult to detect outside of the breeding season, when their wailing calls may be heard.	Thicker areas of the mulga woodland and drainage area habitat in the Study Area and wider region are suitable for the species.	This species is infrequently recorded but is likely to be more common than records suggest, due to the difficulty of detecting it. Recorded at Packsaddle (Ecologia, 2004b) and Area C West (Biologic, <i>in prep.</i> c).
Star Finch (western subspecies)	DEC Priority List: Priority 4 IUCN: Near threatened	Areas of dense vegetation such as reedbeds (Johnstone and Storr, 2004) and woodlands near water (Slater <i>et al.</i> , 2009).	Small areas of suitable habitat associated with larger drainage channels are present in the south of the Study Area. Water pools throughout the survey provide pockets of potentially attractive habitat.	From Major Drainage Line habitat 2 km west of the Study Area (Biota, <i>in prep.</i>) and at several locations along Weeli Wolli Creek to the west (Biologic, <i>in prep.</i> d).



5.1.4 Other conservation significant fauna

A number of species identified as potentially occurring through searches of rare fauna databases were considered unlikely to occur. These were the Cattle Egret (*Ardea ibis*), Major Mitchell's Cockatoo (*Cacatua leadbeateri*), Night Parrot (*Pezoporus occidentalis*) and Oriental Plover (*Charadrius veredus*). Reasons for this consideration are outlined in Table 5.3.

Table 5.3: Conservation significant fauna unlikely to occur

Species	Classification	Rationale
Cattle Egret	EPBC Act: Migratory WC Act: Schedule 3	Species is infrequently recorded in the Pilbara, which is outside its regular range (Birds Australia, 2011). Habitats include moist pasture with tall grass, shallow open wetland and margins and mudflats (Morcombe, 2010), which are entirely absent from the Study Area.
Major Mitchell's Cockatoo	WC Act: Schedule 4	The Pilbara is outside the species normal range (Birds Australia, 2011).
Night Parrot	EPBC Act: Endangered and Migratory WC Act: Schedule 1 IUCN: Critically Endangered	Very rare, even in preferred habitat of spinifex plains or among samphire bushes on the margins of salt lakes (Morcombe, 2010). Although spinifex plains do occur in the Study Area, they are generally associated with rolling Crest/Slope habitats and support lower, smaller hummocks unsuitable for sheltering Night Parrots.
Oriental Plover	EPBC Act: Migratory WC Act: Schedule 3	Habitat in the Study Area is not suitable for the species, which prefers open grassland, claypans or gibber plains, or where dense vegetation has been burnt recently (Morcombe, 2010).

5.2 Locally significant fauna

Based on the fauna habitats present in the Study Area, two locally significant fauna species may occur. These were the Chocolate Wattled Bat (*Chalinolobus morio*) and Pilbara Barking Gecko (*Underwoodisaurus seorsus*). Neither species has been recorded in the Study Area.

The first species, Chocolate Wattled Bat, occurs in the southern part of Western Australia but has a restricted distribution, occurring in the Pilbara only in woodland at Weeli Wolli Creek. According to NatureMap (DEC, 2011) the two nearest records are from approximately 20 km north of the Study Area. Because of the proximity of the Study Area to Weeli Wolli Creek, it was considered that Chocolate Wattled Bats may occur in Major Drainage Line habitat.

The second locally significant species is Pilbara Barking Gecko, which has only recently been described (Doughty and Oliver, 2011). The taxon is considered to be locally significant where it occurs as it has a limited distribution in the Hamersley subregion of the Pilbara.



5.3 Pilbara endemics

Species that are only known or predominantly known from the Pilbara bioregion are also noteworthy. Table 5.4 details species regarded as Pilbara endemics (Kendrick, 2001; B. Maryan, *pers. comm.*) that have been recorded in the Study Area along with comments on status as Pilbara endemics when compared with their current distribution (DEC, 2011).

Table 5.4: Pilbara endemics

Species	Comments on endemic status
Pilbara endemics	
<i>Pseudomys chapmani</i>	Currently restricted to the Pilbara region, but formerly more widespread (Menkhorst and Knight, 2001).
<i>Delma elegans</i>	Current records indicate this species is a true endemic.
<i>Delma pax</i>	Current records indicate this species is a true endemic.
<i>Underwoodisaurus seorsus</i>	Pilbara endemic restricted to the Hamersley Range.
<i>Lerista zietzi</i>	Pilbara endemic restricted largely to the Hamersley Range.
<i>Lerista muelleri</i>	Considered to be a true Pilbara endemic after taxonomic revision by Smith and Adams (2007)
<i>Varanus pilbarensis</i>	Current records indicate this species is a true endemic.
<i>Ramphotyphlops ganei</i>	Current records indicate this species is a true endemic.
Near-endemics	
<i>Dasykaluta rosamondae</i>	Common in the Pilbara, but also extends eastwards into the Great and Little Sandy Deserts.
<i>Diplodactylus savagei</i>	Mostly Pilbara, but also collected from the Gascoyne.
<i>Ctenotus rubicundus</i>	Mostly Pilbara, but also collected from the Gascoyne.
<i>Lerista neander</i>	This species has been recorded from the northern Gascoyne (B. Maryan, <i>pers. comm.</i>)
<i>Lucasium wombeyi</i>	Mostly Pilbara, but also collected from the Gascoyne.
<i>Acanthophis wellsi</i>	Predominantly a Pilbara species, but an isolated population occurs in the North West Cape (B. Maryan, <i>pers. comm.</i>)
<i>Demansia rufescens</i>	Isolated population located in the North West Cape (B. Maryan, <i>pers. comm.</i>)

5.4 Important fauna habitats

The areas of the project that were identified as being most likely to harbour conservation significant fauna were some areas of Gorge/Gully habitat, particularly where rockpools and caves were present. The relative importance of each fauna habitat type, based on criteria outlined in Table 3.2, is discussed in Table 5.5.



Table 5.5: Fauna habitat importance scores

Fauna habitat	Score	Rationale
Calcrete Area	Low	Although this fauna habitat is uncommon in the region, there are no conservation significant fauna that are solely reliant on it, and it does not appear to support a unique faunal assemblage despite having different vegetation. Australian Bustard have been recorded utilising this area, but they are commonly recorded in other habitats types in the Study Area and the wider region.
Crest/Slope	Medium	Western Pebble-mound Mouse are largely restricted to this habitat type within the Study Area. The blindsnake <i>Ramphotyphlops ganeii</i> also occurs in this habitat type, but is not restricted to it. This habitat is common in the region.
Drainage Area	Low	Drainage Area has the potential to provide habitat for a number of conservation significant fauna, such as the blindsnake <i>Ramphotyphlops ganeii</i> and Australian Bustard, but these are not restricted to this habitat type. Pilbara Olive Python is likely to utilise Drainage Area transiently, as corridors during dispersal. Drainage Areas may be used by Rainbow Bee-eater as well, but this species is widespread and not restricted to this habitat type. This habitat is common in the region.
Gorge/Gully	High	Provides potential breeding, shelter and foraging sites for Pilbara Olive Python and Ghost Bat and possibly Pilbara Leaf-nosed Bat. Also provides habitat for the blindsnake <i>Ramphotyphlops ganeii</i> and Rainbow Bee-eater, although neither of these species is restricted to this habitat type. These are a common feature of the surrounding region, represent a small proportion of the total area.
Major Drainage Line	High	Major Drainage Lines represent areas of high local abundance and diversity for birds, and may provide nesting and foraging habitat for Peregrine Falcon and Rainbow Bee-eater. Pilbara Olive Python utilises these drainage lines as corridors during dispersal. Although very little Major Drainage Line is present within the Study Area, it is present on the southern boundary of the Study Area and at Weeli Wolli Creek to the west. This habitat is uncommon in the region, accounting for a small proportion of the total area.
Mulga Association	Medium	Mulga provides habitat for the blindsnake <i>Ramphotyphlops ganeii</i> , although this species is not restricted to it. Mulga also supports a relatively unique and diverse faunal assemblage, with numerous species restricted to this habitat type. Mulga is a common habitat type in the region surrounding the Study Area.

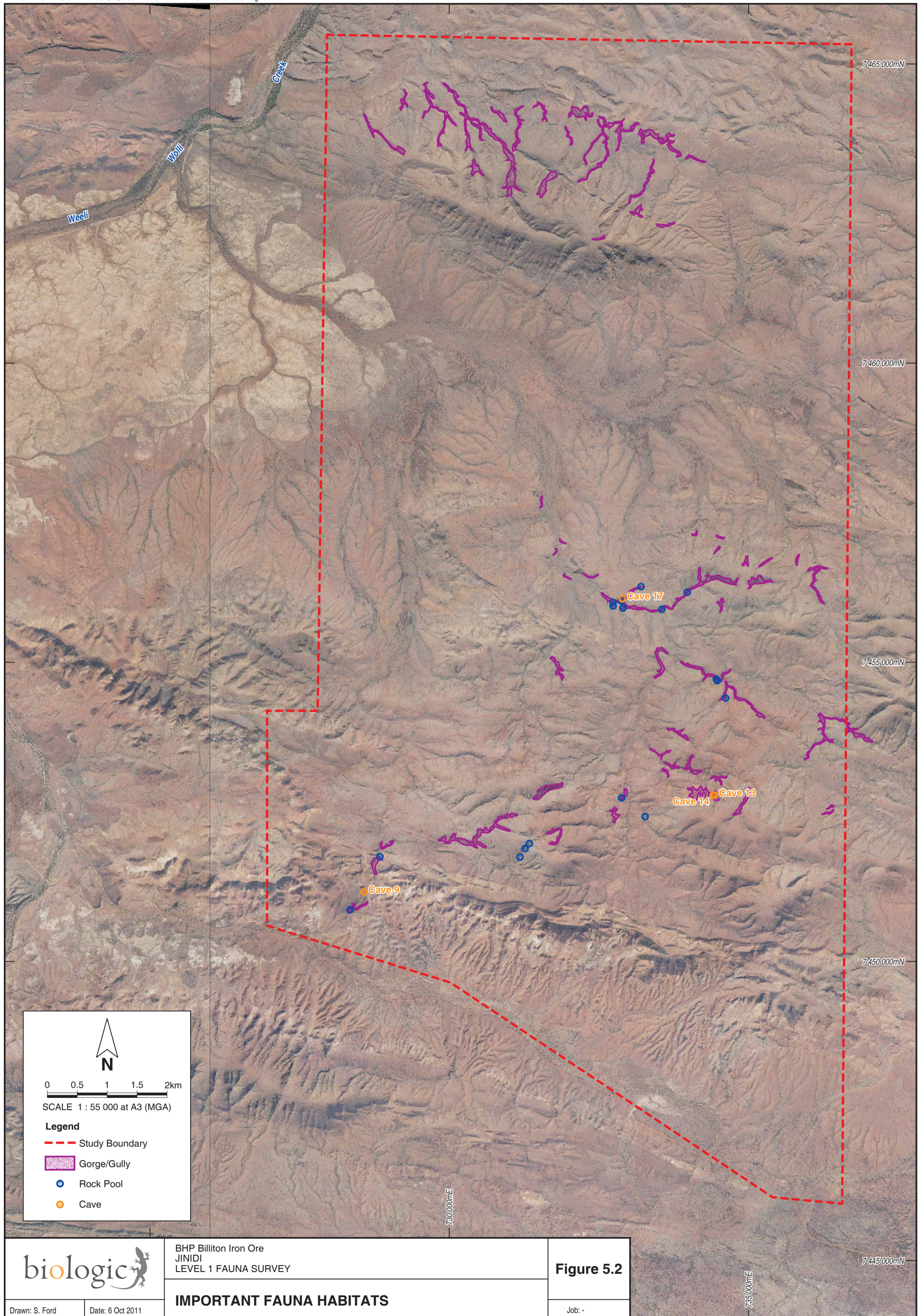
Notable features at Jinidi were the number of permanent and ephemeral rockpools in Gorge/Gully habitat, which provide habitat for Pilbara Olive Python and are important for other fauna species. Some areas of Gorge/Gully habitat appeared to be suitable for Northern Quoll; however, this species was not found despite considerable recent and historical survey effort (Biologic, 2011b).

Another notable feature of the Study Area was the absence of large caves suitable for significant bats such as Ghost Bat and Pilbara Leaf-nosed Bat. Only a single large cave with evidence of continued use by Ghost Bats was found within the Study Area (Appendix E), which contrasts with surveys of nearby areas of Packsaddle Range (Biologic 2011a, *in prep.* a), at which such caves were relatively common. A small cave in the south of the Study Area contained a Ghost Bat scat but did not show signs of frequent use, and at another location an individual was encountered as it flew out of a shallow overhang with a significant vertical crack.



An assessment of the caves previously reported for the Study Area showed that these were mostly shallow overhangs with no ability to provide shelter for Ghost Bat or Pilbara Leaf-nosed Bat.

Important fauna habitats are mapped on Figure 5.2. Only those areas of Gorge/Gully habitat considered likely to provide shelter for Pilbara Olive Python or as most prospective for Northern Quoll were mapped on this figure. The caves at which Ghost Bats were recorded or were considered to have the potential to occur are also shown, as are locations of the rockpools found during the surveys.



BHP Billiton Iron Ore
JINIDI
LEVEL 1 FAUNA SURVEY

IMPORTANT FAUNA HABITATS

Drawn: S. Ford Date: 6 Oct 2011

Figure 5.2

Job: -



6 SUMMARY

This survey is one of six vertebrate fauna survey undertaken within or overlapping the Jinidi Study Area since 2005. Three of these surveys (Ecologia, 2006; ENV, 2010b; OES, 2010) are Level 2 fauna surveys that have included a trapping component, two have been Level 1 surveys (ENV, 2010a; Biologic, current survey) and one was a targeted survey for Northern Quoll (Biologic, 2011b).

Biologic considers that, with respect to Guidance Statement 56 (EPA, 2004), the requirements for a comprehensive baseline fauna survey have been adequately met. Biologic further considers that the survey effort expended on trapping for Northern Quoll is adequate for the size of the Study Area, according to recently published federal guidelines (DSEWPac, 2011c).

Eight conservation significant species have been recorded from the Study Area. These were Pilbara Leaf-nosed Bat, Ghost Bat, Western Pebble-mound Mouse, Fork-tailed Swift, Australian Bustard, Rainbow Bee-eater, the blindsnake *Ramphotyphlops ganei* and Pilbara Olive Python.

None of the species collected or populations identified were considered to be locally or regionally important.

Key findings of the study were that there is very limited cave habitat available for Ghost Bat or Pilbara Leaf-nosed Bat, although gorges and gullies represent suitable foraging habitat for these species. Within the Study Area there were a number of gorges and gullies suitable for Pilbara Olive Python, particularly near the numerous rock pools recorded. This habitat is well represented outside the Study Area in the Hamersley Range and other ranges in the Pilbara and the widespread distribution of the species reflects this (DEC, 2011).

Of the fauna habitats described, the most important in terms of conservation significant fauna were Gorge/Gully and Major Drainage Line habitat, although the latter accounts for a negligible proportion of the study area.

In the local surroundings, the wetland habitats associated with the Weeli Wolli Creek systems represent important habitat for fauna, particularly the locally significant Chocolate Wattled Bat. The Weeli Wolli system is significantly impacted by dewatering at Hope Downs and requires management intervention in the form of surface water discharge, aimed at maintaining the riverine vegetation dependent on the system.



7 REFERENCES

- Anonymous (2006) Pilbara Economic Perspective: an update on the economy of Western Australia's Pilbara Region. Department of Local Government and Regional Development: Perth, Australia
- Armstrong, K. (2001). The roost habitat and distribution of the orange leaf-nosed bat, *Rhinonicteris aurantius*, in the Pilbara region of Western Australia. *Wildlife Research*, 28: 95–104.
- Armstrong, K. (2006). Phylogeographic structure in *Rhinonicteris aurantia* (Chiroptera: Hipposideridae): implications for conservation. *Acta Chiropterologica*, 8: 63–81.
- Armstrong, K. and Anstee, S. (2000). The ghost bat in the Pilbara: 100 years on. *Australian Mammalogy*, 22: 93–101.
- Australian Natural Resource Atlas (2008). "Biodiversity Assessment – Pilbara". Australian Natural Resource Atlas. <http://www.anra.gov.au>. Last accessed June 2010.
- Beard (1975) *Pilbara. Explanatory Notes and Map Sheet 5, 1:1 000 000 series Vegetation Survey of Western Australia*. University of Western Australia Press: Nedlands.
- Biologic (2010) *Camp Hill Vertebrate Fauna Assessment*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biologic (2011a) *Area C and Surrounds Vertebrate Fauna Study*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biologic (2011b) *Jinidi Northern Quoll Targeted Survey*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biologic (*in prep.* a) *Southern Flank Vertebrate Fauna Assessment*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biologic (*in prep.* b) *Marillana Vertebrate Fauna Assessment*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biologic (*in prep.* c) *Area C West Vertebrate Fauna Assessment*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biologic (*in prep.* d) *Jinidi to Mainline Vertebrate Fauna Assessment*. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Biota Environmental Science (2009) Hope Downs 4 Targeted Northern Quoll Survey. Document prepared for Rio Tinto Iron Ore Pty Ltd..
- Biota Environmental Science (2011) Hope Downs Project Life of Mine Targeted Fauna Survey. PER document prepared for Rio Tinto Iron Ore Pty Ltd..
- Biota (*in prep.*) (i) South Parmelia and (ii) part Southern Flank to Jinidi Vertebrate Fauna Preliminary Data. Preliminary report provided to BHP Billiton Iron Ore Pty Ltd.
- Burbidge (1959) *Div. Plant Ind. Tech Paper 12. Notes on plants and plant habitats observed in the Abydos-Woodstock area, Pilbara District, CSIRO, Western Australia*
- Birds Australia (2011) *Birddata*. Database: <http://birddata.com.au/homecontent.do>. Last accessed May 2011.
- Christidis, L. and Boles, W. (2008) *Systematics and Taxonomy of Australian Birds*. CSIRO Publishing, Collingwood.
- Churchill, S.K. (2008). *Australian Bats. 2nd Edition*. Allen and Unwin, Crows Nest, NSW.
- Commonwealth Scientific and Research Organisation (2009) *Australian Soil and Land Survey Field Handbook. 3rd Edition*. CSIRO Publishing, Collingwood.



- Department of Environment and Conservation (2011) *NatureMap: Mapping Western Australia's Biodiversity*. Database: <http://naturemap.dec.wa.gov.au/default.aspx>. Last accessed May 2011.
- Department of Sustainability, Environment, Water, Population and Communities (2011a) *Survey Guidelines for Australia's Threatened Reptiles*. Canberra, ACT.
- Department of Sustainability, Environment, Water, Population and Communities (2011b) *Protected Matters Search Tool*. Database: <http://www.environment.gov.au/epbc/pmst/index.html>. Last accessed May 2011.
- Department of Sustainability, Environment, Water, Population and Communities (2011c) *Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the endangered northern quoll, Dasyurus hallucatus*. Canberra, ACT.
- Department of the Environment, Water, Heritage and the Arts (2010a) *Survey Guidelines for Australia's Threatened Bats*. Canberra, ACT.
- Department of the Environment, Water, Heritage and the Arts (2010b) *Survey Guidelines for Australia's Threatened Birds*. Canberra, ACT.
- Department of the Environment, Water, Heritage and the Arts (2010c) *Survey Guidelines for Australia's Threatened Frogs*. Canberra, ACT.
- Doughty, P. and Oliver, P. (2011) A new species of *Underwoodisaurus* (Squamata: Gekkota: Carphodactylidae) from the Pilbara region of Western Australia. *Zootaxa* 3010:20-30.
- Ecologia Environmental Consultants (1997) Hope Downs Biological Survey. Unpublished report for Hancock Prospecting Pty Ltd.
- Ecologia Environmental Consultants (1998a) Mining Area C Biological Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Ecologia Environmental Consultants (1998b) Weeli Wolli Creek Biological Assessment Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Ecologia Environmental Consultants (2004a) Packsaddle Range Biological Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Ecologia Environmental Consultants (2004b) Area C: Deposits D, E and F Biological Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Ecologia Environmental Consultants (2006) Jirridi Terrestrial Vertebrate Fauna Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd. Perth.
- ENV Australia (2007a) Area C R-deposit Fauna Assessment. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- ENV Australia (2007b) Area C West Fauna Assessment. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- ENV Australia (2008) Area C South Flank Deposit Fauna Assessment. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- ENV Australia (2010a). Jinayri Access Road Vertebrate Fauna Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd. Perth.
- ENV Australia (2010b) Jinayri Mining Lease Vertebrate Fauna Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd. Perth.
- Environmental Protection Authority (2002) *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3*. Perth, Western Australia.



- Environmental Protection Authority (2004) *Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. No. 56.* Perth, Western Australia.
- Environmental Protection Authority and Department of Environment and Conservation and (2010) *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (eds B.M. Hyder, J. Dell and M.A. Cowan). Perth, Western Australia.
- Garnett, S. and Crowley, G. (2000). *The Action Plan for Australian Birds.* Environment Australia and the Royal Australasian Ornithologists Union.
- Hope Downs Management Services Pty Ltd (2000) Hope Downs Iron Ore Project: Public Environmental Report/Public Environmental Review.
- Hutson, A.M., Mickleburgh, S.P. and Racey, P.A. (2001). *Microchiropteran Bats: Global Status Survey and Conservation Action Plan.* IUCN Publication Services Unit
- International Union for Conservation of Nature (2011) *The IUCN Red List of Threatened Species.* Available at www.iucnredlist.org.
- Johnstone, R. and Storr, G. (1998) *Handbook of Western Australian Birds. Volume I – Non-passerines (Emu to Dollarbird).* Western Australian Museum, Perth.
- Johnstone, R. and Storr, G. (2004) *Handbook of Western Australian Birds. Volume II –Passerines (Blue-winged Pitta to Goldfinch).* Western Australian Museum, Perth
- Kendrick, P. (2001) Pilbara 3 (PIL3 – Hamersley subregion). In: May, J. and McKenzie, N (Eds.), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002.* Department of Conservation and Land Management, Perth.
- McKenzie, N.L., Van Leeuwen, S.V. and Pinder, A.M. (2009) Introduction to the Pilbara Biodiversity Survey, 2002 – 2007. *Results of the Western Australian Museum, Supplement 78:* 3-89
- Menkhorst, P. and Knight, F. (2001) *A Field Guide to the Mammals of Australia.* Oxford University Press, South Melbourne.
- Morcombe, M. (2010) *The Michael Morcombe eGuide to Australian Birds.* iPhone edition.
- Ninox Wildlife Consulting (2009) A Fauna Survey of the Proposed Hope Downs 4 Mining Area, Near, Newman, Western Australia. Unpublished report for Mattiske Consulting Pty Ltd, Perth on behalf of Pilbara Iron Company (Services) Pty Ltd, Perth.
- Onshore Environmental Consultants (2011) Jinidi Iron Ore Project Flora and Vegetation Review. Unpublished report for BHP Billiton Iron Ore Pty Ltd, Perth.
- Onshore Environmental Consultants and Biologic (2009) Biological survey: South Parmelia Exploration Leases. Unpublished report for BHP Billiton Iron Ore Pty Ltd, Perth.
- Onshore Environmental Consultants and Biologic (2010) Prairie Downs Vegetation and Level 1 Fauna Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd, Perth.
- Outback Ecology Services (2008) Area C Mining Operation Environmental Management Plan (Revision 4) A, D, P1 and P3 Deposits. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- Outback Ecology Services (2010) Area C to Jinayri to Mount Newman Railway Terrestrial Vertebrate Fauna Survey. Unpublished report for BHP Billiton Iron Ore Pty Ltd.



- Pearson, D.J. (1993), Distribution, status and conservation of pythons in Western Australia. In: Lunney, D. and Ayers, D. (Eds) *Herpetology in Australia: a Diverse Discipline*, pp. 383-395, Royal Zoological Society of NSW, Sydney.
- Pearson, D. 2001. Potential occurrence of the Pilbara Olive Python and its habitat on the proposed Burrup Ammonia Plant site near Hearson Cove. Unpublished Report for Burrup Fertilisers Pty. Ltd
- Pizzey, G. and Knight, F. (2006) *A Field Guide to Australian Birds*. New Holland Publishers. Sydney.
- Shepherd, D., Beeston, G and Hopkins, A. (2002) *Native Vegetation in Western Australia. Extent, Type and Status. Resource Management Technical Report 249*. Department of Agriculture, South Perth.
- Slater, P., Slater, P. and Slater, R. (2009) *The Slater Field Guide to Australian Birds*. 2nd Ed. Reed New Holland Publishers. Sydney.
- Smith, L. and Adams, M. (2007) Revision of the *Lerista muelleri* species-group (Lacertilia: Scincidae) in Western Australia, with a redescription of *L. muelleri* (Fischer, 1881) and the description of nine new species.
- URS Australia and Parsons Brinckerhoff Australia (2011) *Jinidi Deposit – Preliminary Water Resources Assessment*. Unpublished report for BHP Billiton Iron Ore.
- Van Dyck, S. and Strahan, R. (Eds.) (2008) *Mammals of Australia*. 3rd Edition. Australian Museum, Sydney.
- Western Australian Museum (2009) *Checklists of the Fauna of Western Australia*. Unpublished checklist. Last updated 6 October 2009. Western Australian Museum, Perth.
- Wilson, S. and Swan, G. (2010) *A Complete Guide to Reptiles of Australia*. 2nd Edition. New Holland Publishers (Australia), Sydney



Appendix A: Conservation status codes

International Union for Conservation of Nature

Category	Definition
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CE)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it 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
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.



Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Extinct (EX)	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild (EW)	Taxa known to survive only in captivity.
Critically Endangered (CE)	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (VU)	Taxa facing a high risk of extinction in the wild in the medium-term future.
Migratory (MG)	Consists of species listed under the following International Conventions: <ul style="list-style-type: none">• Japan-Australia Migratory Bird Agreement (JAMBA)• China-Australia Migratory Bird Agreement (CAMBA)• Convention on the Conservation of Migratory Species of Wild animals (Bonn Convention)

Schedules of the Wildlife Conservation Act 1950

Category	Definition
Schedule 1 (S1)	Rare and Likely to become Extinct.
Schedule 2 (S2)	Extinct.
Schedule 3 (S3)	Migratory species listed under international treaties.
Schedule 4 (S4)	Other Specially Protected Fauna.

Department of Environment and Conservation Priority codes

Category	Definition
Priority 1 (P1)	Taxa with few, poorly known populations on threatened lands.
Priority 2 (P2)	Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
Priority 3 (P3)	Taxa with several, poorly known populations, some on conservation lands.
Priority 4 (P4)	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.
Priority 5 (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.



Appendix B: Fauna recorded in the Study Area and region

Mammals

Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports													
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a	
TACHYGLOSSIDAE																									
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna																								
DASYURIDAE																									
<i>Dasykaluta rosamondae</i>	Little Red Kaluta																								
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	S1		EN																				
<i>Ningauai timealeyi</i>	Pilbara Ningauai																								
<i>Planigale</i> sp.	Undescribed Planigale																								
<i>Pseudantechinus woolleyae</i>	Woolley's Pseudantechinus																								
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart																								
<i>Sminthopsis ooldea</i>	Ooldea Dunnart																								
<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart																								
MACROPODIDAE																									
<i>Macropus robustus</i>	Euro																								
<i>Macropus rufus</i>	Red Kangaroo																								
<i>Petrogale rothschildi</i>	Rothschild's Rock-wallaby																								
PTEROPODIDAE																									
<i>Pteropus alecto</i>	Black Flying-fox																								
HIPPOSIDERIDAE																									
<i>Rhinonictis aurantia</i>	Pilbara Leaf-nosed Bat	VU	S1																						
MEGADERMATIDAE																									
<i>Macroderma gigas</i>	Ghost Bat			P4	VU																				
EMBALLONURIDAE																									
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat																								
<i>Taphozous georgianus</i>	Common Sheath-tailed Bat																								
<i>Taphozous hilli</i>	Hill's Sheath-tailed Bat																								
VESPERTILIONIDAE																									
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat																								
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	Locally significant																							
<i>Nyctophilus bifax daedalus</i>	Eastern Long-eared Bat																								
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat																								
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat																								



Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports													
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a	
<i>Scotorepens greyii</i>	Little Broad-nosed Bat						•	•	•	•	•		•		•	•	•			•	•	•	•	•	•
<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat						•	•	•	•	•		•	•	•	•	•			•	•	•	•	•	•
MOLOSSIDAE																									
<i>Chaerephon jobensis</i>	Northern Free-tailed Bat						•	•	•	•		•		•			•	•		•		•	•	•	•
<i>Mormopterus beccarii</i>	Beccari's Free-tailed Bat						•	•	•		•			•	•	•	•					•	•	•	•
<i>Mormopterus planiceps</i>	Little Free-tailed Bat												•	•											
<i>Tadarida australis</i>	White-striped Free-tailed Bat						•		•			•			•		•					•			•
MURIDAE																									
<i>*Mus musculus</i>	House Mouse						•	•	•			•		•									•	•	
<i>Notomys alexis</i>	Spinifex Hopping-mouse								•																
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse						•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Pseudomys desertor</i>	Desert Mouse						•	•							•					•			•	•	
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse						•	•	•			•	•	•			•	•					•	•	
<i>Zyomys argurus</i>	Common Rock-rat						•		•	•		•	•		•	•	•	•	•	•			•	•	
LEPORIDAE																									
<i>*Oryctolagus cuniculus</i>	European Rabbit												•												•
CANIDAE																									
<i>*Canis lupus dingo/familiaris</i>	Dog/Dingo						•	•	•	•	•	•		•	•		•	•	•	•	•	•	•	•	•
<i>*Vulpes vulpes</i>	Red Fox																•								
FELIDAE																									
<i>*Felis catus</i>	Cat						•	•	•			•		•		•	•			•	•		•	•	•
EQUIDAE																									
<i>*Equus asinus</i>	Donkey																								•
CAMELIDAE																									
<i>*Camelus dromedarius</i>	One-humped Camel								•															•	•
BOVIDAE																									
<i>*Bos taurus</i>	Cow						•	•	•		•	•	•				•	•				•	•	•	•
<i>*Capra hircus</i>	Goat											•													



Birds

Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports														
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a	
CASUARIIDAE																										
<i>Dromaius novaehollandiae</i>	Emu						•					•	•	•				•								
PHASIANIDAE																										
<i>Coturnix pectoralis</i>	Stubble Quail																		•							
<i>Coturnix ypsilophora</i>	Brown Quail						•											•	•							
ANATIDAE																										
<i>Chenonetta jubata</i>	Australian Wood Duck						•																			
<i>Anas gracilis</i>	Grey Teal													•												
COLUMBIDAE																										
<i>Phaps chalcoptera</i>	Common Bronzewing						•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Ocyphaps lophotes</i>	Crested Pigeon						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Geophaps plumifera</i>	Spinifex Pigeon						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Geopelia cuneata</i>	Diamond Dove						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Geopelia striata</i>	Peaceful Dove						•							•	•			•					•		•	
PODARGIDAE																										
<i>Podargus strigoides</i>	Tawny Frogmouth							•	•		•	•	•	•	•	•	•	•	•					•	•	
EUROSTOPODIDAE																										
<i>Eurostopodus argus</i>	Spotted Nightjar						•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	
AEGOTHELIDAE																										
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar						•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
APODIDAE																										
<i>Apus pacificus</i>	Fork-tailed Swift	M	S3				•	•			•								•					•		
PHALACROCORACIDAE																										
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant						•							•												
ARDEIDAE																										
<i>Ardea pacifica</i>	White-necked Heron						•						•	•						•						
<i>Ardea modesta</i>	Eastern Great Egret	M	S3				•																			
<i>Egretta novaehollandiae</i>	White-faced Heron						•						•	•						•						
<i>Ardea ibis</i>	Cattle Egret	M	S3				•																			
THRESKIORNITHIDAE																										
<i>Threskiornis spinicollis</i>	Straw-necked Ibis						•						•	•												



Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports														
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a	
ACCIPITRIDAE																										
<i>Elanus axillaris</i>	Black-shouldered Kite								•							•										
<i>Lophoictinia isura</i>	Square-tailed Kite							•																		
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard							•	•			•									•			•		
<i>Haliastur sphenurus</i>	Whistling Kite									•				•		•	•	•	•	•	•	•	•	•	•	•
<i>Milvus migrans</i>	Black Kite									•									•				•			
<i>Accipiter fasciatus</i>	Brown Goshawk							•	•	•	•	•					•					•		•	•	
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk									•		•	•											•	•	
<i>Circus assimilis</i>	Spotted Harrier							•	•							•							•	•		
<i>Aquila audax</i>	Wedge-tailed Eagle							•	•	•		•	•	•	•	•	•	•	•	•	•	•		•	•	
<i>Hieraaetus morphnoides</i>	Little Eagle								•			•				•		•	•	•	•			•		
FALCONIDAE																										
<i>Falco cenchroides</i>	Nankeen Kestrel							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Falco berigora</i>	Brown Falcon							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Falco longipennis</i>	Australian Hobby							•	•															•		
<i>Falco hypoleucos</i>	Grey Falcon			P4	NT								•						•							
<i>Falco peregrinus</i>	Peregrine Falcon		S4										•	•							•			•	•	
OTIDIDAE																										
<i>Ardeotis australis</i>	Australian Bustard			P4	NT			•	•	•			•	•	•			•		•	•	•	•	•	•	•
BURHINIDAE																										
<i>Burhinus grallarius</i>	Bush Stone-curlew			P4	NT													•								
RECURVIROSTRIDAE																										
<i>Himantopus himantopus</i>	Black-winged Stilt																									
CHARADRIIDAE																										
<i>Charadrius veredus</i>	Oriental Plover	M	S3			•																				
<i>Euseyornis melanops</i>	Black-fronted Dotterel							•					•	•												
TURNICIDAE																										
<i>Turnix velox</i>	Little Button-quail							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CACATUIDAE																										
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo		S4					•																		
<i>Eolophus roseicapillus</i>	Galah							•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Cacatua sanguinea</i>	Little Corella							•					•	•	•						•		•		•	
<i>Nymphicus hollandicus</i>	Cockatiel							•	•	•	•		•									•		•	•	



Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports														
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a	
PSITTACIDAE																										
<i>Barnardius zonarius</i>	Australian Ringneck					•		•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Psephotus varius</i>	Mulga Parrot					•		•								•	•		•							
<i>Melopsittacus undulatus</i>	Budgerigar					•		•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	
<i>Neopsephotus bourkii</i>	Bourke's Parrot					•							•			•			•							•
<i>Pezoporus occidentalis</i>	Night Parrot	EN, M	S1		CR	•																				
CUCULIDAE																										
<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo					•		•	•	•	•	•	•	•	•				•	•	•				•	•
<i>Chalcites osculans</i>	Black-eared Cuckoo												•													
<i>Cacomantis pallidus</i>	Pallid Cuckoo					•		•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•
STRIGIDAE																										
<i>Ninox connivens</i>	Barking Owl					•								•												
<i>Ninox novaeseelandiae</i>	Southern Boobook					•			•		•	•	•		•	•	•				•				•	•
TYTONIDAE																										
<i>Tyto javanica</i>	Eastern Barn Owl					•		•							•	•									•	
HALCYONIDAE																										
<i>Dacelo leachii</i>	Blue-winged Kookaburra					•		•						•						•	•	•	•	•		
<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher					•		•		•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Todiramphus sanctus</i>	Sacred Kingfisher					•		•					•					•		•						
MEROPIIDAE																										
<i>Merops ornatus</i>	Rainbow Bee-eater	M	S3			•		•	•	•	•					•	•	•	•	•	•	•	•	•	•	•
CLIMACTERIDAE																										
<i>Climacteris melanura</i>	Black-tailed Treecreeper													•	•	•	•									
PTILINORHYNCHIDAE																										
<i>Ptilonorhynchus guttatus</i>	Western Bowerbird					•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
MALURIDAE																										
<i>Malurus splendens</i>	Splendid Fairy-wren					•											•	•		•						
<i>Malurus leucopterus</i>	White-winged Fairy-wren					•		•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Malurus lamberti</i>	Variiegated Fairy-wren					•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren					•		•	•	•	•	•	•	•	•	•	•			•				•	•	
<i>Amytornis striatus</i>	Striated Grasswren					•		•	•		•	•	•	•	•	•	•			•	•			•	•	•
ACANTHIZIDAE																										
<i>Pyrrholaemus brunneus</i>	Redthroat																•			•						



Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports															
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a		
<i>Smicromis brevirostris</i>	Weebill																										
<i>Gerygone fusca</i>	Western Gerygone																										
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill																										
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill																										
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill																										
<i>Acanthiza apicalis</i>	Inland Thornbill																										
<i>Aphelocephala leucopsis</i>	Southern Whiteface																										
PARDALOTIDAE																											
<i>Pardalotus rubricatus</i>	Red-browed Pardalote																										
<i>Pardalotus striatus</i>	Striated Pardalote																										
MELIPHAGIDAE																											
<i>Certhionyx variegatus</i>	Pied Honeyeater																										
<i>Lichenostomus virescens</i>	Singing Honeyeater																										
<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater																										
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater																										
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater																										
<i>Purnella albifrons</i>	White-fronted Honeyeater																										
<i>Manorina flavigula</i>	Yellow-throated Miner																										
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater																										
<i>Conopophila whitei</i>	Grey Honeyeater																										
<i>Epthianura tricolor</i>	Crimson Chat																										
<i>Sugomel niger</i>	Black Honeyeater																										
<i>Lichmera indistincta</i>	Brown Honeyeater																										
<i>Melithreptus gularis</i>	Black-chinned Honeyeater																										
POMATOSTOMIDAE																											
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler																										
<i>Pomatostomus superciliosus</i>	White-browed Babbler																										
PSOPHODIDAE																											
<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush																										
NEOSITTIDAE																											
<i>Daphoenositta chrysoptera</i>	Varied Sittella																										
CAMPEPHAGIDAE																											
<i>Coracina maxima</i>	Ground Cuckoo-Shrike																										



Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports															
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a		
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-Shrike							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Lalage sueurii</i>	White-winged Triller							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
PACHYCEPHALIDAE																											
<i>Pachycephala rufiventris</i>	Rufous Whistler							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Colluricincla harmonica</i>	Grey Shrike-thrush							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Oreoica gutturalis</i>	Crested Bellbird							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
ARTAMIDAE																											
<i>Artamus personatus</i>	Masked Woodswallow								•				•	•	•						•			•			
<i>Artamus cinereus</i>	Black-faced Woodswallow							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Artamus minor</i>	Little Woodswallow							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Cracticus torquatus</i>	Grey Butcherbird							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Cracticus nigrogularis</i>	Pied Butcherbird							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Cracticus tibicen</i>	Australian Magpie							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
RHIPIDURIDAE																											
<i>Rhipidura albiscapa</i>	Grey Fantail							•		•			•	•	•						•			•	•	•	•
<i>Rhipidura leucophrys</i>	Willie Wagtail							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CORVIDAE																											
<i>Corvus bennetti</i>	Little Crow							•	•				•	•							•						
<i>Corvus orru</i>	Torresian Crow							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
MONARCHIDAE																											
<i>Grallina cyanoleuca</i>	Magpie-lark							•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
PETROICIDAE																											
<i>Petroica goodenovii</i>	Red-capped Robin							•					•	•	•						•						•
<i>Melanodryas cucullata</i>	Hooded Robin							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
ALAUDIDAE																											
<i>Mirafra javanica</i>	Horsfield's Bushlark								•												•						
MEGALURIDAE																											
<i>Cincloramphus mathewsi</i>	Rufous Songlark							•		•	•	•	•	•	•	•	•	•	•	•				•	•		
<i>Cincloramphus cruralis</i>	Brown Songlark																										
<i>Eremiornis carteri</i>	Spinifexbird							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HIRUNDINIDAE																											
<i>Cheramoeca leucosterna</i>	White-backed Swallow														•												
<i>Hirundo neoxena</i>	Welcome Swallow																										



Family and Species	Common name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports															
		EPBC Act	WCA	DEC	IUCN	EPBC Act	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a		
<i>Petrochelidon ariel</i>	Fairy Martin						•					•					•			•							
<i>Petrochelidon nigricans</i>	Tree Martin						•		•			•	•	•			•				•						
NECTARINIIDAE																											
<i>Dicaeum hirundinaceum</i>	Mistletoebird						•		•		•	•	•	•	•	•	•	•							•	•	
ESTRILDIDAE																											
<i>Taeniopygia guttata</i>	Zebra Finch						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Neochmia ruficauda subclarescens</i>	Star Finch (western)			P4	NT									•	•												
<i>Emblema pictum</i>	Painted Finch						•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
MOTACILLIDAE																											
<i>Anthus novaeseelandiae</i>	Australasian Pipit						•	•			•	•		•			•	•		•	•	•		•	•		



Reptiles

Scientific Name	WAM Common Name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports															
		EPBC	WCA	DEC	IUCN	EPBC	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a		
AGAMIDAE																											
<i>Amphibolurus longirostris</i>								•	•	•	•	•	•	•	•			•	•	•	•	•	•	•	•	•	
<i>Caimanops amphiboluroides</i>								•	•												•					•	
<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon							•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
<i>Ctenophorus isolepis</i>	Military Dragon							•		•					•		•	•							•	•	
<i>Ctenophorus reticulatus</i>	Western Netted Dragon																				•					•	
<i>Diporiphora valens</i>															•											•	
<i>Pogona minor</i>	Bearded Dragon							•	•	•		•		•	•		•				•				•	•	
<i>Tympanocryptis cephalus</i>	Pebble Dragon							•																			
DIPLODACYTLIDAE																											
<i>Crenadactylus ocellatus</i>	Clawless Gecko							•		•	•			•													
<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko							•		•																	
<i>Diplodactylus pulcher</i>																											•
<i>Diplodactylus savagei</i>	Yellow-spotted Pilbara Gecko							•	•	•	•		•	•			•	•	•	•					•		
<i>Lucasium stenodactylum</i>	Pale-snouted Ground Gecko							•	•	•	•			•	•						•			•	•	•	
<i>Lucasium wombeyi</i>									•	•			•			•	•								•	•	
<i>Oedura marmorata</i>	Marbled Velvet Gecko							•	•	•		•	•	•	•	•		•	•		•			•	•	•	
<i>Rhynchoedura ornata</i>	Beaked Gecko							•											•	•					•	•	
<i>Strophurus ciliaris</i>										•																	
<i>Strophurus elderi</i>								•	•	•	•														•	•	
<i>Strophurus jeanae</i>								•	•																		
<i>Strophurus wellingtonae</i>								•	•	•	•			•		•	•	•			•				•	•	
CARPHODACTYLIDAE																											
<i>Underwoodisaurus seorsus</i>	Pilbara Barking Gecko																									•	•
<i>Nephurus wheeleri</i>								•	•	•	•			•											•	•	
GEKKONIDAE																											
<i>Gehyra pilbara</i>								•		•																•	
<i>Gehyra punctata</i>	Spotted Rock Dtella							•	•	•	•		•	•	•	•	•	•			•	•	•	•	•	•	•
<i>Gehyra purpurascens</i>								•		•																	
<i>Gehyra variegata</i>	Tree Dtella							•	•		•	•		•	•		•	•			•			•	•	•	
<i>Heteronotia binoei</i>	Bynoe's Gecko							•	•	•	•			•	•	•		•	•		•	•		•	•	•	



Scientific Name	WAM Common Name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports														
		EPBC	WCA	DEC	IUCN	EPBC	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a	
<i>Heteronotia spelea</i>	Desert Cave Gecko						•	•	•	•	•		•		•		•	•	•					•	•	
PYGOPODIDAE																										
<i>Delma butleri</i>	Unbanded Delma								•																	
<i>Delma elegans</i>	Pilbara Delma						•	•	•		•													•		
<i>Delma haroldi</i>							•							•								•				
<i>Delma nasuta</i>							•	•		•				•								•		•	•	
<i>Delma pax</i>							•		•		•	•		•			•			•				•	•	
<i>Delma tincta</i>							•	•	•		•	•	•						•		•			•	•	
<i>Lialis burtonis</i>	Burton's legless lizard						•	•		•	•					•	•					•		•	•	
<i>Pygopus nigriceps</i>	Hooded Scaly foot						•		•									•			•					
SCINCIDAE																										
<i>Carlia munda</i>							•	•	•	•		•	•	•	•	•	•		•	•			•	•	•	
<i>Carlia triacantha</i>	Desert Rainbow Skink																					•		•	•	
<i>Cryptoblepharus buchananii</i>							•					?										•			•	
<i>Cryptoblepharus ustulatus</i>							•	•			•	?	•		•		•		•	•		•	•	•	•	
<i>Ctenotus duricola</i>							•		•		•	•		•	•							•		•		
<i>Ctenotus grandis</i>							•																			
<i>Ctenotus hanloni</i>								•	•			•														
<i>Ctenotus helenae</i>							•	•	•		•			•	•		•						•	•	•	
<i>Ctenotus leonhardii</i>												•	•													
<i>Ctenotus pantherinus</i>	Leopard Ctenotus						•	•	•	•		•	•	•	•	•	•		•	•	•	•	•	•	•	
<i>Ctenotus piankai</i>									•			•											•			
<i>Ctenotus rubicundus</i>							•		•		•		•	•		•								•		
<i>Ctenotus rutilans</i>							•	•	•		•	•							•		•	•	•		•	
<i>Ctenotus saxatilis</i>	Rock Ctenotus						•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	
<i>Ctenotus schomburgkii</i>	Barred wedge-tailed Ctenotus						•				•	•		•		•					•				•	
<i>Ctenotus serventyi</i>							•		•			•											•	•		
<i>Cyclodomorphus melanops</i>	Slender Blue-tongue						•	•	•	•		•	•	•		•	•		•	•			•	•	•	
<i>Egernia cygnitos</i>								•	•		•	•		•	•									•	•	
<i>Egernia formosa</i>	Crevice Skink						•	•	•	•	•	•				•		•	•					•	•	
<i>Eremiascincus fasciolatus</i>	Narrow-banded Sand Swimmer						•			•								•	•					•		
<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer						•			•														•		



Scientific Name	WAM Common Name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports															
		EPBC	WCA	DEC	IUCN	EPBC	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a		
<i>Lerista bipes</i>																											
<i>Lerista labialis</i>																											
<i>Lerista muelleri</i>																											
<i>Lerista neander</i>																											
<i>Lerista timida</i>																											
<i>Lerista zietzi</i>																											
<i>Menetia greyii</i>	Dwarf Skink																										
<i>Menetia surda</i>																											
<i>Morethia ruficauda</i>	Fire-tailed Skink																										
<i>Proablepharus reginae</i>																											
<i>Tiliqua multifasciata</i>	Central Blue-tongue																										
VARANIDAE																											
<i>Varanus acanthurus</i>	Spiny-tailed Monitor																										
<i>Varanus brevicauda</i>	Short-tailed Pygmy Monitor																										
<i>Varanus bushi</i>	Pilbara Mulga Monitor																										
<i>Varanus eremius</i>	Pygmy Desert Monitor																										
<i>Varanus giganteus</i>	Perentie																										
<i>Varanus gouldii</i>	Bungarra or Sand Monitor																										
<i>Varanus panoptes</i>	Yellow-spotted Monitor																										
<i>Varanus pilbarensis</i>	Pilbara Rock Monitor																										
<i>Varanus tristis</i>	Racehorse Monitor																										
TYPHLOPIDAE																											
<i>Ramphotyphlops ammodytes</i>																											
<i>Ramphotyphlops ganei</i>																											
<i>Ramphotyphlops grypus</i>																											
<i>Ramphotyphlops hamatus</i>																											
BOIDAE																											
<i>Antaresia perthensis</i>	Pygmy Python																										
<i>Antaresia stimsoni</i>	Stimson's Python																										
<i>Aspidites melanocephalus</i>	Black-headed Python																										
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	S1																								
ELAPIDAE																											
<i>Acanthophis wellsi</i>	Pilbara Death Adder																										



Scientific Name	WAM Common Name	Conservation Status				Database Searches		Reports relevant to the Study Area				Regional reports													
		EPBC	WCA	DEC	IUCN	EPBC	DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a
<i>Brachyurophis approximans</i>							•	•	•	•														•	•
<i>Demansia psammophis</i>	Yellow-faced Whipsnake						•	•	•				•			•	•				•			•	•
<i>Demansia rufescens</i>	Rufous Whipsnake						•		•	•				•	•		•		•					•	•
<i>Furina ornata</i>	Moon Snake						•		•							•	•		•				•	•	•
<i>Parasuta monachus</i>	Inland Hooded Snake						•			•			•								•			•	•
<i>Pseudechis australis</i>	Mulga Snake						•	•	•	•						•					•				•
<i>Pseudonaja mengdeni</i>	Western Brown Snake						•	•		•									•	•					
<i>Pseudonaja modesta</i>	Ringed Brown Snake						•																	•	•
<i>Suta fasciata</i>	Rosen's Snake						•					•												•	•
<i>Vermicella snelli</i>										•															•



Amphibians

Family and Species	Common name	Database Searches	Reports relevant to the Study Area				Regional reports													
		DEC	ecologia 2006	ENV 2010b	OES 2010 (relevant sites)	Current study	ecologia 1997	ecologia 1998a	ecologia 1998b	ecologia 2004a	ecologia 2004b	ENV 2007a	ENV 2007b	ENV 2008	OES 2008	Ninox 2009	Onshore-Biologic 2009	ENV 2010a	Biologic 2011a	Biologic in prep. a
HYLIDAE																				
<i>Cyclorana maini</i>	Main's Frog	•	•			•	•	•	•					•	•	•	•			•
<i>Cyclorana platycephala</i>	Water-holding Frog													•						
<i>Litoria rubella</i>	Desert Tree Frog	•	•	•		•		•	•			•		•	•		•	•		•
MYOBATRACHIDAE																				
<i>Neobatrachus sutor</i>	Shoemaker Frog													•						
<i>Pseudophryne douglasi</i>	Douglas' Toadlet	•																		
<i>Uperoleia russelli</i>	Russell's Toadlet	•							•									•		



Site name	JIN-SD-01	JIN-SD-02	JIN-SD-03	JIN-SD-04	JIN-SD-05	JIN-SD-06	JIN-SD-07	JIN-SD-08	JIN-SD-09	JIN-SD-10	JIN-SD-11	JIN-SD-12	JIN-SD-13	JIN-SD-14	JIN-SD-15	JIN-SD-16	JIN-SD-17	JIN-SD-18	JIN-SD-19	JIN-SD-20	JIN-SD-21	JIN-SD-22	JIN-SD-23	JIN-SD-24	JIN-SD-25	JIN-SD-26	JIN-SD-27	JIN-SD-28	
Sheet erosion							Minor sheet erosion			Minor sheet erosion						Minor sheet erosion				Minor sheet erosion			No sheet erosion		Severe sheet erosion				
Rill erosion					Minor rill erosion	Moderate rill erosion		Minor rill erosion							No rill erosion	Minor rill erosion			Minor rill erosion							Minor rill erosion			
Gully erosion				Minor gully erosion	Moderate gully erosion	Minor gully erosion		Minor gully erosion					Minor gully erosion		Minor gully erosion	Minor gully erosion			Minor gully erosion		Minor gully erosion	Minor gully erosion		Minor gully erosion	Minor gully erosion	Minor gully erosion	Minor gully erosion		
Gully depth				3 m +	1.5-3.0 m	1.5-3.0 m		3 m +					3 m +		1.5-3.0 m	1.5 m -		1.5-3.0 m		1.5 m -	3 m +		3 m +	3 m +	3 m +				
Abundance of coarse fragments	Extremely or very abundant	Extremely or very abundant	Extremely or very abundant	Extremely or very abundant	Very or abundant	Very or abundant	Very or abundant	Extremely or very abundant	Extremely or very abundant	Very or abundant	Moderate or many	Extremely or very abundant	No coarse fragments	Moderate or many	Slight or few	Slight or few	Moderate or many	Very or abundant	Very or abundant	Extremely or very abundant	Very or abundant	Very or abundant	Very or abundant	Common	Very or abundant	Very or abundant	Extremely or very abundant	Extremely or very abundant	
Size of coarse fragments	Coarse gravelly or large pebbles	Stony or stones and smaller	Stony or stones	Stony or stones	Stony or stones, and bellow	Stony or stones and smaller	Coarse gravelly or large pebbles		Bouldery or boulders and smaller	Stony or stones	Large boulders and smaller	Stony or stones and smaller		Cobbly or cobbles and smaller	Cobbly or cobbles and smaller	Coarse gravelly or large pebbles	Cobbly or cobbles and smaller	Stony or stones and smaller	Stony or stones and smaller	Coarse gravelly or large pebbles	Bouldery or boulders and smaller	Large boulders and smaller	Cobbly or cobbles	Large boulders and smaller	Coarse gravelly or large pebbles	Large boulders and smaller	Medium gravelly or large pebbles	Medium gravelly or large pebbles + coarse gravelly	
Abundance of rock outcrop		Rocky	Very slightly rocky	Rockland	Very slightly rocky	Very slightly rocky	Rockland	Rockland	Rockland	Rockland	Rockland	Very rocky	Rockland	No rock outcrop	Slightly rocky	No rock outcrop	No rock outcrop	Slightly rocky	Very slightly rocky	No rock outcrop	Very rocky	Rockland	Very rocky	Rockland	Very rocky	Rocky	Very slightly rocky	No rock outcrop	
Waterbodies	Minor drainage line nearby	no	-	Ephemeral pools	no	seasonal		small pools after rain	nil		no	no	Large permanent pools	no	not atm	-	no	no	no	Adj. dry creek	no	no		Rock seep and ephemeral/permanent pool	Dry pool nearby	yes, permanent pool	-		
Comments	Spinifex		OK for WPMM	Tumbled rocks, boulders: Northern Quoll						Adj. cave JIN-02			Rock ledges, crevices for POP			Thick leaf litter below aneura				Thick acacia scrub, lots of birds			Cracks in basalt boulder piles	Ephemeral pools, deep cracks & crevices.			Potential for Nephurus seorsus		
Texture	Silty loam	Silty loam	Silty loam	No soil	Silty loam	Silty loam	Silty loam	Silty loam	Clay loam	Silty loam	Silty loam	Silty loam		Clay loam	Silty loam	Silty clay loam	Clay loam	Clay loam	Clay loam	Silty loam	Clay loam	Silty loam	Loamy sand	Silty loam	Course Sand	Loam	Light medium clay	Silty loam	
Colour	Brown	Brown/Red	Brown		Brown	Brown	Brown	Brown	Red	Brown	Red	Brown		Brown	Brown	Brown	Brown	Brown	Brown	Brown	Red	Brown	Orange	Brown	Brown	Brown	Brown	Brown	
Water status	Dry	Dry	Dry		Dry	Dry	Dry	Dry	Dry	Dry		Dry		Moderately moist	Dry	Moderately moist	Dry	Moist	Dry	Moderately moist	Moderately moist	Dry	Moderately moist	Moist	Moderately moist	Moist	Dry	Moderately moist	
Strength		Very weak			Weak	Weak		Weak	Very weak		Very weak	Weak		Firm	Weak		Weak	Weak	Weak		Weak	Weak		Very weak		Loose			
Comments		skeletal							skeletal		skeletal, pockets	skeletal			patchy						patchy	skeletal		skeletal					
Existence of substrate		Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g);	Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	No surface exposure;	Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g);	No surface exposure;	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g); Course fragments(Boulders, etc);	Vertical exposure (outcroppin g);	No surface exposure;
Rock type		Ironstone	Ironstone	BIF	mixed, mostly ironstone...	mixed river stones, ironstone outcropping	BIF	Ironstone	Ironstone	Lateritic	Ironstone	Ironstone	BIF	mixed rocks	Ironstone		mixed	Calcrete	Mixed fragments, ironstone exposed		Ironstone conglomerate	Ironstone	Basalt	Ironstone	Ironstone	mixed, mostly ironstone	Calcrete		



Appendix D: Locations of conservation significant fauna recorded

Study	Species	Common Name	Conservation significance	Type of record	Datum	Zone	Easting	Northing
Biologic (current survey)	<i>Apus pacificus</i>	Fork-tailed Swift	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50 K	734975	7460173
Biologic (current survey)	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	EPBC Act Vulnerable, WCA Schedule 1	Scats	WGS84	50 K	733273	7452421
Biologic (current survey)	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	Scats	WGS84	50 K	728572	7451162
Biologic (current survey)	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	Scats	WGS84	50 K	734433	7452779
Biologic (current survey)	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50 K	733904	7454977
Biologic (current survey)	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50 K	735234	7451304
Biologic (current survey)	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50 K	729982	7464487
Biologic (current survey)	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50 K	734374	7457194
Biologic (current survey)	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50 K	734424	7452771
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	728583	7451928
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	730680	7453428
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	730716	7453435
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	730353	7453015
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	732850	7453699
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	733296	7453453
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	732651	7457733
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	734038	7456609
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	730437	7461178
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	730398	7461158
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	733990	7460598
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	734674	7460337
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	736647	7457422
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	733862	7460671
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	728444	7461722
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	729151	7464839
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	733674	7463393
Biologic (current survey)	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50 K	728308	7459228
Biologic 2011b	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	732979	7457313
Biologic 2011b	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	728164	7456852
Biologic 2011b	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	EPBC Act Vulnerable, WCA Schedule 1	Scats	WGS84	50K	733985	7456176
Biologic 2011b	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	EPBC Act Vulnerable, WCA Schedule 1	Scats	WGS84	50K	731778	7457132
Biologic 2011b	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	Individual	WGS84	50K	732891	7456062
Biologic in prep. d	<i>Chalilonobus morio</i>	Chocolate Wattled Bat	Locally significant	Individual	WGS84	50K	730409	7467983
Biota in prep.	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	718174.86	7454517.71
Biota in prep.	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	725810.73	7458224.39
Biota in prep.	<i>Neochmia ruficauda subclarescens</i>	Star Finch (western)	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	724419.99	7450985.05
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728774.40	7459544.58
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728756.15	7459437.17
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728751.57	7459439.80



Study	Species	Common Name	Conservation significance	Type of record	Datum	Zone	Easting	Northing
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728735.64	7459437.71
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	725943.30	7456704.03
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	725944.40	7456783.66
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	726321.74	7458037.03
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	724764.12	7458431.82
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	724475.15	7458789.31
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	724455.88	7458804.00
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723647.37	7459180.50
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723411.36	7459176.58
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723283.92	7459230.21
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722974.05	7459205.22
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722709.60	7459240.59
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722781.40	7459357.63
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722923.79	7459503.30
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	733086.52	7446888.09
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	732885.94	7446975.63
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723467.70	7449933.34
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723347.26	7449550.17
Biota in prep.	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722760.36	7450331.27
ENV 2010a	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4	Individual	WGS84	50K	738961	7443847
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735565	7461827
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735847	7449038
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735706	7461982
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735665	7462819
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735661	7462349
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735403	7462923
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735580	7463419
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735627	7463486
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735666	7463567
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735771	7463578
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735074	7462683
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735055	7461481
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735699	7462928
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735618	7462357
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735657	7462347
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	736086	7461864
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734992	7458967
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735049	7458993
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	733375	7447142
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728463	7459268
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	725003	7458444



Study	Species	Common Name	Conservation significance	Type of record	Datum	Zone	Easting	Northing
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722943	7457724
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	722829	7457559
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734558	7463421
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735043	7463695
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734439	7462356
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	733737	7446912
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735026	7464079
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734833	7462380
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734933	7463039
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734906	7463324
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	733093	7460016
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735585	7463422
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	736355	7464200
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735214	7462927
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735627	7461930
ENV 2010a	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	735687	7461868
ENV 2010b	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	728823	7458072
ENV 2010b	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	730460	7452090
ENV 2010b	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	728891	7461168
ENV 2010b	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	ANABAT	WGS84	50K	728416	7451466
ENV 2010b	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	ANABAT	WGS84	50K	728656	7451203
ENV 2010b	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	ANABAT	WGS84	50K	728404	7451445
ENV 2010b	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	722756	7451834
ENV 2010b	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	723270	7451374
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734735	7458165
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	731159	7457779
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	730923	7458321
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	729973	7452277
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	732196	7457503
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	732990	7456896
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	731065	7457833
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	730225	7451505
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	727883	7454349
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	731547	7459495
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	732993	7450880
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	727949	7452282
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	732489	7452439
ENV 2010b	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	734388	7452306
ENV 2010b	<i>Ramphotyphlops ganei</i>	(An unnamed blindsnake)	DEC Priority 1	Individual	WGS84	50K	729977	7452006
ENV 2010b	<i>Rhinonicteris aurantia</i>	Pilbara Leaf-nosed Bat	EPBC Act Vulnerable, WCA Schedule 1	ANABAT	WGS84	50K	728728	7451664
NatureMap	<i>Chalilonobus morio</i>	Chocolate Wattled Bat	Locally significant	Individual	WGS84	50K	719879	7479795








Study	Species	Common Name	Conservation significance	Type of record	Datum	Zone	Easting	Northing
NatureMap	<i>Chalillonobus morio</i>	Chocolate Wattled Bat	Locally significant	Individual	WGS84	50K	729242	7478148
OES 2010	<i>Ardea modesta</i>	Eastern Great Egret	EPBC Act Migratory	Individual	WGS84	50K	726761	7464045
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	721625	7459701
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	729123	7460591
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	731223	7458008
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	731102	7457929
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	723262	7457748
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	728784	7457388
OES 2010	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	723145	7457680
OES 2010	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	727231	7465870
OES 2010	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	727224	7465832
OES 2010	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	727224	7465832
OES 2010	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	724036	7462450
OES 2010	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	WGS84	50K	727062	7466172
OES 2010	<i>Pandion cristatus</i>	Eastern Osprey	EPBC Act Migratory	Individual	WGS84	50K	729271	7467603
OES 2010	<i>Pandion cristatus</i>	Eastern Osprey	EPBC Act Migratory	Individual	WGS84	50K	727224	7465832
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	729917	7457373
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	730323	7458212
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	730267	7458185
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728210	7461858
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	730235	7461232
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	736031	7457879
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	736693	7457879
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	736693	7457728
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728659	7459395
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728765	7459367
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	729782	7457327
OES 2010	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	727996	7466456
Onshore-Biologic 2009	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	WGS84	50K	734111	7446407
Onshore-Biologic 2009	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	EPBC Act Vulnerable, WCA Schedule 1	Individual	WGS84	50K	724282	7447248
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	732271	7446538
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	727081	7447848
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	726485	7447221
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723146	7447971
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723698	7447455
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723979	7447353
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723971	7450053
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723786	7449904
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	728926	7448325
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	725779	7448268
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	723971	7448575








Study	Species	Common Name	Conservation significance	Type of record	Datum	Zone	Easting	Northing
Onshore-Biologic 2009	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	WGS84	50K	733094	7446754
Ecologia 2006	<i>Apus pacificus</i>	Fork-tailed Swift	EPBC Act Migratory, WCA Schedule 3	Individual	AGD84	50K	729628	7454172
Ecologia 2006	<i>Apus pacificus</i>	Fork-tailed Swift	EPBC Act Migratory, WCA Schedule 3	Individual	AGD84	50K	731812	7457226
Ecologia 2006	<i>Apus pacificus</i>	Fork-tailed Swift	EPBC Act Migratory, WCA Schedule 3	Individual	AGD84	50K	730480	7456114
Ecologia 2006	<i>Ardeotis australis</i>	Australian Bustard	DEC Priority 4, IUCN Near Threatened	Individual	AGD84	50K	731812	7457226
Ecologia 2006	<i>Macroderma gigas</i>	Ghost Bat	DEC Priority 4, IUCN Vulnerable	ANABAT	AGD84	50K	728505	7451394
Ecologia 2006	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	AGD84	50K	735486	7457180
Ecologia 2006	<i>Merops ornatus</i>	Rainbow Bee-eater	EPBC Act Migratory, WCA Schedule 3	Individual	AGD84	50K	728396	7451838
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	729609.6	7453748
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	729623.4	7454073
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	728474.4	7451780
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	728118.7	7451870
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	728236.5	7451876
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	728471	7451741
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	728174.3	7451940
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	729713.2	7454117
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	728167.7	7451945
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	732188.9	7457428
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	731378.4	7454324
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	732429.6	7455532
Ecologia 2006	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	DEC Priority 4	Mound	AGD84	50K	734144.2	7450299



Appendix E: Details of overhangs and caves recorded in the Study Area

Cave Name	Source	Description and position	Significant records	Suitability for Ghost Bat	Suitability for Pilbara Leaf-nosed Bat	Overall value	Photo
Cave 1	ENV	Shallow overhang with high (2m) roof internally, but no further chambers or crevices. 50K 0728415 7451465	Ghost Bat (ANABAT)	Not suitable as a feeding, temporary (overnight) or more permanent roost. Potential to be used as a feeding roost, although this would be considered very unusual for this type of cavity. Lack of any feeding signs supports this.	Not suitable.	Low	
Cave 2	ENV	Shallow overhang with no chamber or deep crevices. 50K 0728594 7451541	No records	Not suitable.	Not suitable.	Low	
Cave 3	ENV	Cave could not be located as the waypoint was incorrect. Comments relate to the appearance of the photograph only. 50K 0728655 7451203	Ghost Bat (ANABAT)	Appears to be unsuitable for Ghost Bat as a roost.	Appears to be unsuitable for Pilbara Leaf-nosed Bat.	Low	
Cave 4	ENV	Shallow overhang unsuitable for any bats. 50K 0728404 7451445	Ghost Bat (ANABAT). Recorded twice.	Not suitable.	Not suitable.	Low	
Cave 5	ENV	Small, shallow overhang with no chambers or crevices. 50K 0728730 7451436	No records	Not suitable.	Not suitable.	Low	




Cave Name	Source	Description and position	Significant records	Suitability for Ghost Bat	Suitability for Pilbara Leaf-nosed Bat	Overall value	Photo
Cave 6	ENV	Cave with depth of approximately 12m, narrow (about 1.5m) and low (about 1m) cave. 50K 0728728 7451663	Pilbara Leaf-nosed Bat (ANABAT)	Not suitable.	Not suitable for Pilbara Leaf-nosed Bat. This species requires hot, humid and deep caves. Also, no suitable foraging habitat nearby as this species prefers moderately dense to closed woodlands with water present.	Low	
Cave 7	ENV	A series of shallow overhangs at the base of a cliff. No caves or sizeable cavities. 50K 0729863 7452016	No records	Not suitable for Ghost Bat. This cave is shallow and Ghost Bats require deep complex caves (Armstrong and Anstee, 2000). Cave may receive visits.	Not suitable for Pilbara Leaf-nosed Bat. This species requires hot, humid and deep caves.	Low	
Cave 8	ENV	Shallow overhang. 50K 0732957 7452852	No records	Not suitable for Ghost Bat. This cave is shallow and Ghost Bats require deep complex caves (Armstrong and Anstee, 2000). Cave may receive visits.	Not suitable for Pilbara Leaf-nosed Bat. This species requires hot, humid and deep caves.	Low	
Cave 9	Biologic	Complex internally with a large, domed, high-roofed (>2m) side chamber. Permanent pools nearby (<1km) 50K 0728572 7451162	Ghost Bat (scats)	A few old scats indicate infrequent use, at least as a feeding roost. Chamber is not pitch black suggesting that this cave is unlikely to be used as a temporary daytime or more permanent roost.	Open entrance results in similar temperature and humidity conditions internally, suggesting that this cave is unsuitable for Pilbara Leaf-nosed Bat.	Medium	
Cave 10	Biologic	This is a long (35-40m), straight, tunnel-shaped cave with fairly uniform height (1.5m) and width (up to 4m). Smaller bat species (<i>Taphozous georgianus</i> and <i>Vespadelus finlaysoni</i>) were present. 50K 0734958 7450645	None	Possible visit cave.	Not suitable for Pilbara Leaf-nosed Bat. This species requires hot, humid and deep caves.	Low	



Cave Name	Source	Description and position	Significant records	Suitability for Ghost Bat	Suitability for Pilbara Leaf-nosed Bat	Overall value	Photo
Cave 11	Biologic	A reasonably deep (25m), high (3m) cave that narrows mid-way. A few small tunnels are present at the back of the main chamber. Bats present included <i>Taphozous georgianus</i> and <i>Vespadelus finlaysoni</i> . 50K 0734957 7450674	None	Possible visit cave.	Not suitable for Pilbara Leaf-nosed Bat. This species requires hot, humid and deep caves.	Low	
Cave 12	Biologic	A small, saucer-shaped cave 7m deep with a low, narrow entrance. 50K 0733800 7453260	None	Possible feeding cave.	The cave had higher temperature and humidity, but was not considered to be suitable for Pilbara Leaf-nosed Bats due to small size and inability to insulate against external temperature changes.	Low	
Cave 13	Biologic	A very large, complex cave with three elongate (20m), high-ceilinged, wide chambers. Pitch black in side chambers. Left-hand chamber has a stone cairn inside. A permanent pool is nearby, downstream. 50K 0734433 7452779	Very large Ghost Bat scat pile.	Suitable as a feeding, daytime (temporary) or longer-term roost. Large scat pile suggestive of the latter for a small number of Ghost Bats.	Although the cave is deep, large and complex, the temperature and humidity were not markedly different from outside, suggesting that the cave is unlikely to be a suitable natural roost for Pilbara Leaf-nosed Bat. This should not be ruled out, however.	High	
Cave 14	Biologic	This cave is adjacent to Cave 13 and consists of a large chamber with high, domed ceiling of indeterminate depth (the entrance is 'bricked up' and too narrow to enter). 50K 0734414 7452781	Unknown	Likely to be suitable for Ghost Bat because of cave internal shape and close proximity to known roost at Cave 13.	Unknown.	Medium	
Cave 15	Biologic	A long (25m), tapering, tunnel-shaped cave that narrows toward the back. Small tunnel cavities extend from the rear of the cave. A rockpool is present around 500m away. <i>Taphozous georgianus</i> were present. 50K 0734909 7452612	None.	Possible visit cave.	Not suitable for Pilbara Leaf-nosed Bat. This species requires hot, humid and deep caves.	Low	



Cave Name	Source	Description and position	Significant records	Suitability for Ghost Bat	Suitability for Pilbara Leaf-nosed Bat	Overall value	Photo
Cave 16	Biologic	A long, narrowing, conical cave with no observable end - potentially leads to a larger chamber. A number of rockpools are present within 200m. Adjacent to a very large <i>Ficus</i> sp. and sedge habitat. 50K 0732847 7463731	None.	Unlikely to be suitable for Ghost Bat.	Unknown as the cave internal shape and temperature/humidity conditions could not be determined - proximity to water suggests that this may be a potential roost or visit cave.	Low	
Cave 17	Biologic	A very shallow overhang with a dark, high vertical crack in the ceiling. 50K 0732891 7456062	Individual Ghost Bat	Likely to be only a temporary day roost for Ghost Bat.	Unlikely to be suitable for Pilbara Leaf-nosed Bat.	Medium	No photo available