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**ASIA IRON AUSTRALIA  
EXTENSION HILL MAGNETITE PROJECT  
CONSERVATION SIGNIFICANT FAUNA MONITORING 2013**

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## ACRONYMS

<b>AIA</b>	Asia Iron Australia
<b>BoM</b>	Bureau of Meteorology
<b>CAMBA</b>	China-Australia Migratory Bird Agreement
<b>DEC</b>	Department of Environment and Conservation (now DPaW or DER)
<b>DPaW</b>	Department of Parks and Wildlife
<b>DSEWPaC</b>	Department of Sustainability, Environment, Water, Population and Communities (now Department of the Environment)
<b>EIA</b>	Environmental Impact Assessment
<b>EP Act</b>	<i>Environmental Protection Act 1986</i>
<b>EPA</b>	Environmental Protection Authority
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
<b>JAMBA</b>	Japan-Australian Migratory Bird Agreement
<b>NHMRC</b>	National Health and Medical Research Centre
<b>SAC</b>	Species Accumulation Curve
<b>WC Act</b>	<i>Wildlife Conservation Act 1950</i>

## EXECUTIVE SUMMARY

Extension Hill Pty Ltd and Mount Gibson Iron Limited are joint proponents for the Mount Gibson Iron Ore and Infrastructure Project (the Project). Approval for the Project was granted under Ministerial Statement (MS) 753. Under section 12.1 of this ministerial statement, Asia Iron Australia was required to prepare a Mine Site Fauna Management Plan that addresses the management and monitoring of the following four conservation significant species:

1. Western Spiny-tailed Skink (*Egernia stokesii badia*);
2. Peregrine Falcon (*Falco peregrinus*);
3. Major Mitchell's Cockatoo (*Cacatua leadbeateri*); and
4. Rainbow Bee-eater (*Merops ornatus*).

This document compiles the results of the 2013 monitoring conducted in November 2013 for the four identified conservation significant fauna species within the study area.

Survey methods adopted by *ecologia* Environment are in accordance with EPA Guidance Statement No. 56 (EPA 2004) and Position Statement No. 3 (EPA 2002). Species-specific survey methodology used for the Western Spiny-tailed Skink (*Egernia stokesii badia*) was in accordance with *Survey guidelines for Australia's threatened reptiles* (DSEWPaC 2011). Point count avifauna observation methods were in accordance with the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010).

Surveying for Western Spiny-tailed Skink consisted of searching pre-determined sites, which were selected prior to the field survey. These search sites were initially targeted and surveyed, with the search area expanded to include all areas of the study area. Sampling methods for the three targeted conservation significant bird species consisted of both systematic survey methodology via 30 minute duration point counts, and making opportunistic sightings while completing other activities within the study area.

A total of three fauna habitats were recorded; Acacia shrubland on sandy soil, Acacia shrubland on rocky soil and Eucalypt woodland. Results of the assessment of utilisation of habitats by targeted species identified potential nesting/breeding habitat for Western Spiny-tailed Skink, Major Mitchell's Cockatoo and Peregrine Falcon within the Eucalypt woodland habitat type. Potential foraging habitat for all targeted bird species (Rainbow Bee-eater, Major Mitchell's Cockatoo and Peregrine Falcon) exists throughout all habitat types, with potential foraging habitat for Western Spiny-tailed Skink restricted to the Eucalypt woodland only.

The Western Spiny-tailed Skink was recorded only within the Eucalypt woodland habitat type, and within this habitat type, there appeared to be a micro-habitat for which the Western Spiny-tailed Skink showed preference for. This microhabitat is associated with the presence of a relatively diverse small shrub layer surrounding refuge logs.

Two refuge logs within the Extension Hill Pty Ltd tenement boundary contained evidence of Western Spiny-tailed Skink occupation. Additionally, one refuge log within the tenement boundary showed potential evidence of occupation. Two individual Western Spiny-tailed Skinks were observed 30 m outside of the tenement boundary.

The Peregrine Falcon was recorded on a total of three occasions, twice during systematic point counts and once opportunistically (outside of the tenement boundary). A single opportunistic record of Major Mitchell's Cockatoo was made during the survey, consisting of two individuals. A total of 17 visual observation records of Rainbow Bee-eater were made, nine of the records being from systematic point counts with the remaining eight records made opportunistically.

# 1 INTRODUCTION

## 1.1 PROJECT OVERVIEW

Extension Hill Pty Ltd and Mount Gibson Iron Limited are joint proponents for the Mount Gibson Iron Ore and Infrastructure Project (the Project). Approval for the Project was granted under Ministerial Statement (MS) 753. Under section 12.1 of this ministerial statement, Asia Iron Australia (AIA) was required to prepare a Mine Site Fauna Management Plan (fauna management plan) that addresses the management and monitoring of four conservation significant species:

1. Western Spiny-tailed Skink (*Egernia stokesii badia*);
2. Peregrine Falcon (*Falco peregrinus*);
3. Major Mitchell's Cockatoo (*Cacatua leadbeateri*); and
4. Rainbow Bee-eater (*Merops ornatus*).

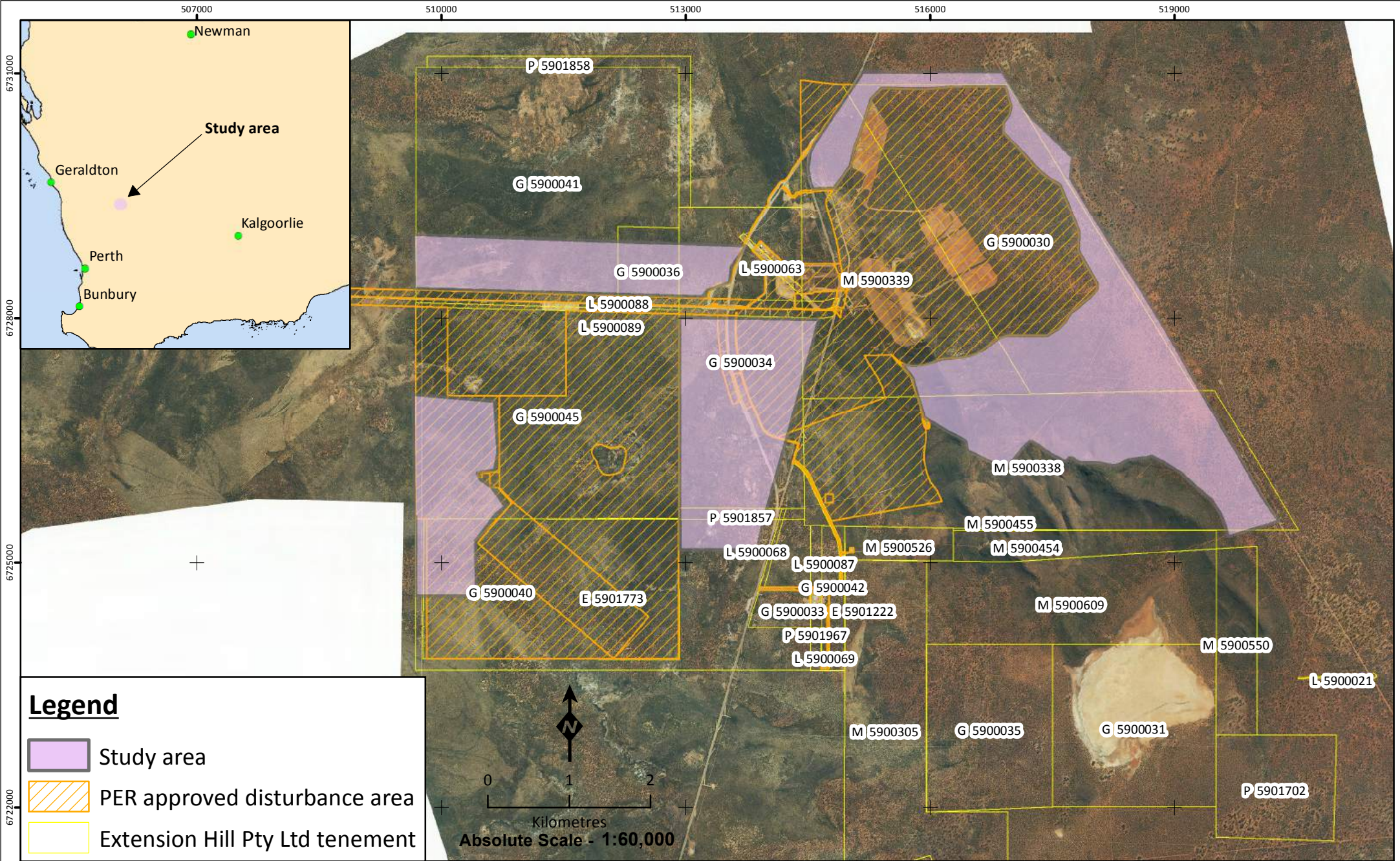
This document compiles the results of the 2013 monitoring conducted in November 2013 for the four identified conservation significant fauna species within the study area (Figure 1.1). The study area was defined as tenements held by Extension Hill Pty Ltd, excluding areas currently undergoing mining activities (Public Environmental Review (PER) approved disturbance area) and areas south of Mount Gibson range.

## 1.2 SURVEY OBJECTIVES

AIA commissioned *ecologia* Environment (*ecologia*) to design and conduct a monitoring program for the four conservation significant fauna species identified in Ministerial Statement 753. The program was undertaken in accordance with the EPA Guidance Statement No. 56 (EPA 2004), Position Statement No. 3 (EPA 2002), *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010) and species specific survey methodology (Section 2).

Fauna monitoring conducted in this program will assist in identifying potential direct and indirect impacts of development of the project on conservation significant fauna species. It allows for the development of management measures that maximise the protection and long-term conservation of the species adjacent to impact areas.







## 2 METHODS

Survey methods adopted by *ecologia* are in accordance with EPA Guidance Statement No. 56 (EPA 2004) and Position Statement No. 3 (EPA 2002). Point count avifauna observation methods were in accordance with the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010). Western Spiny-tailed Skink survey methodology was in accordance with *survey guidelines for Australia’s threatened reptiles* (DSEWPaC 2011).

The monitoring survey was conducted between 5 and 11 November 2013, during a time that optimises the likelihood of recording each of the four targeted species. Survey timing and duration for the 2013 monitoring survey is summarised in Table 2.1.

**Table 2.1 – Summary of survey timing and duration**

Survey	Dates of survey	Duration (days)	Person days
2013 Fauna Monitoring	5 – 11 November 2013	7	21

This initial phase of monitoring comprised the following:

- Identifying the extent of potential habitat for the four species within the study area;
- Conducting widespread systematic and targeted searches for the four species to identify populations; and
- Establishing monitoring sites applicable to each species that are repeatable on an annual basis.

### 2.1 WESTERN SPINY-TAILED SKINK

#### 2.1.1 Sampling methods

There is currently no evidence that the Western Spiny-tailed Skink is readily trapped, as the species seems to venture only short distances from refuge sites over short periods of feeding, however baited Elliot traps in close proximity to refuge sites may be successful (DSEWPaC 2011). Due to the limitations in trapping for this species, thorough searching of likely sheltering sites (hollow logs and roots, piles of timber, hollow trees/branches, and possibly rock outcrops) over long time periods is likely to produce the best results (DSEWPaC 2011).

##### 2.1.1.1 Active searches

Pre-determined search sites for the Western Spiny-tailed Skink were selected prior to the field survey. These search sites were initially targeted and surveyed, with the search area expanded to include all areas of the study area.

All habitats containing large fallen trees, piles of logs, or rock piles within the study area were thoroughly searched for scats or individuals by three experienced zoologists. Scats and individuals were searched for by examining the entrances and internal cavities of hollow branches or logs using a head torch. The scat of the Western Spiny-tailed Skink is distinctive, being relatively large, typically reptile shaped and composed of vegetative and insect material, with scats typically deposited in a communal latrine pile.

An attempt was made to search all potentially suitable refuge sites within the study area. All refuge sites with evidence of occupation or visitation by the skinks were recorded. Photographs, GPS locations, and a habitat assessment were taken at all potential refuge sites, as well as all active search areas visited. Active search point locations for Western Spiny-tailed Skink are shown below in Table 2.2 and mapped in Figure 2.2.

**Table 2.2 – Western Spiny-tailed Skink pre-determined survey site locations**

Site	Zone	Datum	Easting	Northing
EH ESB1	50	GDA 94	517956	6729035
EH ESB2	50	GDA 94	518285	6728655
EH ESB3	50	GDA 94	518157	6727837
EH ESB4	50	GDA 94	518288	6727328
EH ESB5	50	GDA 94	510930	6728569
EH ESB6	50	GDA 94	518925	6726552
EH ESB7	50	GDA 94	517431	6729919
EH ESB8	50	GDA 94	512340	6728518
EH ESB9	50	GDA 94	513530	6726169
EH ESB10	50	GDA 94	514178	6727394
EH ESB11	50	GDA 94	509990	6726234
EH ESB12	50	GDA 94	517480	6726982

### 2.1.1.2 Camera trapping

Camera traps utilising infra-red motion-sensing cameras were installed at the entrances of hollows where individual skinks were observed during an active search, to determine if more than one individual was present, and/or if a family unit inhabits the refuge site. Entrances were baited with universal bait (mix of peanut butter, oats and sardines) and fruit, attempting to entice individuals in to the area. Camera trap locations are shown in Table 2.3. Camera traps were deployed for a total of 384 hours.

**Table 2.3 – Western Spiny-tailed Skink camera trap locations**

Site	Zone	Datum	Easting	Northing
EH ESB LOG3	50	GDA 94	518250	6728777
EH ESB LOG5	50	GDA 94	518073	6729024

**Figure 2.1 – Example of camera trap set-up on EH ESB LOG5**

## 2.2 PEREGRINE FALCON, RAINBOW BEE-EATER AND MAJOR MITCHELL'S COCKATOO

### 2.2.1 Sampling Methods

Sampling methods for the three targeted conservation significant bird species consisted of both systematic survey methodology via point counts and opportunistic sightings whilst completing other activities within the study area. Systematic point count survey methodology for avifauna is consistent with methods outlined within the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010).

#### 2.2.1.1 Point counts

Thirteen monitoring sites were selected within the study area for point counts, and were positioned to represent the main habitat types present. These locations are shown in Table 2.4 and mapped in Figure 2.3. At each monitoring site, thirty minute set-time surveys were used to document the avifauna present at each of the monitoring sites. During each set-time survey an ornithologist completed a point count, where the number of individuals of each species seen or heard was recorded from a stationary position. Each monitoring site was surveyed on four occasions, totalling two hours of point count survey effort at each monitoring location. This systematic method will allow for statistical analysis and comparison of change over time, utilising future results.

Point count surveys were concentrated at monitoring sites within three hours of dawn and two hours of dusk, as this time is deemed to be the optimal times to record most bird species. A total of 26 hours of systematic point counts were completed.

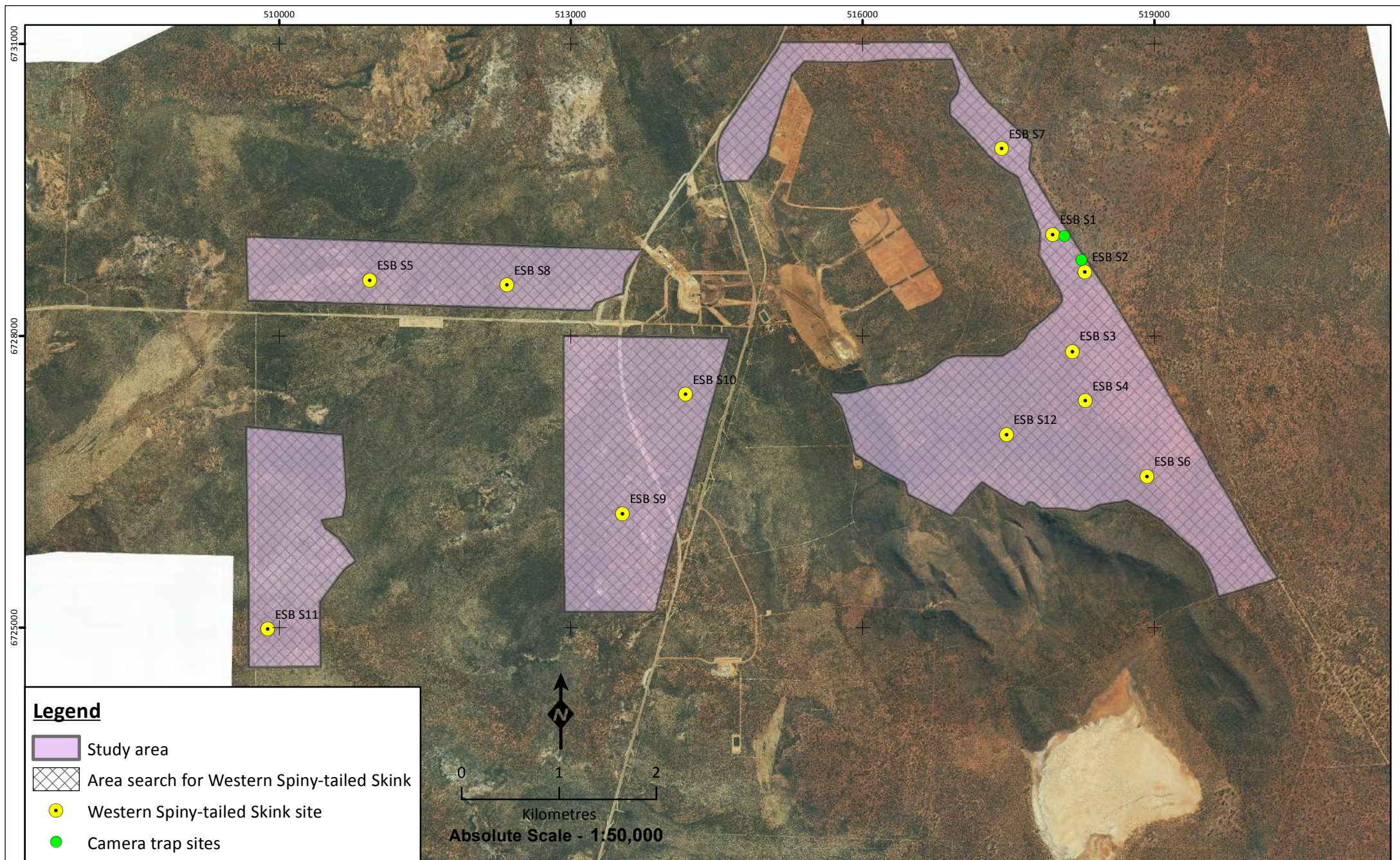
**Table 2.4 – Avifauna point count locations**

Site	Zone	Datum	Easting	Northing
EH PC S1	50	GDA 94	512154	6728395
EH PC S2	50	GDA 94	513677	6727758
EH PC S3	50	GDA 94	513849	6726348
EH PC S4	50	GDA 94	517514	6729980
EH PC S5	50	GDA 94	518404	6728381
EH PC S6	50	GDA 94	518170	6727859
EH PC S7	50	GDA 94	517886	6727283
EH PC S8	50	GDA 94	519046	6727351
EH PC S9	50	GDA 94	509755	6726446
EH PC S10	50	GDA 94	510184	6728401
EH PC S11	50	GDA 94	517423	6726724
EH PC S12	50	GDA 94	518531	6726577
EH PC S13	50	GDA 94	517933	6729268

#### 2.2.1.2 Opportunistic sampling

Targeted conservation significant fauna were also recorded opportunistically within the study area outside of targeted surveys, such as while travelling between survey sites. Secondary evidence such as feeding signs, feathers, tracks, nests were investigated and searched for.





**Legend**

- Study area
- Area search for Western Spiny-tailed Skink
- Western Spiny-tailed Skink site
- Camera trap sites

0 1 2  
Kilometres  
Absolute Scale - 1:50,000



**Western Spiny-tailed Skink survey site locations**

Figure: 2.2  
Project ID: 1567

Drawn: BG  
Date: 13/12/2013

Coordinate System  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994

Unique Map ID: BG318

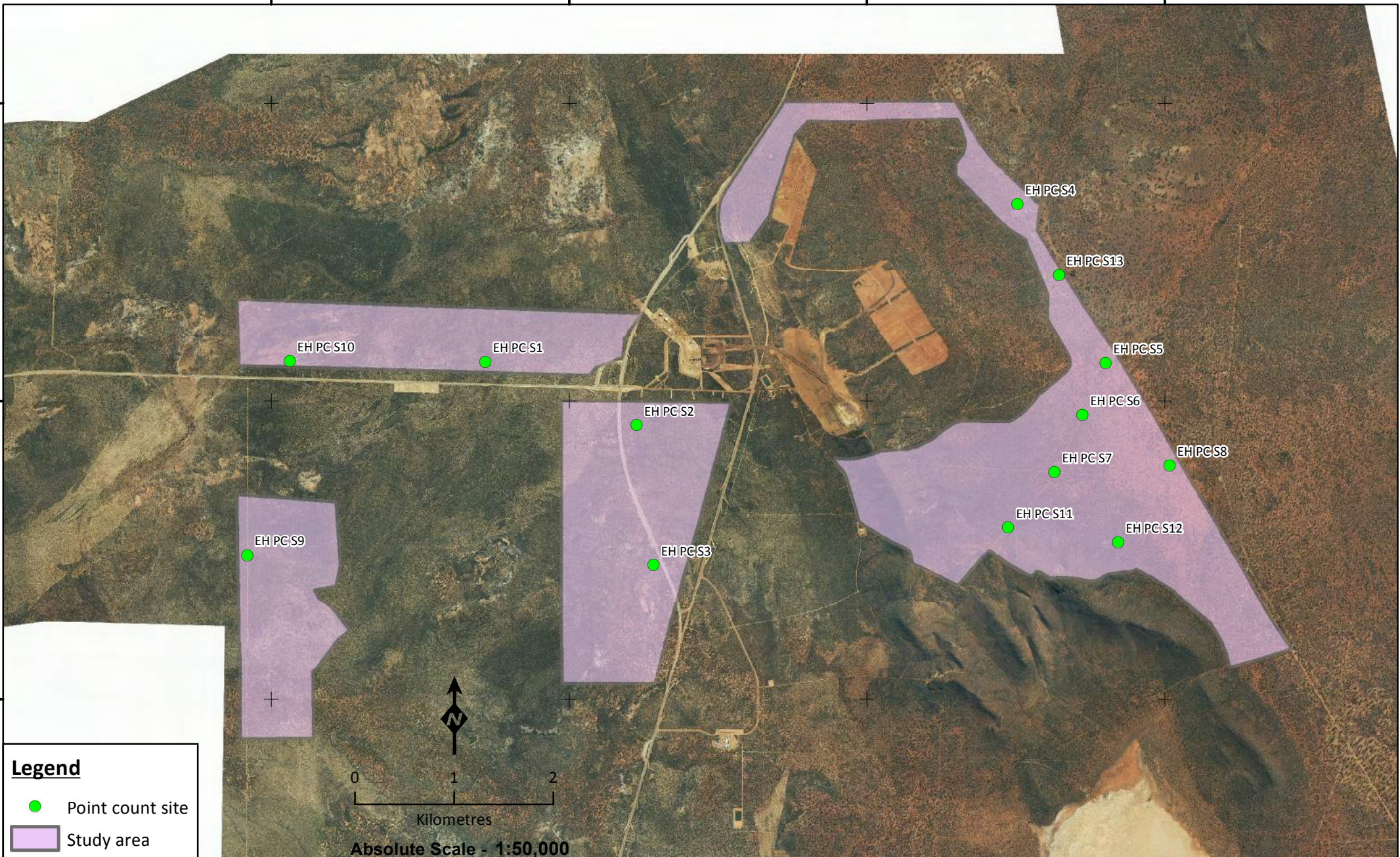


510000 513000 516000 519000

6731000

6728000

6725000



**Legend**

- Point count site
- Study area

Absolute Scale - 1:50,000



### Avifauna point count locations

<b>Figure: 2.3</b> <b>Project ID: 1567</b>	<b>Drawn: BG</b> <b>Date: 13/12/2013</b>
<small>Coordinate System</small> Name: GDA 1994 MGA Zone 50 Projection: Transverse Mercator Datum: GDA 1994	Unique Map ID: BG318



### 2.3 ANIMAL ETHICS

Surveying was conducted as per *ecologia's* Animal Ethics Code of Practice, which conforms to Section 5 of the *Australian code of practice for the care and use of animals for scientific purposes* (NHMRC 2004).

In all cases, fauna were identified in the field, and not captured during the survey.

### 2.4 SURVEY TEAM AND LICENCES

Field survey team members are listed in Table 2.5. The 2013 monitoring phase was conducted under DEC Regulation 17 Licence SF009544.

**Table 2.5 – Field survey personnel**

Survey Team Member	Expertise	Qualification	Experience
Nigel Jackett	Ornithology	B.Sc. (Hons)	12 years
Bruce Greatwich	Ornithology	B.Sc.	6 years
Jesse Forbes-Harper	Herpetology	B.Sc. (Hons)	4 years

### 2.5 BROAD-SCALE FAUNA HABITAT MAPPING

A fauna habitat type broadly describes an area of habitat that is distinguishable in its vegetation and land features from its surroundings, and is likely to support a different fauna assemblage to that found in other fauna habitats. For habitat mapping, particular attention is also paid to the likelihood that certain species are present which tend to be found only in that specific habitat. Fauna habitat types were identified, described and mapped using the following existing information:

- IBRA subregions;
- Aerial photography;
- Vegetation associations (Beard 1981; Shepherd et al. 2002); and
- Land systems (van Vreeswyk *et al.* 2004).

During the survey, other information was also collected to assist in fauna habitat definition and mapping, including:

- Landform;
- Vegetation type and structure;
- Soil characteristics (soil structure and substrate); and
- Composition of terrestrial fauna species.

### 3 RESULTS

#### 3.1 FAUNA HABITATS OF THE STUDY AREA

Whilst conducting the targeted survey, an assessment of broad-scale habitats present, and their likelihood and suitability for supporting the targeted species was made. A total of three fauna habitats were recorded; Acacia shrubland on sandy soil, Acacia shrubland on rocky soil and Eucalypt woodland. The utilisation (potential nesting/breeding habitat and/or foraging habitat) of each habitat type for each targeted species was assessed, along with the area of occupancy of each habitat, displayed in Table 3.1. Fauna habitats are mapped in Figure 3.4 and described in further detail below.

**Table 3.1 – Fauna habitat area calculations of the study area**

Habitat type	Area (ha)	Percentage of study area	Targeted species utilisation	
			Potential nesting/breeding	Potential foraging
Acacia shrubland on sandy soil	788.5	48.2	-	Rainbow Bee-eater Major Mitchell's Cockatoo Peregrine Falcon
Acacia shrubland on rocky soil	439.4	26.9	-	Rainbow Bee-eater Major Mitchell's Cockatoo Peregrine Falcon
Eucalypt woodland	406.2	24.9	Major Mitchell's Cockatoo Peregrine Falcon Western Spiny-tailed Skink	Rainbow Bee-eater Major Mitchell's Cockatoo Peregrine Falcon Western Spiny-tailed Skink
<b>Total</b>	<b>1,634.1</b>	<b>100</b>		

##### 3.1.1 Acacia shrubland on sandy soil

The Acacia shrubland on sandy soil (Figure 3.1) is the dominant habitat type found within the study area, occupying 48.2% of the study area (Table 3.1). This habitat is found throughout the western half of the study area (Figure 3.4). The sandy soil substrate is the dominate feature of this habitat type, however there is some variation towards a more clayey soil in some areas. Vegetation within the habitat type is exclusively restricted to a shrub layer, consisting of various low to medium sized shrubs such as *Acacia* spp. *Allocasuarina* sp. and *Phebalium* spp.



**Figure 3.1 – Representative photo of Acacia shrubland on sandy soil habitat**



### 3.1.2 Acacia shrubland on rocky soil

The Acacia shrubland on rocky soil habitat type (Figure 3.2) is similar to the Acacia shrubland on sandy soil habitat type, with the rocky soil substrate feature the major difference. The shrub diversity is generally lower than on the sand, consisting predominantly of various *Acacia* spp. shrubs, with patches of Salmon Gum (*Eucalyptus salmonophloia*). The rocky soil substrate is associated with the Mount Gibson range, found mostly within the centre of the study area (Figure 3.4). The soil substrate varies from rocky ridges and banded iron formation outcropping, to scattered stony surface layer, to areas consisting of predominately of clay soil.



Figure 3.2 – Representative photo of Acacia shrubland on rocky soil habitat

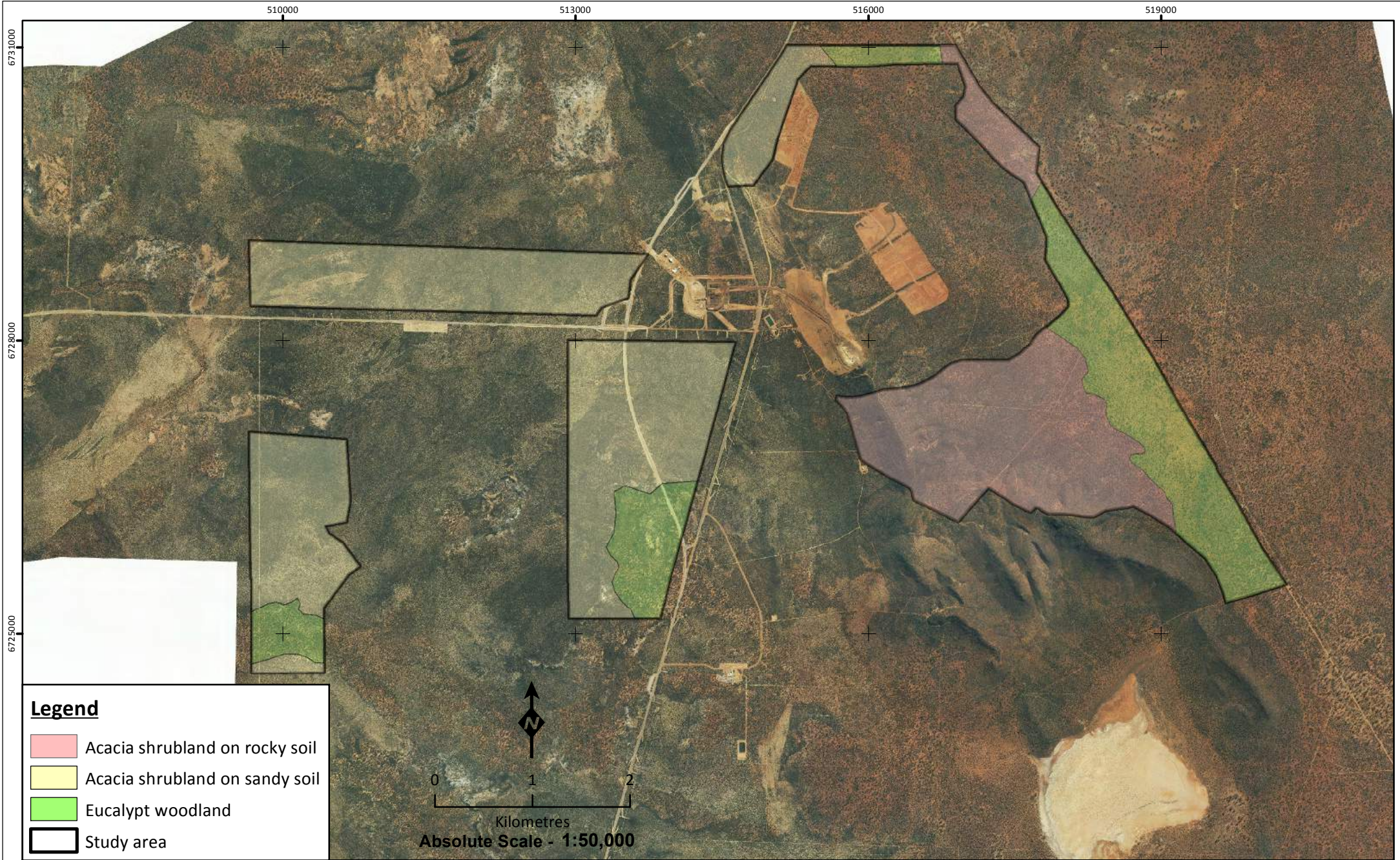
### 3.1.3 Eucalypt woodland

The Eucalypt woodland habitat type is characterised by two dominant eucalypt tree species, York Gum (*Eucalyptus loxophleba*) and Salmon Gum (*Eucalyptus salmonophloia*). These trees create a large open woodland, with various smaller trees such as Mulga (*Acacia aneura*) and White Cypress Pine (*Callitris glaucophylla*) occurring in patches. Shrub species consist of *Exocarpos aphyllus*, *Acacia Tetragonofila*, *Atriplex vesicaria*, *Maireana triptera*, *Olearia muelleri*, *Ptilotus divaricatus*, *Ptilotus obovatus*, *Santalum acuminatum* and *Senna artemisioides* subsp. *filifolia*. The soil substrate of this habitat type varies from sandy to areas with higher clay content. The Eucalypt woodland habitat type is restricted to the eastern side of the study area (Figure 3.4), and is the least dominant habitat type, occupying 24.9% of the study area (Table 3.1).



Figure 3.3 – Representative photo of Eucalypt woodland habitat





**Legend**

- Acacia shrubland on rocky soil
- Acacia shrubland on sandy soil
- Eucalypt woodland
- Study area



Kilometres  
Absolute Scale - 1:50,000



**Fauna habitats of the study area**

**Figure: 3.4**  
**Project ID: 1567**

**Drawn: BG**  
**Date: 13/12/2013**

*Coordinate System*  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994

Unique Map ID: BG322



### 3.2 WESTERN SPINY-TAILED SKINK

A total of six refuge hollow logs contained evidence of occupation by adult or large Western Spiny-tailed Skink (Table 3.2), all within 50 m of the eastern boundary of the Extension Hill Pty Ltd tenement (Figure 3.8). Two of these logs also contained smaller, possibly juvenile-sized scats. An example of a communal latrine pile, and individual scat is shown in Figure 3.6.

Of the six refuge logs recorded, two were within the Extension Hill Pty Ltd tenement boundary, while four were found within 50 m outside of the tenement boundary. Both individual skinks observed were recorded outside of the Extension Hill Pty Ltd tenement (Figure 3.5).

Smaller scats were also recorded at a further five logs where no larger scats were observed during the active searches. However, due to the smaller size and absence of an obvious latrine pile, the scats could potentially belong to another species of reptile (i.e. *Egernia depressa*), and as such, are regarded as *potential* evidence of Western Spiny-tailed Skink occupation (Table 3.2). Descriptions of all refuge logs recorded are shown in Appendix D.

A single image of a Western Spiny-tailed Skink was recorded via the camera traps. The individual was not enticed to the area by bait, however the capture confirms this species can be recorded via camera traps (Figure 3.7).

**Table 3.2 – Summary of Western Spiny-tailed Skink evidence**

Site	Zone	Location			Inside/Outside Tenement	Comments
		Datum	Easting	Northing		
EH ESB LOG1	50	GDA 94	518147	6728881	Inside	Large scats within and adjacent to log
EH ESB LOG2	50	GDA 94	518198	6728902	Outside	Large and small scats within and adjacent to log
EH ESB LOG3	50	GDA 94	518249	6728790	Outside	Adult observed within hollow log; individual captured on camera trap; numerous fresh scat
EH ESB LOG4	50	GDA 94	518292	6728760	Outside	Large and small scats within and adjacent to log
EH ESB LOG5	50	GDA 94	518078	6729040	Outside	Adult observed within hollow log; numerous fresh scat
EH ESB LOG6	50	GDA 94	518011	6729082	Inside	Single old scat
EH ESB LOG7*	50	GDA 94	518014	6729181	Outside	Two small scats
EH ESB LOG8*	50	GDA 94	518000	6729163	Outside	Small scats
EH ESB LOG9*	50	GDA 94	518379	6728623	Outside	Five small scats
EH ESB LOG10*	50	GDA 94	517807	6729499	Outside	Single medium-sized scat
EH ESB LOG11*	50	GDA 94	519407	6726787	Inside	Single large scat

\*Refuge log containing smaller sized scats only, treated as *potential* evidence of occupation



Figure 3.5 – Western Spiny-tailed Skinks observed at EH ESB LOG3 (left) and EH ESB LOG5 (right)



Figure 3.6 – Western Spiny-tailed Skinks latrine site (top) and individual scat (bottom)





Figure 3.7 – Western Spiny-tailed Skink captured on camera trap from EH ESB LOG3



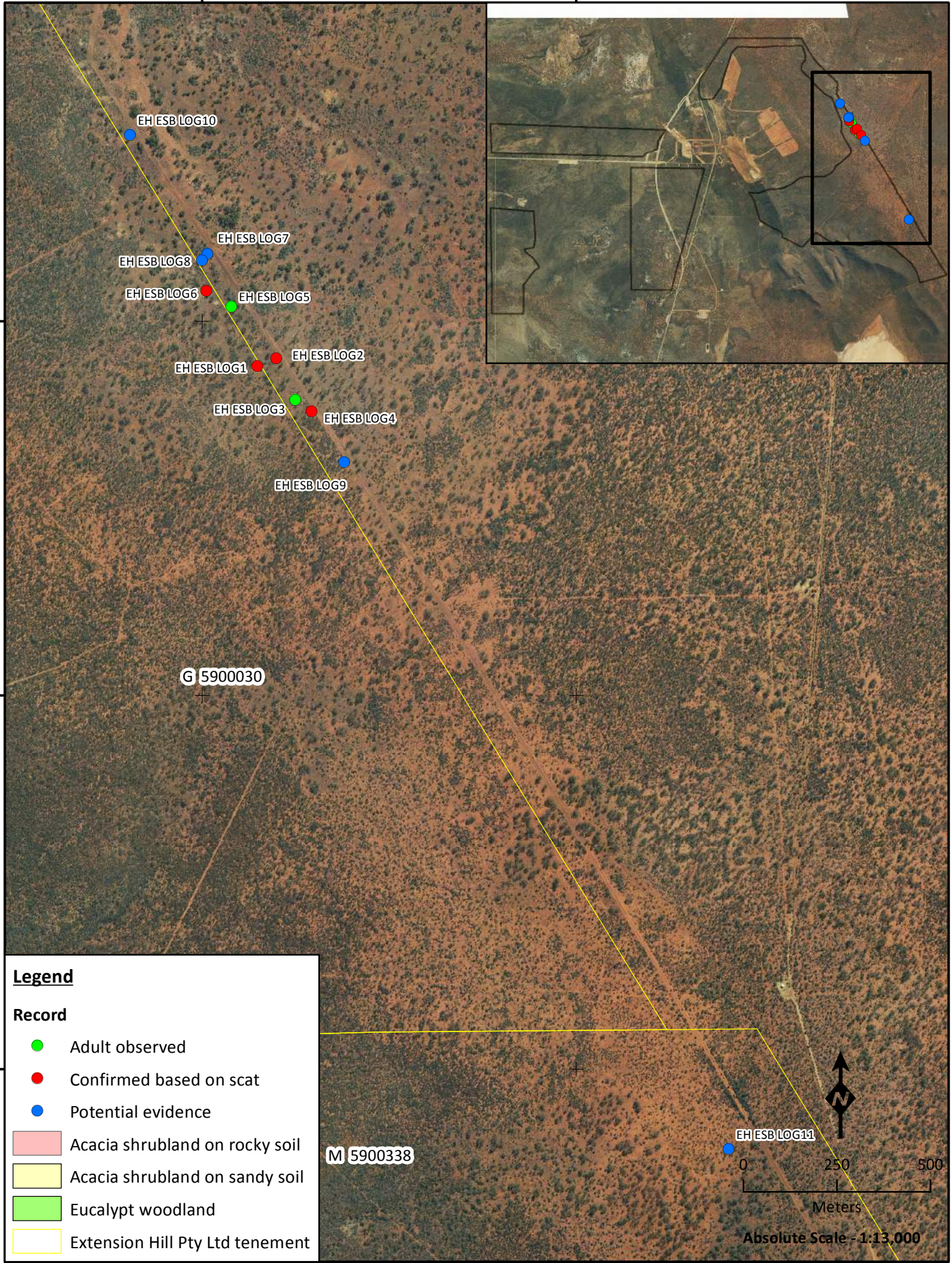
518000

519000

6729000

6728000

6727000



**Legend**

**Record**

- Adult observed
- Confirmed based on scat
- Potential evidence
- Acacia shrubland on rocky soil
- Acacia shrubland on sandy soil
- Eucalypt woodland
- Extension Hill Pty Ltd tenement

**Figure: 3.8**  
**Project ID: 1567**  
 Coordinate System Name: GDA 1994 MGA Zone 50  
 Projection: Transverse Mercator  
 Datum: GDA 1994

**Drawn: NJ**  
**Date: 22/01/2014**  
 Unique Map ID: NJ079

**A4**

**Western Spiny-tailed Skink records**





### 3.3 PEREGRINE FALCON

The Peregrine Falcon was recorded on a total of three occasions, twice during systematic point counts and once opportunistically (Table 3.3, Figure 3.10). Of these, one was recorded inside the Extension Hill Pty Ltd tenement boundary (Table 3.3). The two point count records were made on the same day within minutes of each other, and are therefore presumed to represent the same individual, as the bird was observed flying from PC S4 in the direction of PC S5. The opportunistic record consisted of an individual perched and calling loudly within York Gum (*Eucalyptus loxophleba*) woodland, approximately one kilometre south of the study area.

**Table 3.3 – Summary of Peregrine Falcon records**

Site	Location				Inside/Outside Tenement	Comments
	Zone	Datum	Easting	Northing		
PC S4	50	GDA 94	517514	6729980	Outside	Individual observed flying in a south-easterly direction
PC S5	50	GDA 94	518404	6728381	Inside	Individual observed flying in a southerly direction
Opportunistic	50	GDA 94	520810	6724595	Outside	Adult observed perched and calling in mature <i>Eucalyptus loxophleba</i>

### 3.4 MAJOR MITCHELL’S COCKATOO

A single opportunistic record of Major Mitchell’s Cockatoo was made during the survey (Table 3.4), consisting of two individuals feeding on (*Acacia murrayana*) seed pods (Figure 3.9) in conjunction with 12 Little Corellas.

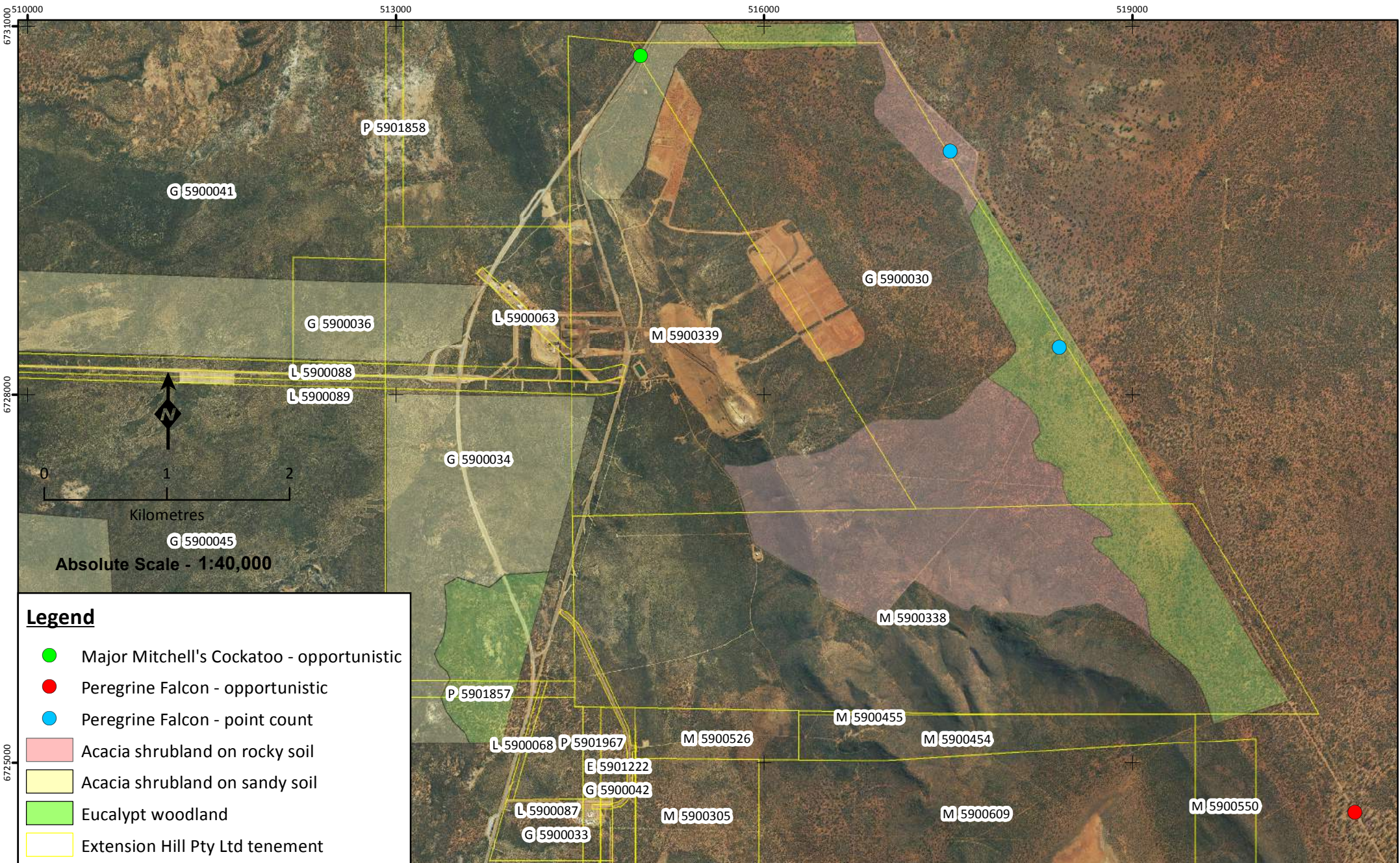
**Table 3.4 – Summary of Major Mitchell’s Cockatoo records**

Site	Location				Inside/Outside Tenement	Comments
	Zone	Datum	Easting	Northing		
Opportunistic	50	GDA 94	514990	6730755	Inside	Two individuals observed feeding on seeds of <i>Acacia murrayana</i> beside highway. Associating with flock of 12 Little Corella’s.



**Figure 3.9 – Discarded *Acacia murrayana* seed pods from a pair of Major Mitchell’s Cockatoos**





**Legend**

- Major Mitchell's Cockatoo - opportunistic
- Peregrine Falcon - opportunistic
- Peregrine Falcon - point count
- Acacia shrubland on rocky soil
- Acacia shrubland on sandy soil
- Eucalypt woodland
- Extension Hill Pty Ltd tenement

**Peregrine Falcon and  
Major Mitchell's Cockatoo records**

**Figure: 3.10**  
**Project ID: 1567**

**Drawn: NJ**  
**Date: 22/01/2014**

*Coordinate System*  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994

Unique Map ID: NJ076





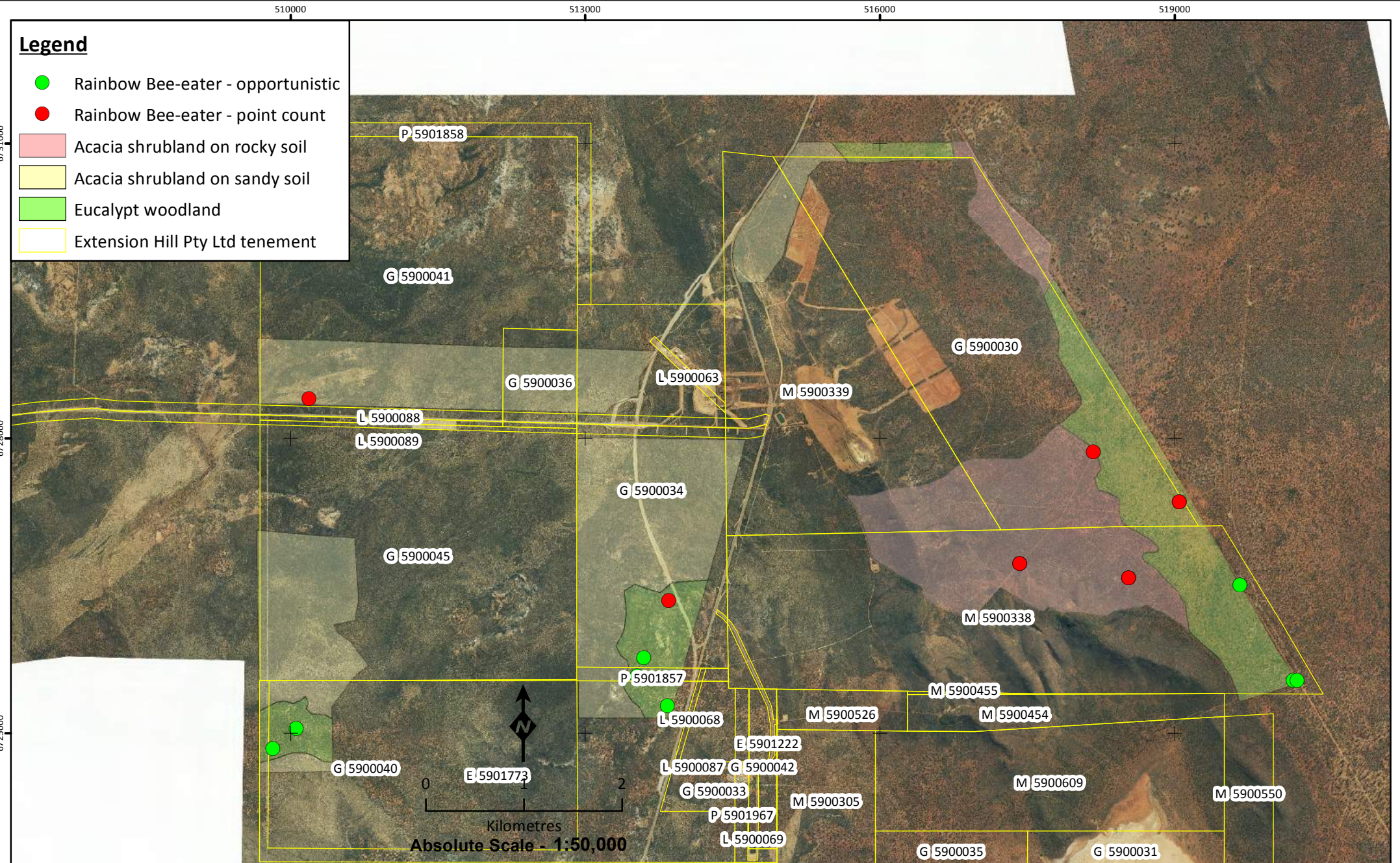
### 3.5 RAINBOW BEE-EATER

A total of 17 visual observation records of Rainbow Bee-eater were made, nine of these being from systematic point counts with the remaining eight records made opportunistically. These records are summarised in Table 3.5 and mapped in Figure 3.11.

**Table 3.5 – Summary of Rainbow Bee-eater records**

Site	Location				Inside/Outside Tenement	Number of individuals	Date of record
	Zone	Datum	Easting	Northing			
PC S6	50	GDA 94	518170	6727859	Inside	1	6/11/13
PC S8	50	GDA 94	519046	6727351	Inside	1	7/11/13
PC S11	50	GDA 94	517423	6726724	Inside	1	7/11/13
PC S12	50	GDA 94	518531	6726577	Inside	2	8/11/13
PC S11	50	GDA 94	517423	6726724	Inside	1	8/11/13
PC S3	50	GDA 94	513849	6726348	Inside	1	8/11/13
PC S12	50	GDA 94	518531	6726577	Inside	1	9/11/13
PC S8	50	GDA 94	519046	6727351	Inside	1	9/11/13
PC S10	50	GDA 94	510184	6728401	Inside	2	10/11/13
Opportunistic	50	GDA 94	520206	6725529	Inside	1	5/11/13
Opportunistic	50	GDA 94	519667	6726503	Inside	1	5/11/13
Opportunistic	50	GDA 94	520247	6725535	Inside	1	8/11/13
Opportunistic	50	GDA 94	513592	6725762	Inside	1	6/11/13
Opportunistic	50	GDA 94	510054	6725041	Inside	3	6/11/13
Opportunistic	50	GDA 94	509816	6724837	Inside	2	6/11/13
Opportunistic	50	GDA 94	513835	6725274	Outside	1	6/11/13
Opportunistic	50	GDA 94	513525	6725580	Inside	2	6/11/13





**Legend**

- Rainbow Bee-eater - opportunistic
- Rainbow Bee-eater - point count
- Acacia shrubland on rocky soil
- Acacia shrubland on sandy soil
- Eucalypt woodland
- Extension Hill Pty Ltd tenement

6731000

6728000

6725000

510000

513000

516000

519000

Kilometres  
Absolute Scale - 1:50,000



**Rainbow Bee-eater records**

Figure: 3.11  
Project ID: 1567

Drawn: NJ  
Date: 22/02/2014

Coordinate System  
Name: GDA 1994 MGA Zone 50  
Projection: Transverse Mercator  
Datum: GDA 1994

Unique Map ID: NJ078



### 3.6 COMPARISON OF DETECTION RATES OF TARGETED AVIFAUNA

A total of 11 detections of the targeted avifauna occurred during the 52 systematic point counts. The most frequently recorded species was the Rainbow Bee-eater, which was recorded on 17.3% of point counts, followed by the Peregrine Falcon (3.8% of point counts). The Major Mitchell's Cockatoo was not detected during the point counts within the current survey (Table 3.6).

**Table 3.6 – Detection rates of targeted avifauna during systematic point counts**

Species	Number of point counts	Number of detections	Detection rate (%)
Peregrine Falcon <i>Falco peregrinus</i>	52	2	3.8
Major Mitchell's Cockatoo <i>Cacatua leadbeateri</i>	52	0	0.0
Rainbow Bee-eater <i>Merops ornatus</i>	52	9	17.3

### 3.7 STATISTICAL ANALYSES

As this is the first year of monitoring, insufficient data is available for statistical analysis. Future monitoring will allow the identification of changes in activity levels and population sizes of conservation significant fauna, by applying the robust design model (Kendall et al. 1995) to the mark-recapture type data collected where applicable. Future monitoring should also capture and monitor environmental variables (rainfall, temperature) at the study site. This will allow for assessment of the targeted fauna's population responses to environmental conditions and incorporation into statistical analyses.

### 3.8 NON-TARGETED FAUNA RECORDS

While conducting the monitoring, an additional 63 birds, six reptiles and three mammals were recorded. The species recorded are shown in Appendix D.

### 3.9 NON-TARGETED CONSERVATION SIGNIFICANT SPECIES RECORDS

Included in the fauna species recorded, were four non-targeted conservation significant fauna species. These species being: Malleefowl, Shy Heathwren, White-browed Babbler (wheatbelt) and Crested Bellbird (southern). Records for these species are summarised in Table 3.7.

**Table 3.7 – Summary of non-targeted conservation significant species records**

Species	Conservation status			Location		Site	Number of individuals
	EPBC Act	WC Act	DEC	Easting	Northing		
Malleefowl ( <i>Leipoa ocellata</i> )	VU	S1	VU	517441	6730249	Opportunistic	1
Malleefowl ( <i>Leipoa ocellata</i> )	VU	S1	VU	513018	6721770	Opportunistic	1
Malleefowl ( <i>Leipoa ocellata</i> )	VU	S1	VU	518172	6727842	Opportunistic	Tracks only
Malleefowl ( <i>Leipoa ocellata</i> )	VU	S1	VU	518114	6728472	Opportunistic	Tracks only
Shy Heathwren (Western) ( <i>Hylacola cauta whitlocki</i> )			P4	512154	6728395	EH PC S1	2

Species	Conservation status			Location		Site	Number of individuals
	EPBC Act	WC Act	DEC	Easting	Northing		
White-browed Babbler (Wheatbelt) ( <i>Pomatostomus superciliosus ashbyi</i> )			P4	518404	6728381	EH PC S5	4
White-browed Babbler (Wheatbelt) ( <i>Pomatostomus superciliosus ashbyi</i> )			P4	518170	6727859	EH PC S6	3
White-browed Babbler (Wheatbelt) ( <i>Pomatostomus superciliosus ashbyi</i> )			P4	519046	6727351	EH PC S8	11
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	517514	6729980	EH PC S4	4
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	518404	6728381	EH PC S5	5
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	518170	6727859	EH PC S6	4
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	517886	6727283	EH PC S7	4
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	519046	6727351	EH PC S8	5
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	510184	6728401	EH PC S10	1
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	517423	6726724	EH PC S11	2
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	518531	6726577	EH PC S12	1
Crested Bellbird (southern) <i>Oreoica gutturalis gutturalis</i>			P4	517933	6729268	EH PC S13	3

Zone 50  
 Datum GDA 94

## 4 DISCUSSION

### 4.1 WESTERN SPINY-TAILED SKINK (*EGERNIA STOKESII BADIA*)

#### 4.1.1 Species description

**Conservation Status:** EPBC Act Endangered, WC Act Schedule 1 (Vulnerable).

**Distribution and Habitat:** The Western Spiny-tailed Skink belongs to the cunninghami group; a group of moderately large, diurnal, saxicolous (rock dwelling) lizards that shelter within crevices of large rocky outcrops (Chapple 2003). Occasionally, hollow logs and semi arboreal habitats are used as sheltering sites. In the *E. stokesii* species group, members of the same social group generally bask in close proximity and occasionally on top of each other (Duffield and Bull 2002).

Two distinct colour morphs are recognised as occurring within *Egernia stokesii badia* (Figure 4.1), which are likely to represent distinct species (Pearson 2012). The brown morph of *Egernia stokesii badia* has a patchy distribution throughout the dry to semiarid habitats of Western Australia, occurring in York Gum (*Eucalyptus loxophleba*) woodland, Gimlet (*Eucalyptus salubris*) and Salmon Gum (*Eucalyptus salmonophloia*) woodland (Cogger *et al.* 1993; Storr *et al.* 1999). Its known distribution is from Minnivale (150 km ENE of Perth), north to Mullewa, east of Perenjori but restricted to south of Yalgoo (Pearson 2012). The black morph of *Egernia stokesii badia* was originally known from a limited number of locations on the vicinity of Cue (Pearson 2012), where it inhabits rocky crevices within large granite outcrops and boulder piles. Surveys between 2006-2010 by *ecologia* have significantly increased the known distribution of this morph, with over 70 new locations across the Murchison recorded (Pearson 2012).



**Figure 4.1 – Western Spiny-tailed skink brown morph (this survey, left) and black morph (right)**

**Ecology:** Individuals of the same social group share a common crevice or tree hollow refuge and are generally observed within a core set of crevices or tree hollows within the group's home range (Duffield and Bull 2002). Each social group has between 2 and 11 refuge, of which 1 to 7 are core refuges (Duffield and Bull 2002). The home range overlap between social groups is relatively small (14.1%) and dispersal in and out of *E. stokesii* populations is generally low (Duffield and Bull 2002).

#### 4.1.2 Targeted survey

A total of 11 trees were recorded as showing evidence of occupation by the brown morph Western Spiny-tailed Skink, six of which have been confirmed of occupancy, with the remaining five assessed as potential occupancy (Section 0) based on the evidence available. Of these, two confirmed refuge logs and one potential refuge log were recorded within the Extension Hill Pty Ltd tenement boundary.

Initially, pre-determined search sites were investigated for evidence of Western Spiny-tailed Skink. These point locations were then extended, and the entire study area was searched for suitable habitat and potential evidence of occupancy (Figure 2.2). All refuge trees where evidence or potential evidence was recorded were located in the eastern section of the study area (Figure 3.8). Western Spiny-tailed Skink has been identified as occurring within York Gum (*Eucalyptus loxophleba*) and Salmon Gum (*Eucalyptus salmonophloia*) woodlands (Cogger *et al.* 1993; Storr *et al.* 1999). Western Spiny-tailed Skink records from this survey confirm this habitat preference, with all Western Spiny-tailed Skink records restricted to this habitat type within the study area (Figure 3.8). Refuge trees were predominately York Gum (*Eucalyptus loxophleba*), which appears to provide more suitable refuge characteristics than Salmon Gum (*Eucalyptus salmonophloia*). The entire study area was assessed for this suitable Eucalypt woodland habitat for Western Spiny-tailed Skink.

Within the Eucalypt woodland habitat type, there appeared to be a micro-habitat preference for Western Spiny-tailed Skink. All refuge logs with Western Spiny-tailed Skink evidence recorded (excluding a single log, EH ESB LOG11) had a relatively diverse small shrub layer surrounding the refuge log. Other areas within the Eucalypt woodland habitat type contained suitable refuge logs. However the small shrub layer was absent, with predominantly bare ground in the vicinity of the potential refuge log, Western Spiny-tailed Skink evidence was generally not recorded in these areas.

Small shrub species recorded in association with Western Spiny-tailed Skink occurrence were *Atriplex vesicaria*, *Maireana triptera*, *Olearia muelleri*, *Ptilotus divaricatus*, *Ptilotus obovatus*, *Santalum acuminatum* and *Senna artemisioides* subsp. *filifolia*. Literature and personal observations have suggested the Western Spiny-tailed Skink has a combined insectivorous and herbivorous diet (Pearson 2012). Scat pellets from this survey were investigated, with a high level of plant matter observed within pellets. This suggests that the Western Spiny-tailed Skink may be directly feeding on shrubs in close vicinity of their refuge log. Hence, refuge logs with an absence of shrubs in close vicinity, may be less appealing as a refuge site and may remain unoccupied, despite the log displaying suitable refuge characteristics.

Survey methodology is currently structured around detection of refuge sites, identified by locating scats (DSEWPaC 2011). There is no evidence that the species is readily trapped, however it is noted Elliott traps may be successful when placed in close proximity to known refuge sites (DSEWPaC 2011).

During this survey, individuals were not enticed in to the target areas of camera traps, using universal bait (mix of peanut butter, rolled oats and sardines) or fruit (banana and apple), so it appears unlikely that individuals would be enticed into baited Elliott traps. Individuals may be susceptible to being lured away from shelter sites by using mealworms or other invertebrates, where they could then be extracted by hand. Any capture methods should be passive, with protection of refuge logs a priority.

## 4.2 PEREGRINE FALCON (*FALCO PEREGRINUS*)

### 4.2.1 Species description

**Conservation Status:** WC Act Schedule 4, DPaW Specially Protected Fauna.

**Distribution and Habitat:** This nomadic or sedentary falcon is widespread in many parts of Australia and some of Australia's continental islands, but absent from most deserts and the Nullarbor Plain. The species is considered to be moderately common in the Stirling Range, uncommon in the Kimberley, Hamersley and Darling Ranges, and rare or scarce elsewhere (Johnstone and Storr 1998). The Peregrine Falcon occurs most commonly near cliffs along coasts, rivers and ranges, and around wooded watercourses and lakes.

**Ecology:** Peregrine Falcons feed almost entirely on birds, especially parrots and pigeons. They nest primarily on ledges on cliffs, granite outcrops and in quarries, but may also nest in tree hollows around wetlands or in woodlands. Eggs are predominantly laid in September (Johnstone and Storr 1998; Olsen *et al.* 2006).

#### 4.2.2 Targeted survey

The Peregrine Falcon was recorded on a total of three occasions, with two records highly likely to be the same individual (Section 3.3, Figure 3.10) that was recorded during con-current point counts. An additional record, approximately 1 km south of the study area was made opportunistically, consisting of an individual perched within Salmon Gum (*Eucalyptus salmonophloia*) woodland. These records suggest at least one local bird regularly utilises all habitats within the study area for foraging. The Eucalypt woodland habitat type where the perched individual was recorded (Salmon Gum woodland (*Eucalyptus salmonophloia*)) also represents suitable nesting habitat. The individual recorded was vocal upon observation, and this calling behaviour has been found to be associated with the presence of other individuals (N. Jackett *pers. obs.*).

### 4.3 MAJOR MITCHELL'S COCKATOO (*CACATUA LEADBEATERI*)

#### 4.3.1 Species description

**Conservation Status:** WC Act Schedule 4, DPaW Other Specially Protected Fauna.

**Distribution and Habitat:** Major Mitchell's Cockatoos are common in the Great Australian Bight, but generally rare to uncommon in Western Australia. The species is widespread, but discontinuous in the arid and semi-arid zones of the state as far north as the Edgar Ranges in the Kimberley. It also occurs in the arid and semi-arid interior of eastern Australia. Preferred habitat is lightly wooded country near water and tall eucalypts, though it also occurs on beaches and coastal dunes.

**Ecology:** This large cockatoo is easily recognisable by its orange-red erectile crest with a central yellow band. Major Mitchell's Cockatoos feed on split and germinating wheat seeds, the flower, roots and seeds of the doublegee (*Emex australis*), the flesh and seeds of melons, wild radish and turnip, native figs, the heads and seeds of native grasses, herbs, pinecones, Marri flowers and eucalyptus seeds, and insect larvae (Johnstone and Storr 1998; Park 1995).

Major Mitchell's Cockatoos are aggressively territorial and nest in tree hollows. They are usually found in pairs or small flocks (Morcombe 2000). To date, breeding has only been reported in the Wheatbelt, with females laying three clutches of two eggs between August and September. Both sexes incubate the eggs and brood the chicks (Johnstone and Storr 1998).

#### 4.3.2 Targeted survey

A single opportunistic observation of two Major Mitchell's Cockatoos was made during the survey (Section 3.4, Figure 3.10). These individuals were recorded in association with a flock of 12 Little Corella's, and were foraging on *Acacia murrayana* seeds. This record confirms Major Mitchell's Cockatoo utilises the study area as foraging habitat. They are likely to forage in any areas of the study area where seed producing flora such as *Acacia* spp. shrubs and Cypress Pine (*Callitris glaucophylla*) exists, which includes all habitat types recorded in the study area (Section 3.1).

Suitable nesting habitat exists within the Eucalyptus woodland habitat type of the study area, where appropriate tree hollows occur. Survey timing for this survey (November) was outside the typical breeding season for Major Mitchell's Cockatoo (August to September) (Johnstone and Storr 1998).

#### 4.4 RAINBOW BEE-EATER (*MEROPS ORNATUS*)

##### 4.4.1 Species description

**Conservation Status:** EPBC Act Migratory, WC Act Schedule 3.

**Distribution and Habitat:** The Rainbow Bee-eater is scarce to common throughout much of Western Australia, except for the arid interior, preferring lightly wooded, preferably sandy country near water (Johnstone and Storr 1998).

**Ecology:** In Western Australia the Rainbow Bee-eater can occur as a resident, breeding visitor, post-nuptial nomad, passage migrant or winter visitor. It nests in burrows usually dug at a slight angle on flat ground, sandy banks or cuttings, and often at the margins of roads or tracks (Simpson and Day 2004). Eggs are laid at the end of the metre-long tunnel from August to January (Boland 2004). Rainbow Bee-eaters are most susceptible to predation during breeding, as it spends significantly more time on the ground in this period.

##### 4.4.2 Targeted survey

The Rainbow Bee-eater was the most commonly recorded of the targeted species, with a total of seventeen records of this species made (Section 3.5, Figure 3.11). Records were made from predominantly the Eucalypt woodland habitat type, but were also recorded in all habitat types, with records occurring from much of the study area.

Habitats present within the study area do not appear to represent any suitable areas for nesting habitat, where open sandy ground is required. The study area does contain suitable sandy substrate within the Acacia shrubland on sandy soil habitat type, however vegetation appears to be too dense to be allow nesting.

#### 4.5 SURVEY LIMITATIONS AND CONSTRAINTS

Limitations of the current survey are summarised in Table 4.1. Given that no limitations were encountered, it can be confirmed that an adequate level of survey was undertaken for the current monitoring period.

**Table 4.1 – Summary of survey limitations**

Aspect	Constraint? (yes/no)	Comment
Competency/experience of the consultant carrying out the survey.	No	All survey staff involved are experienced in fauna assessments within a variety of habitats found in Western Australia, including mallee, mulga and eucalypt woodlands.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	No	Sampling methods were deemed adequate. All faunal groups were sampled using appropriate methods.
Proportion of fauna identified, recorded and/or collected.	No	All vertebrate fauna were identified in the field.
Sources of information (previously available information as distinct from new data).	No	A previous Level 2 fauna survey and fauna monitoring has been conducted within the study area, providing site specific information regarding the potentially resident fauna.
The proportion of the task achieved and further work which might be needed.	No	All tasks required for the 2013 phase of monitoring were completed during the current survey.
Timing/weather/season/cycle.	No	The survey was conducted during optimal timing for these species (spring), resulting in the recording of the four targeted species.



Aspect	Constraint? (yes/no)	Comment
Disturbances which affected results of the survey (e.g. fire, flood, accidental human intervention).	No	No disturbances were observed, experienced or recorded during the current survey that could have affected the results of the study.
Intensity (in retrospect was the intensity adequate).	No	The intensity of the monitoring survey was deemed adequate, with excellent coverage across the study area.
Completeness (e.g. was relevant area fully surveyed).	No	All fauna habitats expected to occur within the study area were assessed during the field survey, including those relevant to the four target species.
Resources (e.g. degree of expertise available in animal identification to taxon level).	No	The field team have extensive knowledge of the identifying features and ecology of the four targeted species, and were able to identify all the four targeted species in the field.
Remoteness and/or access problems.	No	The majority of the study area and all fauna habitats were accessible by either vehicle or on foot and therefore adequately addressed in the field.
Availability of contextual (e.g. biogeographic) information on the region).	No	The level of biogeographic information available is adequate.
Efficacy of sampling methods (i.e. any groups not sampled by survey methods).	No	All four target species were recorded during the survey. The sampling methods were appropriate in determining the occurrence of these species within the study area.

## 5 CONCLUSIONS

The main conclusions from this initial 2013 targeted survey for monitoring Western Spiny-tailed Skink, Peregrine Falcon, Major Mitchell's Cockatoo and Rainbow Bee-eater at the Extension Hill Magnetite Project are as follows:

- Survey methodology was suitable in detecting all target species;
- A total of three fauna habitats were recorded; Acacia shrubland on sandy soil, Acacia shrubland on rocky soil and Eucalypt woodland;
- Results of the assessment of utilisation of habitats by targeted species identified potential nesting/breeding habitat for Western Spiny-tailed Skink, Major Mitchell's Cockatoo and Peregrine Falcon within the Eucalypt woodland habitat type. Potential foraging habitat for all targeted bird species (Rainbow Bee-eater, Major Mitchell's Cockatoo and Peregrine Falcon) exists throughout all habitat types, with potential foraging habitat for Western Spiny-tailed Skink restricted to the Eucalypt woodland only;
- Two refuge logs within the Extension Hill Pty Ltd tenement boundary contained evidence of Western Spiny-tailed Skink occupation. Additionally, one refuge log within the tenement boundary showed potential evidence of occupation. Two individual Western Spiny-tailed Skinks were observed 30 m outside of the tenement boundary;
- The Peregrine Falcon was recorded on a total of three occasions, twice during systematic point counts and once opportunistically outside of the tenement boundary;
- A single opportunistic record of Major Mitchell's Cockatoo was made within the tenement boundary during the survey, consisting of two individuals; and
- A total of 17 records of Rainbow Bee-eater were made, nine of these being from systematic point counts within the tenement boundary, with the remaining eight records made opportunistically (including one record outside the tenement boundary).

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## **APPENDIX A            EXPLANATION OF CONSERVATION CODES**

**Appendix A1** Definitions of categories under the *Environment Protection and Biodiversity Conservation Act 1999*

Category	Definition
Endangered (EN)	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable (VU)	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Migratory (M)	Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: <ul style="list-style-type: none"> <li>• the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range State;</li> <li>• the agreement between the Government of Australian and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their environment (CAMBA); or</li> <li>• the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).</li> </ul>

**Appendix A2** Definition of Schedules under the *Wildlife Conservation Act 1950*

Schedule	Definition
Schedule 1 (S1)	Fauna which are rare or likely to become extinct, are declared to be fauna that is in need of special protection.
Schedule 2 (S2)	Fauna which are presumed to be extinct, are declared to be fauna that is in need of species protection.
Schedule 3 (S3)	Birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of species protection.
Schedule 4 (S4)	Declared to be fauna that is in need of species protection, otherwise than for the reasons mentioned above.

**Appendix A3** Definition of DPaW Threatened and Priority Fauna Codes

Threatened	Definition
Critically Endangered (CR)	Considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Considered to be facing a high risk of extinction in the wild.
Priority	Definition
Priority 1 (P1)	<i>Taxa with few, poorly known populations on threatened lands.</i> Taxa which are known from few specimens or sight records from one or a few localities, on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 2 (P2)	<i>Taxa with few, poorly known populations on conservation lands.</i> Taxa which are known from few specimens or sight records from one or a few localities, on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 3 (P3)	<i>Taxa with several, poorly known populations, some on conservation lands.</i> Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 4 (P4)	<i>Taxa in need of monitoring.</i> Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could if present circumstances change. These taxa are usually represented on conservation lands.
Priority 5 (P5)	<i>Taxa in need of monitoring.</i> 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.



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## **APPENDIX B      DAILY WEATHER DATA DURING SURVEY**



Date	Mean Minimum Temperature (°C)	Mean Maximum Temperature (°C)	Rainfall (mm)
5/11/13	16.4	33.1	0
6/11/13	12.4	30.5	0
7/11/13	14.5	29.5	0
8/11/13	17.0	31.2	0
9/11/13	18.1	33.4	0
10/11/13	20.8	34.0	0
11/11/13	22.5	35.6	0

Note: climate data supplied by Extension Hill Pty Ltd.



## **APPENDIX C      WESTERN SPINY-TAILED SKINK REFUGE SITES**

Western Spiny-tailed Skink Refuge Site	Site Photo
<p><b>EH ESB LOG1</b> <b>Refuge Attributes:</b> 7m long fallen York Gum (<i>Eucalyptus loxophleba</i>), with large entrance at base and multiple broken branches. <b>Evidence:</b> Large scats found near entrance of hollow branch.</p>	
<p><b>EH ESB LOG2</b> <b>Refuge Attributes:</b> Spoil heap on side of Emu proof fence access track, consisting up of two seven York Gum (<i>Eucalyptus loxophleba</i>) and Salmon Gum (<i>Eucalyptus salmonophloia</i>) logs. Multiple hollowed out branches resulting in connecting network of refuge hollows. <b>Evidence:</b> 47 large and small scats found near and on end of log pile.</p>	





Western Spiny-tailed Skink Refuge Site	Site Photo
<p><b>EH ESB LOG3</b>  <b>Refuge Attributes:</b> Single fallen large five meter York Gum (<i>Eucalyptus loxophleba</i>) tree, completed hollowed out in main trunk and branches.  <b>Evidence:</b> Adult Western Spiny-tailed Skink observed in top vertical branch (Figure 3.5) and individual captured on camera trap (Figure 3.7). Up to 35 large and small scats recorded around exit points of hollows.</p>	
<p><b>EH ESB LOG4</b>  <b>Refuge Attributes:</b> Single fallen large 10 meter York Gum (<i>Eucalyptus loxophleba</i>) tree, multiple hollowed out branches.  <b>Evidence:</b> Multiple adult and juvenile sized scats recorded at exit points of hollows.</p>	



Western Spiny-tailed Skink Refuge Site	Site Photo
<p><b>EH ESB LOG5</b>  <b>Refuge Attributes:</b> Single large York Gum (<i>Eucalyptus loxophleba</i>) tree. Main vertical trunk alive, with large hollowed out, dead horizontal trunk and branches.</p> <p><b>Evidence:</b> Adult Western Spiny-tailed Skink observed in dead horizontal branch (Figure 3.5). Many large adult sized scats present along with smaller, juvenile sized scats.</p>	
<p><b>EH ESB LOG6</b>  <b>Refuge Attributes:</b> Single large fallen York Gum (<i>Eucalyptus loxophleba</i>) tree. Hollowed out trunk and branches.</p> <p><b>Evidence:</b> Adult sized scats recorded.</p>	



Western Spiny-tailed Skink Refuge Site	Site Photo
<p><b>EH ESB LOG7</b> <b>Refuge Attributes:</b> Single large fallen York Gum (<i>Eucalyptus loxophleba</i>) of relatively small size (approximately three meters). Main trunk hollowed out only. <b>Evidence:</b> Potential evidence recorded in the form of two smaller scats, possible from juvenile Western Spiny-tailed Skink or could be other reptile.</p>	
<p><b>EH ESB LOG8</b> <b>Refuge Attributes:</b> Single five meter fallen York Gum (<i>Eucalyptus loxophleba</i>). Main trunk hollowed out with some hollowed branches. <b>Evidence:</b> Potential evidence recorded in the form a single smaller scat, possible from juvenile Western Spiny-tailed Skink or could be other reptile.</p>	



Western Spiny-tailed Skink Refuge Site	Site Photo
<p><b>EH ESB LOG9</b> <b>Refuge Attributes:</b> Single large seven meter fallen York Gum (<i>Eucalyptus loxophleba</i>). Main trunk hollowed out with some hollowed branches. <b>Evidence:</b> Potential evidence recorded in the form a single medium sized scat.</p>	
<p><b>EH ESB LOG10</b> <b>Refuge Attributes:</b> Two large fallen York Gum (<i>Eucalyptus loxophleba</i>) trees. Main trunk hollowed out with some hollowed branches. <b>Evidence:</b> Potential evidence recorded in the form a single medium sized scat.</p>	

Western Spiny-tailed Skink Refuge Site	Site Photo
<p><b>EH ESB LOG11</b></p> <p><b>Refuge Attributes:</b> Single large fallen York Gum (<i>Eucalyptus loxophleba</i>). Main trunk very large and hollowed out with some hollowed branches.</p> <p><b>Evidence:</b> Potential evidence recorded in the form a single medium sized scat. Possibly from juvenile Western Spiny-tailed Skink or could be other reptile.</p>	

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## **APPENDIX D      NON-TARGETED FAUNA RECORDED**



Common Name	Species name	Common Name	Species name
<b>Mammals</b>		Grey-fronted Honeyeater	<i>Lichenostomus plumulus</i>
Echidna	<i>Tachyglossus aculeatus</i>	White-fronted Honeyeater	<i>Purnella albifrons</i>
Red Kangaroo	<i>Macropus rufus</i>	Yellow-throated Miner	<i>Manorina flavigula</i>
European Rabbit	<i>Oryctolagus cuniculus</i>	Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
<b>Birds</b>		Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>
Emu	<i>Dromaius novaehollandiae</i>	White-browed Babbler	<i>Pomatostomus superciliosus</i>
Malleefowl	<i>Leipoa ocellata</i>	Chestnut Quail-thrush	<i>Cinclosoma castanotum</i>
Common Bronzewing	<i>Phaps chalcoptera</i>	Varied Sittella	<i>Daphoenositta chrysoptera</i>
Spotted Nightjar	<i>Eurostopodus argus</i>	Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	Gilbert's Whistler	<i>Pachycephala inornata</i>
Whistling Kite	<i>Haliastur sphenurus</i>	Golden Whistler	<i>Pachycephala pectoralis</i>
Brown Goshawk	<i>Accipiter fasciatus</i>	Rufous Whistler	<i>Pachycephala rufiventris</i>
Collared Sparrowhawk	<i>Accipiter cirrocephalus</i>	Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Wedge-tailed Eagle	<i>Aquila audax</i>	Crested Bellbird	<i>Oreoica gutturalis</i>
Little Eagle	<i>Hieraetus morphnoides</i>	Black-faced Woodswallow	<i>Artamus cinereus</i>
Brown Falcon	<i>Falco berigora</i>	Dusky Woodswallow	<i>Artamus cyanopterus</i>
Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii</i>	Grey Butcherbird	<i>Cracticus torquatus</i>
Galah	<i>Eolophus roseicapillus</i>	Pied Butcherbird	<i>Cracticus nigrogularis</i>
Western Corella	<i>Cacatua pastinator pastinator</i>	Australian Magpie	<i>Cracticus tibicen</i>
Little Corella	<i>Cacatua sanguinea</i>	Grey Currawong	<i>Strepera versicolor</i>
Regent Parrot	<i>Polytelis anthopeplus</i>	Grey Fantail	<i>Rhipidura albiscapa</i>
Australian Ringneck	<i>Barnardius zonarius</i>	Willie Wagtail	<i>Rhipidura leucophrys</i>
Mulga Parrot	<i>Psephotus varius</i>	Australian Raven	<i>Corvus coronoides</i>
Red-backed Kingfisher	<i>Todiramphus pyrrhopygius</i>	Jacky Winter	<i>Microeca fascinans</i>
Rufous Treecreeper	<i>Climacteris rufa</i>	Red-capped Robin	<i>Petroica goodenovii</i>
Splendid Fairy-wren	<i>Malurus splendens</i>	Western Yellow Robin	<i>Eopsaltria griseogularis</i>
Blue-breasted Fairy-wren	<i>Malurus pulcherrimus</i>	Southern Scrub-robin	<i>Drymodes brunneopygia</i>
Shy Heathwren (western)	<i>Hylacola cauta whitlocki</i>	White-backed Swallow	<i>Cheramoeca leucosterna</i>
Redthroat	<i>Pyrrholaemus brunneus</i>	Tree Martin	<i>Petrochelidon nigricans</i>
Weebill	<i>Smicrornis brevirostris</i>	<b>Reptiles</b>	
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	Spotted Military Dragon	<i>Ctenophorus maculatus</i>
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>		<i>Ctenophorus scutulatus</i>
Inland Thornbill	<i>Acanthiza apicalis</i>		<i>Cryptoblepharus buchani</i>
Southern Whiteface	<i>Aphelocephala leucopsis</i>	Sand Monitor	<i>Varanus gouldii</i>
Striated Pardalote	<i>Pardalotus striatus</i>	Yellow-spotted Monitor	<i>Varanus panoptes</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>	Racehorse Monitor	<i>Varanus tristis</i>
White-eared Honeyeater	<i>Lichenostomus leucotis</i>		