REPORT ON A FAUNA SURVEY OF PONY HILLS EAST QUARRY EXTENSION, FAIRVIEW GAS FIELD

Compiled by BOOBOOK

for

SANTOS

BOOBOOK
113 Euthulla Road
PO Box 924
Roma QLD 4455
Ph. (07) 46222646
Fax (07) 46221325
boobook1@bigpond.com
ABN: 94 617 952 309
www.boobook.biz

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EXECUTIVE SUMMARY

This report provides a summary of the results of a targeted survey for endangered, vulnerable and near threatened (EVNT) fauna undertaken by Boobook Ecological Consulting (Boobook) between 4 and 8 December 2012. The survey was undertaken within a proposed extension to the Pony Hills East quarry, Fairview gas field (the Site), about 45 km east of Injune, southern inland Queensland.

The fauna survey included standard fauna survey techniques such as active searching, spotlighting, ultrasonic bat call detection and the use of cage, pitfall, funnel, harp and camera traps. Native fauna recorded within the Site included 34 species of bird, 21 species of reptile, nine species of mammal, three species of amphibian and three species of butterfly. Introduced fauna recorded included three species of mammal and one species of amphibian.

One species of reptile – Golden-tailed Gecko (*Strophurus taenicauda)* - and one species of bat – Little Pied Bat (*Chalinolobus picatus*) - scheduled as near threatened under the *Nature Conservation Act 1992* (NC Act) were detected within or adjacent to the proposed extension footprint.

One species listed as migratory species under the EPBC Act was detected during the survey: the Rainbow Bee-eater (*Merops ornatus*). This bird was observed flying over the quarry footprint. A regionally significant non-EVNT species, the Speckled Warbler (*Chthonicola sagittata*) was also recorded on the Site.

Due to the high fauna habitat values contained within the gravel pit footprint (including known habitat for at least two species of threatened fauna (Golden-tailed Gecko and Little Pied Bat) sources of alternative gravel supplies should be investigated.

Should no alternative sites be located, the proposed gravel pit footprint should be reduced to avoid the highest concentrations of hollow-bearing trees and other significant fauna habitat features such as rock shelters. The locations of these features have been provided in earlier work by Boobook. Clearing should be done in a manner that ensures mobile fauna has an opportunity to escape.

LIST OF ABBREVIATIONS

Abbreviation	Description
GLNG	Gladstone Liquefied Natural Gas
BPA	Biodiversity Planning Assessment
DEHP	Department of Environment and Heritage Protection
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVNT	Endangered, vulnerable or near threatened
GPS	Global Positioning System
MNES	Matters of National Environmental Significance
NC Act	*Nature Conservation Act 1992*

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1. BACKGROUND

Boobook was engaged to conduct a survey of fauna within the area of a proposed extension to the Pony Hills East quarry, Fairview Gas Field (the Site). Background information regarding the location, vegetation types, previous fauna recordings and general ecological values of the Site are outlined in previous reports by Boobook (2010, 2011). Among the findings of these studies was the presence of suitable habitat on the Site for a range of EVNT fauna and the likelihood that some of these species would be present (Boobook 2011). Of particular concern were the threatened reptiles Golden-tailed Gecko *Strophurus taenicauda,* Brigalow Scaly-foot *Paradelma orientalis*, Yakka Skink *Egernia rugosa* and Dunmall's Snake *Furina dunmalli*, and three insectivorous bat species: South-eastern Long-eared Bat *Nyctophilus corbeni*, Large-eared Pied Bat *Chalinolobus dwyeri* and Little Pied Bat *C. picatus.*

This report details the results of a fauna survey undertaken between 4 December and 8 December 2012. The survey focused on the detection of the EVNT fauna predicted to occur at the Site. Other fauna species were recorded opportunistically using the methods described below and these records expand on the inventory of fauna known from the Site.

Field surveys were undertaken by Richard Johnson (Senior Ecologist), David Chemello (Fauna Spotter), Rosamund Aisthorpe (Graduate Botanist) and Angela Bendall (Trainee Field Assistant). Logistical assistance was also provided by Angela Sherwin (Civil Works Ecologist, Santos). The Project Supervisor is Craig Eddie (Principal Ecologist, Boobook) who received DSEWPaC approval on 28 January 2011 to undertake tasks relating to the Gladstone Liquefied Natural Gas (GLNG) project (The Project).

2. METHODOLOGY

2.1 Desktop searches

Pre-existing ecological assessment results for the Site (Boobook 2010, 2011) were reviewed prior to commencement of the survey. As mentioned above, this work predicted the potential occurrence of several EVNT species. It was also valuable in directing survey site location, survey techniques and search effort.

2.2 Fauna Survey

A fauna survey was commenced at the Site on 4 December 2012 and completed on 8 December 2012. The focus of this survey was on the detection of EVNT fauna, particularly the threatened reptiles Golden-tailed Gecko *Strophurus taenicauda,* Brigalow Scaly-foot *Paradelma orientalis*, Yakka Skink *Egernia rugosa* and Dunmall's Snake *Furina dunmalli*, and three insectivorous bat species: South-eastern Long-eared Bat *Nyctophilus corbeni*, Large-eared Pied Bat *Chalinolobus dwyeri* and Little Pied Bat *C. picatus.*

The survey was undertaken in accordance with Scientific Purposes Permit WISP11669312 issued to Craig Eddie as the representative for Boobook Enterprises Pty. Ltd. The nomenclature for all vertebrate fauna and butterflies follows the state Wildlife Online database (DEHP 2012).

2.2.1 Survey site selection

Prior to field work, four trapping sites were selected using existing knowledge (Boobook 2010, 2011) to identify locations with either a high number or a diversity of habitat features. In particular, trapping sites were located in concentrations of identified habitat trees and close to rock outcrops. The locations of these sites were refined on subsequent field visits. A number of supplementary survey sites were selected to include notable habitat features, where incidental records of fauna were obtained or where sites suitable for particular techniques (e.g. bat trapping) were found. The location of each survey site was determined using a Garmin GPSmap 78S handheld global positioning system (GPS). Figure 1 shows the location of trapping and other sites relative to the proposed footprint of the quarry extension. Summary details of the location and characteristics of the survey sites are shown in Table 1: more detail on the four trapping sites is shown in Appendix 1. Survey site locations are shown in Figure 1.

Table 1: Location, characteristics and survey techniques at survey sites.

SURVEY SITE NUMBER	EASTING/NORTHING (datum GDA94 grid zone 55J)	VEGETATION DESCRIPTION[1]	LANDFORM/ SUBSTRATE	SURVEY TECHNIQUES USED
P1	700740 7146771	*Acacia longispicata* open scrub with scattered *Eucalyptus melanophloia, Angophora leiocarpa, Allocasuarina luehmannii* and *Callitris glaucophylla*; sparse ground layer dominated by native perennial species (recently burnt).	Ridge slope. Pale brown loamy sand with embedded rock..	Pitfall traps, funnel traps, spotlighting, active searching.
P2	700802 7146882	*Acacia longispicata* open scrub with associated *Eucalyptus melanophloia, Callitris glaucophylla, Alphitonia excelsa, Petalostigma pubescens* and *Allocasuarina luehmannii*; sparse ground layer dominated by native perennial grasses (recently burnt).	Ridge crest. Brown clay loam.	Pitfall traps, funnel traps, spotlighting, active searching, camera traps.
P3	700955 7146783	*Callitris glaucophylla* woodland; midlayer dominated by *Acacia longispicata* and *Acacia leiocalyx*; very sparse groundlayer (recently burnt).	Low ridge slope. Pale brown loamy sand.	Pitfall traps, funnel traps, spotlighting, active searching.
P4	700947 7146669	*Callitris glaucophylla* open forest with associated *Eucalyptus chloroclada, Corymbia clarksoniana* and *Allocasuarina luehmannii*; midlayer composed of *Callitris glaucophylla* saplings, *Acacia leiocalyx, Acacia longispicata* and *Allocasuarina luehmannii*; very sparse ground layer reshooting after recent fires.	Low ridge slope. Pale brown sandy loam.	Pitfall traps, funnel traps, spotlighting, active searching.
CAM 1	700684 7146801	*Acacia longispicata* open scrub with scattered *Eucalyptus melanophloia, Angophora leiocarpa, Allocasuarina luehmannii* and *Callitris glaucophylla*; sparse ground layer dominated by native perennial species (recently burnt).	Low scarp formed by outcropping sandstone. Shallow sandy lithosol.	Camera trap.
CAM2	700964 7146904	*Callitris glaucophylla* woodland; midlayer dominated by *Acacia longispicata* and *Acacia leiocalyx*; very sparse groundlayer (recently burnt). *Ficus* sp. on rock shelf.	Low scarp. Rock and grey loam.	Camera trap.
H1	700939 7147138	*Eucalyptus melanophloia* woodland with mid-dense shrub layer dominated by *Acacia longispicata* and *Allocasuarina luehmannii;* sparse grassy ground layer.	Lower slope. Grey loam (texture contrast).	Bat trap, bat ultrasound recording.
H 2	701133 7146994	*Callitris glaucophylla* woodland; midlayer dominated by *Acacia longispicata*; very sparse groundlayer (recently burnt).	Low ridge slope. Pale brown loamy sand.	Bat trap.

SURVEY SITE NUMBER	EASTING/NORTHING (datum GDA94 grid zone 55J)	VEGETATION DESCRIPTION[1]	LANDFORM/ SUBSTRATE	SURVEY TECHNIQUES USED
US1	701114 7146632	*Callitris glaucophylla* woodland; midlayer dominated by *Acacia longispicata*; very sparse groundlayer (recently burnt).	Low ridge slope. Pale brown loamy sand.	Bat ultrasound recording.

2.2.2 Survey Techniques

Standard vertebrate fauna survey techniques were used within the survey which broadly followed the guidelines of DSITIA (Eyre *et.* al 2012) and DSEWPaC (2011a, 2011b). These techniques were modified to suit the individual site characteristics.

Pitfall and Funnel Traps

Four pitfall trap lines each comprising six x 20L plastic buckets (30cm diameter x 40cm deep) linked by an aluminium flyscreen drift fence were constructed. Due to the presence of large rock sheets at a shallow depth, only four buckets were deployed at a third site and funnel traps only at a fourth site. The buckets were spaced four metres apart and the drift fence was 30m long. Each line was left open for four nights giving a total of 64 pitfall trap nights. Dirt and bark was placed in the bottom of each bucket to provide cover for captured fauna. Traps exposed to direct sunlight during the day were shaded by leaning vegetation on the drift fence. Pitfall traps targeted small mammals (e.g. dunnarts, planigales and native rodents), ground-dwelling amphibians and small reptiles.

Six funnel traps (Terrestrial Ecosystems: 75cm x 18cm x 18cm with 3cm diameter entry) were placed against the drift fence at each pitfall trap site. Piles of dead grass and tree branches were placed over the traps to prevent desiccation of captured fauna. Funnel traps targeted reptiles, particularly snakes (e.g. Dunmall's Snake *Furina dunmalli*) and geckos (e.g. Golden-tailed Gecko *Strophurus taenicauda*). Funnel traps were left open at each site for four consecutive nights giving a total of 96 funnel trap nights.

Cage traps

Four collapsible steel cage traps (Elliott Scientific) were used at each trapping site in a grid pattern. The traps were placed outside rock crevices and cavities or at the ends or sides of hollow logs. Traps were baited variously with sliced apple and potatoes laced with pistachio essence and were left open for four consecutive nights (total 64 trap nights).

Camera traps

Two camera traps (TrackSnap Digital Eye) were used at two sites for four nights (eight trap nights). These were positioned on trees adjacent to rock outcrops with large crevices, and the field of view was baited with cereal laced with pistachio essence.

Ultrasonic Bat call detection

A SM2 Songmeter was placed at survey sites H1 and US1 for three consecutive nights to record the ultrasonic calls of microbats. Songmeters were positioned on tree trunks either close to flyways or in close proximity to hollow-bearing trees.

Harp Trapping

This technique was constrained by the availability of suitable flyway locations in which to locate traps. Traps were placed outside the quarry footprint area on adjacent tracks and roads. Two traps were placed about 60m apart on an old logging track to the north of the Site and two others placed side-by-side on a road immediately east of the Site. As the traps were located in similar habitat to that on the Site it was reasonable to expect that any captures were of species likely to use the Site as a roosting and/or feeding area. Harp traps were deployed for a total of 16 trap-nights.

Active searching
Active searching involved rolling rocks and logs, raking leaf litter, peeling loose bark on trees and logs, checking burrows and crevices with torches, looking for animal traces (scats, sloughs, shells, scratches, diggings and burrows) and scanning logs for basking reptiles. Observations of birds were also made during active searches. Active searching was undertaken at each pitfall trap site, with additional active searches conducted throughout the majority of the Site area as walked traverses. Total search effort was 14 person hours over three days.

Spotlighting
Spotlighting was used to detect nocturnally active animals. The technique involved night-time searches of the Site using head torches to scan the ground, tree trunks and branches, fallen logs and rock piles. Spotlighting was carried out as walked traverses across the Site. Total search effort was 11.5 person hours over three days.

Incidental Observations
All identifiable fauna heard or sighted while checking traps or conducting other activities during the survey were recorded as incidental records. Two species were identifiable from other evidence: characteristic scats of Wild Dog/Dingo, and skeletal remains of a Bearded Dragon. The location of observations within or outside the clearing footprint was recorded on field sheets and plotted using a GPS (where not associated with a formal survey site).

2.2.3 Weather Conditions

As weather conditions can have a significant influence on animal activity and trappability, general weather observations were recorded during the survey. Some weather observations (e.g. daily maximum/minimum temperatures) were derived from on-line data (BOM 2012). Maximum and minimum temperatures recorded at the nearest weather station to the Site (i.e. Injune) are presented in Table 2. Weather experienced during the survey can be summarised as comprising warm to hot days (maximum temperatures exceeding 30°C daily) but mild to cool minimum temperatures in the latter half of the survey period. This is likely to have affected movement of nocturnal reptiles. Storms were active in the general area during the afternoon/early evening of 3 December with only light rain: no rain fell on the subsequent days of the survey. No rain occurred at the Site. The moon was in a waning gibbous phase, being 79% full at the commencement of the survey and 40% full by the end of the survey. Night light was therefore low until late in the night throughout the survey.

Table 2: Official minimum and maximum temperatures recorded at the nearest weather station (Injune 43015) to Pony Hills East quarry, 4-8 December 2012.

DAY/DATE (2012)	MINIMUM (ºC)*	MAXIMUM (ºC)*
Tuesday, 4 December	19.9	35.9
Wednesday, 5 December	16.3	32.1
Thursday, 6 December	9.3	34.5
Friday, 7 December	11.2	34.9
Saturday, 8 December	20.3	34.4

* Source from Bureau of Meteorology (BOM 2012).

3. RESULTS

3.1 Fauna Survey

3.1.1 Desktop Assessment Results

Previous ecological assessments of the Site (Boobook 2010, 2011) highlighted the habitat values of the Site and the potential occurrence at the site of multiple EVNT fauna including Brigalow Scaly-foot (*Paradelma orientalis*), Golden-tailed Gecko (*Strophurus taenicauda*), Yakka Skink (*Egernia rugosa*), Dunmall's Snake (*Furina dunmalli*), Collared Delma (*Delma torquata*), Little Pied Bat (*Chalinolobus picatus*) and South-eastern Long-eared bat (*Nyctophilus corbeni*). The report also noted the possibility of Northern Quoll (*Dasyurus hallucatus*) occurring here. This information directed trap site choices (e.g. areas with multiple habitat trees), survey techniques and effort required to adequately survey the target EVNT fauna potentially present.

3.1.2 Fauna Survey Results

Native fauna recorded within the gravel pit and access road included 34 species of bird, 21 species of reptile, nine species of mammal, three species of amphibian and three species of butterfly (Appendix 2). Introduced fauna recorded included three species of mammal and one species of amphibian. The method of detection for each species is also shown in Appendix 2.

Results of the pitfall and funnel trapping are shown in Table 3. No fauna was captured in the cage traps. The only fauna images captured in camera traps were of a Grey Shrike-thrush *Colluricincla harmonica* and two non-native mammals: Feral Cat *Felis catus* and House Mouse *Mus musculus*.

Table 3: Pitfall and funnel trap captures at each of four trapping sites.

Key: P = pitfall trap; F = funnel trap.

	P1	P2	P3	P4	TOTAL
Amphibians					
*Platyplectrum ornatum*_ Ornate Burrowing Frog	4 (P)				**4**
Reptiles					
Diplodactylus vittatus Eastern Stone Gecko		1 (F)			**1**
Strophurus taenicauda Golden-tailed Gecko			1 (P)		**1**
Carlia pectoralis Rainbow Skink			4 (P)	1 (F)	**5**
Lerista fragilis Eastern Mulch Slider	2 (P)			1 (P)	**3**
Lygisaurus foliorum Burnett's Skink	1 (P)		1 (P) 1 (F)		**3**
Menetia timlowi Tim Low's Skink			1 (P)		**1**
Morethia boulengeri Boulenger's Skink			1 (F)	1 (P)	**2**
Morethia taeniopleura Fire-tailed Skink	2 (F)				**2**
Varanus tristis Freckled Monitor	2 (F)			1 (F)	**3**
Demansia psammophis Yellow-faced Whip Snake		1 (F)			**1**
Furina diadema Red-naped Snake				1 (F)	**1**
Mammals					
Planigale maculata Common Planigale		2 (F)			**2**
TOTAL	**11**	**4**	**9**	**5**	**29**

Harp-trapping yielded 27 individuals of six species of insectivorous bats (Appendix 2).

Active searching and spotlighting were productive methods of encountering amphibians and reptiles. It is noteworthy that of 21 reptile species recorded, 10 were encountered solely by active searching/spotlighting, while only 4 were encountered by trapping alone (7 were encountered by both methods).

All bird records are incidental recordings as this faunal group was not specifically targeted.

The number of fauna detected represents only a proportion of species likely to occur at the Site. Additional species in all vertebrate and invertebrate classes would be expected to occur with further survey effort, particularly at different times of the year and under varied weather conditions.

Two species of EVNT fauna - both listed as Near Threatened under the NC Act - were detected during the survey. Two individuals of the Golden-tailed Gecko (*Strophurus taenicauda*) were encountered: one was pit-trapped at P4 (grid reference 55J 700947E 7146669N) and another found during a nocturnal active search at 55J 700914E 7146775N (see Figure 2). This species shelters during the day under loose bark and within hollows and is likely to occur throughout the Site.

A single adult male Little Pied Bat (*Chalinolobus picatus*) was captured in a harp trap at H2 (55J 701133E 7146994N) (Figure 2). This bat lives in dry forests and woodlands where it shelters in tree hollows. As suitable habitat trees are present on the Site, it is likely that the Little Pied Bat is resident here.

A species identified as being regionally significant non-EVNT (EPA 2008) and recorded during the field survey was the Speckled Warbler (*Chthonicola sagittata*). One bird species listed as migratory under the EPBC Act was detected during the survey: the Rainbow Bee-eater (*Merops ornatus*).

4. CONCLUSIONS

Key findings of this fauna survey include the following:

- Presence of a population of at least two species scheduled as near threatened under the NC Act, namely Golden-tailed Gecko (*Strophurus taenicauda*) and Little Pied Bat (*Chalinolobus picatus*);
- Presence of regionally significant fauna (Speckled Warbler *Chthonicola sagittata*) and EPBC migratory fauna (Rainbow Bee-eater *Merops ornatus*);
- Presence of a diverse reptile and bat fauna, which may indicate that other EVNT reptiles (Brigalow Scaly-foot *Paradelma orientalis* and Dunmall's Snake *Furina dunmalli*) and bats (South-eastern Long-eared Bat *Nyctophilus corbeni* and Large-eared Pied Bat *Chalinolobus dwyeri)* may be present and detectable with further effort.

5. RECOMMENDATIONS

Based on the field results of this survey the following actions are recommended:

- Due to the high fauna habitat values contained within the quarry extension footprint (including known habitat for at least two species of threatened fauna (Golden-tailed Gecko and Little Pied Bat) alternative sources of quarry material should be investigated.
- Should no alternative sites be located, the proposed quarry extension footprint should be reduced to avoid the highest concentrations of hollow-bearing trees and other significant fauna habitat features such as rock shelters. The locations of these features have been provided in earlier work by Boobook.

- Should clearing proceed it should be done in a manner that ensures mobile fauna has an opportunity to escape and a fauna spotter should be present during the clearing process.

6. REFERENCES

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Figure 1. Location of survey sites, Pony Hills East quarry extension fauna survey

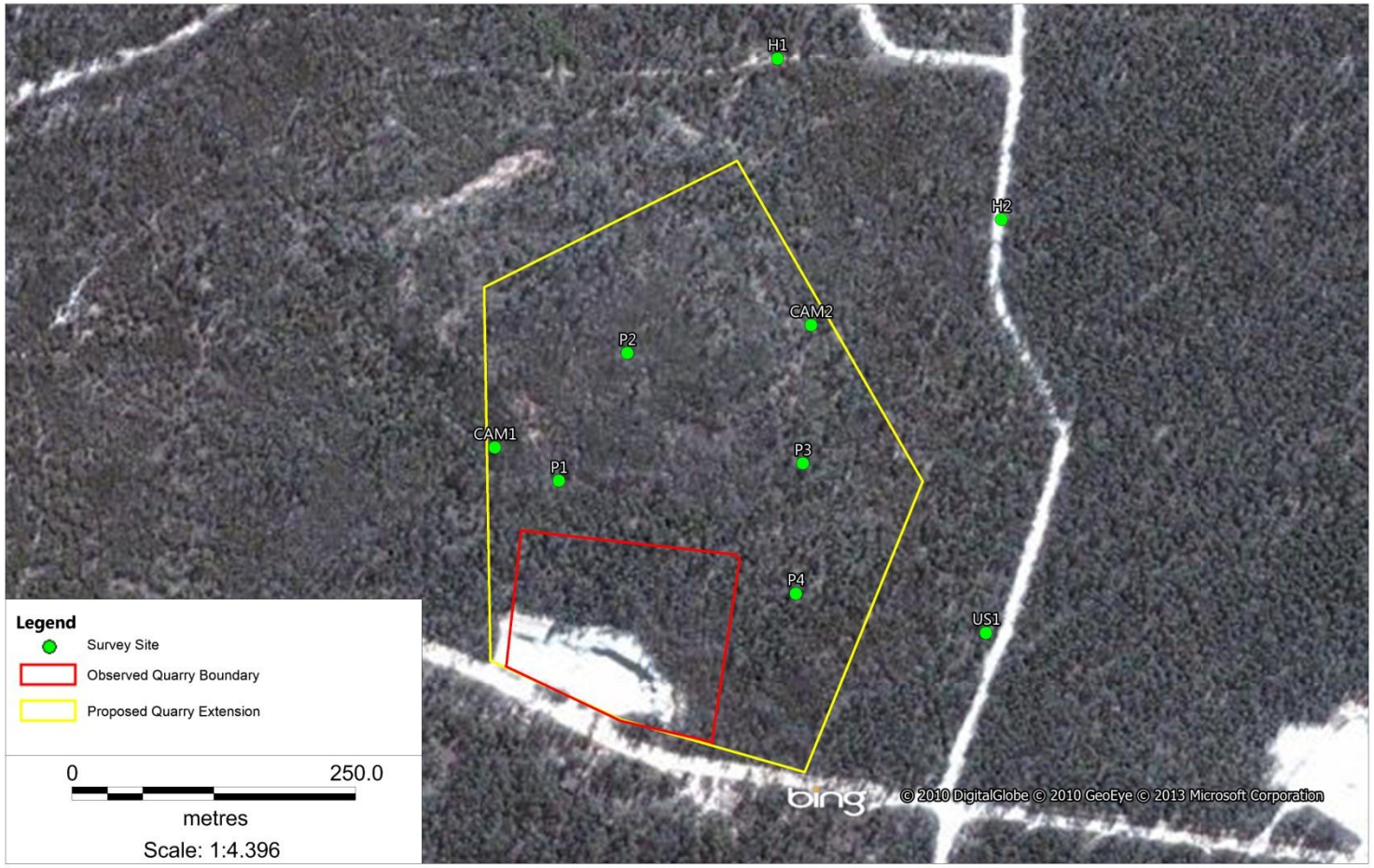
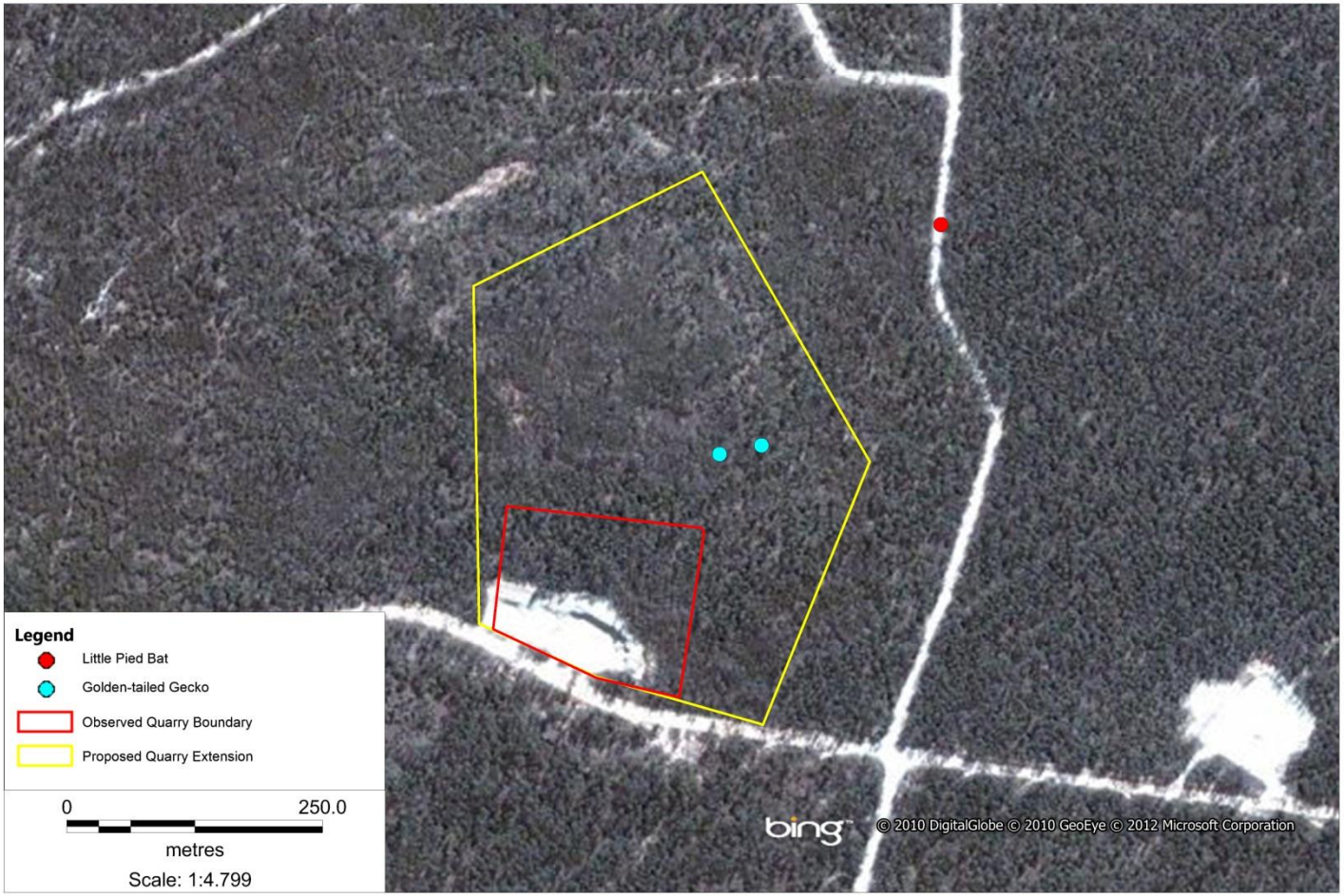


Figure 2: Locations of EVNT fauna, Pony Hills East quarry extension fauna survey



Appendix 1. Quaternary assessment results for four pitfall trapping sites.

Site No.	P1	**Recorder:**	R. Aisthorpe, D. Chemello, R. Johnson, A. Bendall	**Date**	04/12/2012
Purpose	Pony Hills East Quarry Fauna Survey			**Time**	10.00
Locality: (inc. distance/direction to nearest town)	Pony Hills East Quarry, Hallet State Forest				
Zone:	55J	0700740 E	7146771 N	**Datum**	GDA94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	12	10 - 15	V
T2	6	5 - 7	M
T3		-	
S1		-	
S2		-	
S3		-	
G	0.4	0.1 - 0.5	V

Structural formation: Open scrub

Ecologically dominant layer: T2

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	*Eucalyptus melanophloia*
T1	A	*Angophora leiocarpa*
T1	A	*Allocasuarina luehmannii*
T1	S	*Callitris glaucophylla*
T2	D	*Acacia longispicata*
T2	A	*Callitris glaucophylla*
G	A	*Enneapogon* sp.
G	C	*Alloteropsis semialata*
G	A	*Eragrostis* sp.
G	A	*Digitaria brownii*
G	A	*Cenchrus ciliaris*
G	C	*Aristida caput-medusae*

Geology, landform, soils

Geology code and rock types:	Coarse-grained sandstone
Landform:	Ridge slope
Soils:	Pale brown loamy sand with embedded rock
DERM Mapped RE Code:	Non-remnant
Observed RE code: 11.10.9	**Landzone:** 10

Vegetation Short Description
Acacia longispioata open scrub with scattered *Eucalyptus melanophloia, Angophora leiocarpa, Allocasuarina luehmannii* and *Callitris glaucophylla*; sparse ground layer dominated by native perennial species (recently burnt).
Connectivity/Patch Characteristics
Part of remnant patch adjoining quarry to south.
Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed) *Cenchrus ciliaris* (R) *Opuntia tomentosa* (R)

% Weed Cover:	<5%
EVR Flora Present:	*Wahlenbergia islensis* (growing on rock shelf)
EVR Flora Likely:	-
Field Wpt Code:	2012/1
Photo Nos.	BBK5 2055 - 2075

Additional Flora:	
Hakea lorea	*Ancistrachne uncinulata*
Cyanthillium cinereum	*Breynia oblongifolia*
Sporobolus creber	*Dianella conferta*
Polycarpaea corymbosa var. *minor*	*Euphorbia tannensis*
Melaleuca thymifolia	
Jacksonia scoparia	
Tricoryne elatior	
Maireana microphylla	
Alphitonia excelsa	
Dianella caerulea	
Petalostigma pubescens	
Pandorea pandorana	
Corondium oxylepis	

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks - embedded	2	Boulders	1	shrub layer	1	ground cover	1
Rocks - loose	2	fallen bark	1	leaf litter	1	bare ground	3

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

crevices/ledges	1	large logs (>30cm diameter)	1	Trees / logs bearing loose bark	1
Underhangs /overhangs / caves	0	logs with hollows	0	termite mounds	0
small logs (<30cm diameter.)	2	hollow bearing trees	0	mistletoe	0

Other	
Soil cracks	(Describe): -
Water	(Describe eg. waterhole, temporary pool, dam, pond, gilgais): -
Other (eg. food trees):	(Describe): -

Disturbances
Fire - minimal/moderate - <6 months
Grazing - minimal - <6 months
Logging - moderate/severe - 10-20 years ago

Incidental Fauna Observations	EVR Fauna Likely

Additional Notes

Site No.	P2	**Recorder:**	R. Aisthorpe, D. Chemello, R. Johnson, A. Bendall	**Date**	04/12/2012
Purpose	Pony Hills East Quarry Fauna Survey			**Time**	13.00
Locality: (inc. distance/direction to nearest town)	Pony Hills East Quarry, Hallett State Forest				
Zone:	55J	0700802 E	7146882 N	**Datum**	GDA94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E	15	14 - 16	V
T1	6	5 - 7	M
T2		-	
T3		-	
S1		-	
S2		-	
S3		-	
G	0.3	0.1 - 0.4	S

Structural formation: Open scrub

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
E	D	*Eucalyptus melanophloia*
S1	D	*Callitris glaucophylla*
T1	D	*Acacia longispicata*
S1	A	*Petalostigma pubescens*
S1	A	*Alphitonia excelsa*
T1	A	*Allocasuarina luehmannii*
G	D	*Aristida caput-medusae*

Geology, landform, soils

Geology code and rock types:	Coarse-grained sandstone
Landform:	Ridge crest
Soils:	Brown clay loam
DERM Mapped RE Code:	Non-remnant
Observed RE code: 11.10.9	**Landzone:** 10

Vegetation Short Description

Acacia longispicata open scrub with associated *Eucalyptus melanophloia, Callitris glaucophylla, Alphitonia excelsa, Petalostigma pubescens* and *Allocasuarina luehmannii*; sparse ground layer dominated by native perennial grasses (recently burnt).

Connectivity/Patch Characteristics

Part of remnant patch (quarry to south).

Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)

Opuntia tomentosa (R)

% Weed Cover:	<5%
EVR Flora Present:	Nil
EVR Flora Likely:	-
Field Wpt Code:	
Photos Nos.	BBK5 2113 - 2124

Additional Flora:	
Capparis canescens	
Hibiscus sturtii	
Dodonaea heteromorpha	
Maytenus cunninghamiana	
Lomandra multiflora	

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks - embedded	1	Boulders	0	shrub layer	1	ground cover	1
Rocks - loose	2	fallen bark	1	leaf litter	2	bare ground	2

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

crevices/ledges	0	large logs (>30cm diameter)	1	Trees / logs bearing loose bark	2
Underhangs /overhangs / caves	0	logs with hollows	1	termite mounds	0
small logs (<30cm diameter.)	3	hollow bearing trees	1	mistletoe	0

Other	
Soil cracks	(Describe): -
Water	(Describe eg. waterhole, temporary pool, dam, pond, gilgais): -
Other (eg. food trees):	(Describe): -

Disturbances
Fire - minimal/moderate - <6 months
Grazing - minimal - <6 months
Logging - severe - 10-20 years ago

Incidental Fauna Observations	EVR Fauna Likely

Additional Notes

Site No.	P3 **Recorder:** R. Aisthorpe, D. Chemello, R. Johnson, A. Bendall	**Date**	04/12/2012
Purpose	Pony Hills East Quarry Fauna Survey	**Time**	12.00
Locality: (inc. distance/direction to nearest town)	Pony Hills East Quarry, Hallett State Forest		
Zone:	55J 0700955 E 7146783 N	**Datum**	GDA94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	16	15 - 18	S
T2	5	4 - 6	M
T3		-	
S1		-	
S2		-	
S3		-	
G	0.2	0.1 - 0.3	S

Structural formation: Woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	*Callitris glaucophylla*
T2	D	*Acacia longispicata*
T2	A	*Acacia leiocalyx*
G	S	*Vittadinia dissecta*
G	D	*Enneapogon* sp.

Geology, landform, soils

Geology code and rock types:	Coarse-grained sandstone
Landform:	Low ridge slope
Soils:	Pale brown loamy sand
DERM Mapped RE Code:	Non-remnant
Observed RE code: 11.10.9	**Landzone:** 10

Vegetation Short Description

Callitris glaucophylla woodland; midlayer dominated by *Acacia longispicata* and *Acacia leiocalyx*; very sparse groundlayer (recently burnt).

Connectivity/Patch Characteristics

Part of remnant patch; adjoined by roads to east and south; quarry to south.

Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)

Cenchrus ciliaris (R) *Opuntia tomentosa* (R) *Bidens pilosa* (R) *Malvastrum americanum* (R)

% Weed Cover:	<5%
EVR Flora Present:	Nil
EVR Flora Likely:	-
Field Wpt Code:	2012/3
Photo Nos.	BBK5 2101 - 2112

Additional Flora:	
Corymbia clarksoniana	
Allocasuarina luehmannii	
Cheilanthes sieberi	

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks - embedded	0	Boulders	0	shrub layer	3	ground cover	2
Rocks - loose	1	fallen bark	1	leaf litter	1	bare ground	3

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

crevices/ledges	0	large logs (>30cm diameter)	1	Trees / logs bearing loose bark	2
Underhangs /overhangs / caves	0	logs with hollows	1	termite mounds	0
small logs (<30cm diameter.)	3	hollow bearing trees	1	mistletoe	0

Other	
soil cracks	(Describe): -
water	(Describe eg. waterhole, temporary pool, dam, pond, gilgais): -
Other (eg. food trees):	(Describe): -

Disturbances
Fire - minimal - within the last 6 months
Grazing - minimal

Incidental Fauna Observations	EVR Fauna Likely

Additional Notes

Site No.	P4	**Recorder:**	R. Aisthorpe, D. Chemello, R. Johnson, A. Bendall	**Date**	04/12/2012
Purpose	Pony Hills East Quarry Fauna Survey			**Time**	0800
Locality: (inc. distance/direction to nearest town)	Pony Hills East Quarry, Hallett State Forest				
Zone:	55J	0700947 E	7146669 N	**Datum**	GDA94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	16	15 - 18	M
T2	6	5 - 8	M
T3		-	
S1	2	1 - 3	V
S2		-	
S3		-	
G	0.2	0.1 - 0.3	V

Structural formation: Open forest

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum; ***d*** – dominant; ***c*** – codominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	*Callitris glaucophylla*
T1	A	*Eucalyptus chloroclada*
T1	A	*Corymbia clarksoniana*
T2	D	*Acacia leiocalyx*
T2	A	*Callitris glaucophylla*
T1	A	*Allocasuarina luehmannii*
T2	A	*Acacia longispicata*
S1	C	*Acacia luehmannii*
S1	C	*Callitris glaucophylla*
G	D	*Aristida* sp.
G	S	*Eragrostis* sp.

Geology, landform, soils

Geology code and rock types:	Coarse-grained sandstone
Landform:	Low ridge slope
Soils:	Pale brown sandy loam
DERM Mapped RE Code:	Non-remnant
Observed RE code: 11.10.9	**Landzone:** 10

Vegetation Short Description

Callitris glaucophylla open forest with associated *Eucalyptus chloroclada, Corymbia clarksoniana* and *Allocasuarina luehmannii*; midlayer composed of *Callitris glaucophylla* saplings, *Acacia leiocalyx, Acacia longispicata* and *Allocasuarina luehmannii*; very sparse ground layer reshooting after recent fires.

Connectivity/Patch Characteristics

Part of large remnant patch (adjoined by existing quarry and vehicle tracks).

Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)

Opuntia tomentosa (R) *Cenchrus ciliaris* (R) *Bidens pilosa* (R)

% Weed Cover:	<5%
EVR Flora Present:	Nil
EVR Flora Likely:	-
Field Wpt Code:	2012/4
Photo Nos.	BBK 2017 - 2032

Additional Flora:	
Marsdenia viridiflora	
Alphitonia excelsa	
Petalostigma pubescens	
Eucalyptus populnea	
Epaltes australis	
Pittosporum angustifolium	
Capparis canescens	
Polycarpaea corymbosa var. *minor*	
Vittadinia dissecta	
Calotis dentex	
Corymbia tessellaris	
Cheilanthes distans	

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks - embedded	1	Boulders	0	shrub layer	2	ground cover	1
Rocks - loose	1	fallen bark	1	leaf litter	1	bare ground	4

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

crevices/ledges	0	large logs (>30cm diameter)	1	Trees / logs bearing loose bark	1
Underhangs /overhangs / caves	0	logs with hollows	1	termite mounds	0
small logs (<30cm diameter.)	2	hollow bearing trees	1	mistletoe	0

Other	
soil cracks	(Describe): -
water	(Describe eg. waterhole, temporary pool, dam, pond, gilgais): -
Other (eg. food trees):	(Describe): -

Disturbances
Fire - moderate/minimal - within the last 6 months
Logging - moderate - within 10 - 20 years
Grazing - minimal - <1 year

Incidental Fauna Observations	EVR Fauna Likely

Additional Notes

Appendix 2. Fauna species recorded during the survey

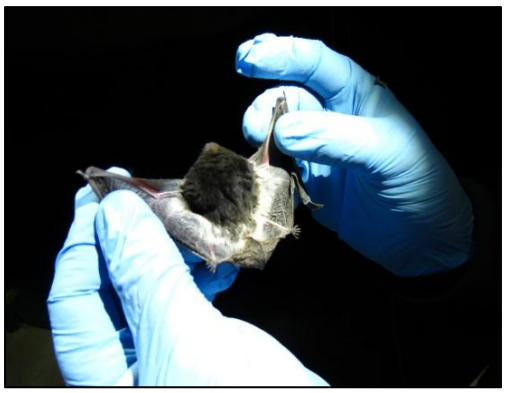
Key to method of encounter: AS = active search; CT = camera trap; FT = funnel trap; HT = harp trap; IN = incidental (seen, heard, traces); PT = pitfall trap.

Class	Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status	Method of encounter
Amphibians	Bufonidae	*Rhinella marina*	Cane Toad			IN
	Hylidae	*Litoria caerulea*	Green Tree Frog	Least Concern		SP
	Hylidae	*Litoria rubella*	Ruddy Tree Frog	Least Concern		IN
	Limnodynastidae	*Platyplectrum ornatum*	Ornate Burrowing Frog	Least Concern		PT
Reptiles	Agamidae	*Pogona barbata*	Bearded Dragon	Least Concern		IN
	Carphodactylidae	*Underwoodisaurus milii*	Barking Gecko	Least Concern		SP
	Diplodactylidae	*Diplodactylus vittatus*	Wood Gecko	Least Concern		FT
	Diplodactylidae	*Omalosia rhombifer*	Zigzag Velvet Gecko	Least Concern		SP, AS
	Diplodactylidae	*Strophurus taenicauda*	Golden-tailed Gecko	Near Threatened		PT, AS
	Elapidae	*Cryptophis boschmai*	Carpentaria Snake	Least Concern		IN
	Elapidae	*Demansia psammophis*	Yellow-faced Whipsnake	Least Concern		FT
	Elapidae	*Furina diadema*	Red-naped Snake	Least Concern		FT
	Gekkonidae	*Gehyra dubia*	Dubious Dtella	Least Concern		AS, SP
	Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko	Least Concern		AS, SP
	Pythonidae	*Morelia spilota*	Carpet Python	Least Concern		SP
	Scincidae	*Carlia pectoralis*	a skink	Least Concern		PT, FT, AS, IN
	Scincidae	*Carlia vivax*	Lively Rainbow Skink	Least Concern		AS
	Scincidae	*Cryptoblepharus pulcher pulcher*	Elegant Snake-eyed Skink	Least Concern		AS
	Scincidae	*Egernia striolata*	Tree Skink	Least Concern		SP
	Scincidae	*Lerista fragilis*	a skink	Least Concern		PT, AS
	Scincidae	*Lygisaurus foliorum*	Burnett's Skink	Least Concern		PT, FT, AS
	Scincidae	*Menetia timlowi*	Tim Low's Skink	Least Concern		PT, AS
	Scincidae	*Morethia boulengeri*	Boulenger's Skink	Least Concern		PT, FT, AS
	Scincidae	*Morethia taeniopleura*	Fire-tailed Skink	Least Concern		FT
	Varanidae	*Varanus tristis*	Black-headed Monitor	Least Concern		FT, IN

Birds	Acanthizidae	*Acanthiza apicalis*	Inland Thornbill	Least Concern		IN
	Acanthizidae	*Acanthiza nana*	Yellow Thornbill	Least Concern		IN
	Acanthizidae	*Chthonicola sagittata*	Speckled Warbler	Least Concern		IN
	Acanthizidae	*Smicrornis brevirostris*	Weebill	Least Concern		IN
	Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	Least Concern		IN
	Artamidae	*Artamus personatus*	Masked Woodswallow	Least Concern		IN
	Artamidae	*Cracticus torquatus*	Grey Butcherbird	Least Concern		IN
	Artamidae	*Strepera graculina*	Pied Currawong	Least Concern		IN
	Cacatuidae	*Nymphicus hollandicus*	Cockatiel	Least Concern		IN
	Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	Least Concern		IN
	Campephagidae	*Coracina tenuirostris*	Cicadabird	Least Concern		IN
	Coraciidae	*Eurystomus orientalis*	Dollarbird	Least Concern		IN
	Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	Least Concern		IN
	Corcoracidae	*Struthidea cinerea*	Apostlebird	Least Concern		IN
	Corvidae	*Corvus orru*	Torresian Crow	Least Concern		IN
	Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	Least Concern		IN
	Cuculidae	*Eudynamys orientalis*	Eastern Koel	Least Concern		IN
	Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	Least Concern		IN
	Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	Least Concern		IN
	Meliphagidae	*Manorina melanocephala*	Noisy Miner	Least Concern		IN
	Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	Least Concern		IN
	Meliphagidae	*Plectorhyncha lanceolata*	Striped Honeyeater	Least Concern		IN
	Meropidae	*Merops ornatus*	Rainbow Bee-eater	Least Concern	M	IN
	Monarchidae	*Myiagra rubecula*	Leaden Flycatcher	Least Concern		IN
	Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	Least Concern		IN
	Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	Least Concern		IN, CT
	Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	Least Concern		IN
	Pardalotidae	*Pardalotus striatus*	Striated Pardalote	Least Concern		IN
	Petroicidae	*Eopsaltria australis*	Eastern Yellow	Least		IN

			Robin	Concern		
	Petroicidae	*Petroica goodenovii*	Red-capped Robin	Least Concern		IN
	Pomatostomidae	*Potamostomus temporalis*	Grey-crowned Babbler	Least Concern		IN
	Psittacidae	*Aprosmictus erythropterus*	Red-winged Parrot	Least Concern		IN
	Psittacidae	*Platycercus adscitus*	Pale-headed Rosella	Least Concern		IN
	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	Least Concern		IN
Mammals	Canidae	*Canis lupus*	Dingo/Wild Dog			IN
	Dasyuridae	*Planigale maculata*	Common Planigale	Least Concern		FT, SP
	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheath-tailed Bat	Least Concern		SP
	Felidae	*Felis catus*	Cat			CT
	Macropodidae	*Macropus rufogriseus*	Red-necked Wallaby	Least Concern		SP
	Muridae	*Mus musculus*	House Mouse			CT
	Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	Least Concern		HT
	Vespertilionidae	*Chalinolobus picatus*	Little Pied Bat	Near Threatened		HT
	Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat	Least Concern		HT
	Vespertilionidae	*Nyctophilus gouldi*	Gould's Long-eared Bat	Least Concern		HT
	Vespertilionidae	*Scotorepens greyii*	Little Broad-nosed Bat	Least Concern		HT
	Vespertilionidae	*Scotorepens sp. (*undescribed)	Central-eastern Broad-nosed Bat			HT
Insects	Nymphalidae	*Junonia villida*	Meadow Argus			IN
	Nymphalidae	*Euploea core*	Common Crow			IN
	Pieridae	*Belenois java*	Caper White			IN

Appendix 3. Photographs of selected fauna detected during the survey.



Above. Little Pied Bat *Chalinolobus picatus* captured in harp trap at HARP 2 (left); Golden-tailed Gecko *Strophurus taenicauda* from pitfall trap at site P3 (right).

Above. Common Planigale *Planigale maculata* spotlighted near trap site P3 (left); Black-headed Monitor *Varanus tristis* on a tree at trap site P1 (right).

Above. Red-naped Snake *Furina diadema* caught in a funnel trap at site P4 (left); Rainbow Skink *Carlia pectoralis* was abundant throughout the Site (right).

Above: the most commonly-trapped bat was the central-eastern broad-nosed bat *Scotorepens* sp. (left); a female Gould's long-eared bat trapped at site H1 (right).

Above: barking gecko *Underwoodisaurus milii* spotlighted in a rock crevice at CAM1 (left); the zigzag gecko *Amolosia rhombifer* was commonly found on rocks and trees (right).

Above: Boulenger's skink *Morethia boulengeri* trapped on sandy soils at site P4 (left); the closely-related fire-tailed skink *M. taeniopleura*, trapped at the rocky site P1(right).