

**Western Ringtail Possum  
Survey  
&  
Black Cockatoo  
Habitat Assessment  
of  
Sabina Vale  
Loc 3819  
(Sussex Land District)**

**Wonnerup**

APRIL 2013

*Version 1*

*On behalf of:*

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## TABLE OF CONTENTS

1.	INTRODUCTION .....	1
2.	SCOPE OF WORKS & METHODS .....	1
2.1	WESTERN RINGTAIL POSSUM SURVEY .....	2
2.2	BLACK COCKATOO HABITAT ASSESSMENT .....	2
3.	PREVIOUS SURVEYS.....	3
4.	SURVEY CONSTRAINTS.....	5
5.	RESULTS .....	6
5.1	WESTERN RINGTAIL POSSUM ASSESSMENT .....	6
5.2	BLACK COCKATOO HABITAT ASSESSMENT .....	6
6.	CONCLUSION.....	8
7.	BIBLIOGRAPHY .....	9

### FIGURES

FIGURE 1:	Study Area and Surrounds
FIGURE 2:	Study Area – Air Photo
FIGURE 3:	Fauna Habitats
FIGURE 4:	Day Survey Results – April/May 2006
FIGURE 5:	Nocturnal Count - May 2006
FIGURE 6:	Nocturnal Count - June 2006
FIGURE 7:	Day Survey Results – March 2013
FIGURE 8:	Nocturnal Count – April 2013
FIGURE 9:	Habitat Trees (DBH >50cm)

### APPENDICES

APPENDIX A:	Habitat Tree Details
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## **DISCLAIMER**

This fauna assessment report (“the report”) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Greg Harewood (“the Author”). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints. In accordance with the scope of services, the Author has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

Within the limitations imposed by the scope of services, the field assessment and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

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The Author will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

## 1. INTRODUCTION

This report details the results of a western ringtail possum (WRP) survey and black cockatoo habitat assessment of a section of Lot 3819, Wonnerup (“Sabina Vale”). The subject site is located about 8 kms south of Busselton in south west Western Australia and is centred at approximately 33.671285°S and 115.411774°E (Figure 1).

It is understood that Cristal Mining Australia Limited (Cristal) are proposing to mine an identified heavy mineral sand deposit located within the subject site in the near future. A previous fauna assessment at the site (Harewood 2006c) identified the presence of WRP and potential black cockatoo habitat within likely mine areas. As the removal of some of this habitat will be required for the proposed mine to proceed, potential impacts on WRPs and black cockatoos (if any) need to be identified and managed.

The area of investigation was limited to that section of Lot 3819 currently identified as containing the mineral sand resource and some nearby/intervening areas (Figure 2). Sections of Lot 3819, outside of this area have not been assessed during this most recent survey though it should be noted that previous survey work included some nearby vegetated areas (e.g. vegetation bordering Sabina River - Harewood 2006c). A summary of these earlier results is also provided.

## 2. SCOPE OF WORKS & METHODS

The main scope of the survey work reported on here was obtain a current update on the distribution and abundance of WRPs across a section of the subject site compared to the previous surveys carried out in 2006 (Harewood 2006c), in addition to providing information on the value of the area as habitat for black cockatoos.

Note: For the purposes of this report the term black cockatoo is in reference to Baudin’s black cockatoo *Calyptorhynchus baudinii*, Carnaby’s black cockatoo *Calyptorhynchus latirostris* and the forest red-tailed black cockatoo *Calyptorhynchus banksii naso*. All three species have the potential to frequent the general area at times to varying degrees.



## 2.1 WESTERN RINGTAIL POSSUM SURVEY

The western ringtail possum survey included the following:

- Daytime survey of the site searching for dreys, obvious tree hollows (and other potential daytime refuge habitat), scats and individual WRPs; and
- One night time survey to locate and record the distribution and abundance of WRPs.

Surveys were carried out on foot along close spaced transects. Nocturnal survey work was carried out using a 100 lumen incandescent head torch.

The daytime survey was carried out on the 26 March 2013. The nocturnal count was carried out on the 2 April 2013.

## 2.2 BLACK COCKATOO HABITAT ASSESSMENT

The black cockatoo habitat assessment included a:

- Habitat tree survey: This involved the identification of all suitable trees species within likely impact areas and some nearby/intervening locations that have a Diameter at Breast Height (DBH) of over 50cm (irrespective of the presence/absence of suitable hollows – Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) criteria). The location of each tree identified was recorded with a GPS and details on tree species, number and size of hollows (if any) noted. Trees observed to contain hollows (of any size) were marked with “H” using spray paint.

Target tree species included tuart, marri and jarrah or any other suitable *Corymbia/Eucalyptus* species of a suitable size that may be present. Peppermints, banksia, sheoak and melaleuca tree species (for example) were not assessed as they typically do not develop hollows that are used by black cockatoos.

For the purposes of this study a potential cockatoo nest hollow was defined as:

*Generally any tree which is alive or dead that contains one or more visible hollows (cavities within the trunk or branches) suitable for occupation by any of the three black cockatoo species for the purpose of nesting/breeding. Hollows that had an entrance greater*



*than about 12cm in diameter and would allow the entry of a cockatoo (white tailed or red-tailed) into a suitably orientated and sized branch/trunk, were recorded as a “potential nest hollow”.*

This definition is based on the minimum entrance size of black cockatoo nest hollows (i.e. 12cm) found in published literature, namely Johnstone and Storr (1998).

Identified hollows (if any) were examined using binoculars for evidence of actual use by black cockatoos (e.g. chewing around hollow entrance, scarring and scratch marks on trunks and branches). Trees with possible nest hollows were also scratched and raked with a large stick/pole to flush any sitting birds from hollows and calls of chicks were also listened for.

- Black cockatoo foraging assessment: The location and nature of black cockatoo foraging evidence (e.g. chewed fruits around base of trees) observed during the field survey was recorded.
- Roosting habitat survey: Direct and indirect evidence of black cockatoos roosting within trees on site was noted if observed (e.g. branch clippings, droppings or moulted feathers).

### 3. PREVIOUS SURVEYS

A level 1 fauna assessment was carried out over the site in May/June 2006 (Harewood 2006c). This assessment also included a series of western ringtail possum surveys. The area surveyed included the current study area in addition to vegetation bordering Sabina River (Figure 2).

During this assessment broad scale fauna habitats within Sabina Vale, primarily based on vegetation units, were defined. The extent of the fauna habitats within the current study area are shown in Figure 3 with a description of each given below. All areas are, from a vegetation condition point of view, highly degraded given they have been either totally cleared or have been open to grazing for many years. Despite this, some sections have value to some degree as habitat for western ringtail possums and black cockatoos and a comment is provided for each of the defined units.

1. **Cleared Pasture** – Cleared farmland with a mixture of introduced pasture grasses, clovers, weeds and degraded sedgelands. These areas also contain a small number of scattered trees (mostly peppermint *Agonis*



*flexuosa*, marri *Corymbia calophylla*, flooded gum *Eucalyptus rudis* or paperbark *Melaleuca* spp.). Some lower lying areas in the north are waterlogged/inundated during winter. No fallen logs or understorey are generally present. Little or no value as habitat for western ringtail possums and black cockatoos.

2. **Flooded Gum (*Eucalyptus rudis*) – Marri (*Corymbia calophylla*) – Peppermint (*Agonis flexuosa*) - *Melaleuca* spp. Woodland:** Occupies a small area within the current study area (and also present along the Sabina River). Understorey and ground cover has been severely degraded and typically consists only of introduced weeds and grasses. Sub-dominant peppermint provides some midstorey habitat suitable for western ringtail possums to utilise though very limited in number and extent. Some value as black cockatoo habitat given presence of marri trees (potential breeding habitat and foraging habitat). Flooded gum is rarely used for breeding or foraging by black cockatoos.
- 3 **Marri (*Corymbia calophylla*) Open Woodland:** Occupies a small area within the current study area. Most trees are relatively tall but young in age and contain no hollows. No fallen logs or understorey are present. Little value as western ringtail possum habitat except as a temporary refuge for transient individuals. Some value as black cockatoo habitat given presence of marri trees (potential breeding habitat and foraging habitat).
3. **Peppermint (*Agonis flexuosa*) Open Forest:** Two small patches of peppermint dominated, parkland cleared open forest are present in the study area. These areas also contain some marri, jarrah and *Nuytsia floribunda* trees. No understorey is present and a groundcover of grasses and weed species dominates. These areas provide potential western ringtail possum habitat though quality is relatively poor given their isolation from larger remnants and the generally discontinuous canopy connectivity within each patch. Some value as black cockatoo habitat given presence of marri and jarrah trees (potential breeding habitat and foraging habitat).
4. ***Melaleuca* spp Low Closed Forest:** Several small patches of seasonally inundated *Melaleuca* dominated swamps are present. The western most patch also contains scattered flooded gum trees and is bordered by some marri trees. No understorey is present and a groundcover of grasses and weed species dominates. Low value as western ringtail possum habitat except as a temporary refuge for transient individuals. Some value as black cockatoo habitat given presence of a small number of marri trees (potential breeding habitat and foraging habitat).



The daytime survey carried out in April/May 2006 identified five WRP dreys with the current study area. Three trees with hollows potentially suitable for WRPs to use as a day to refuge were also observed. Eight additional WRP dreys and 25 trees hollows were located in other sections of the area investigated (mainly along Sabina River) (Figure 4).

Nocturnal counts were carried out on Sabina Vale on the 11 May and the 7 June, 2006. The first nocturnal count located three WRPs within the current study area and another 17 individuals within vegetation bordering Sabina River. Ten common brushtail possums (CBPs) were observed within the study area and another 16 within vegetation bordering Sabina River (Figure 5).

The second nocturnal count located six WRPs within the current study area and another 15 individuals within vegetation bordering Sabina River. Six CBPs were observed within the study area and another 16 within vegetation bordering Sabina River (Figure 6).

#### **4. SURVEY CONSTRAINTS**

No seasonal sampling has been carried out as part of this fauna assessment. The conclusions presented are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of the field assessments. It should be recognised that site conditions can change with time.

The number of WRPs observed during the various nocturnal surveys represents the minimum number present within the area surveyed at the time of each survey. Due to various survey limitations it is unlikely that every WRP present within the area was observed on any one night. The area is also “open” to WRP movement in and out of nearby and adjoining suitable habitat. As a consequence some WRPs may have home ranges that overlap the boundary of the study area and as such there can be no guarantee that all WRPs that utilise the site were actually present within the area surveyed at the time of the nocturnal counts.

During the black cockatoo habitat survey trees with hollows were recorded. It should be noted that identifying hollows suitable for fauna species from ground level has limitations. Generally the full characteristics of any hollow seen are not fully evident (e.g. internal dimensions). It is also difficult to locate all hollows within all trees as some are not observable from ground level.





The location of habitat trees was recorded using a handheld GPS. The accuracy of the coordinates obtained cannot be guaranteed below a level of about 5 to 10 metres, though it in some circumstance the accuracy can be worse or better than this.

## 5. RESULTS

### 5.1 WESTERN RINGTAIL POSSUM ASSESSMENT

No western ringtail possum dreys were located within the current study area during the daytime site assessment carried out on the 26 March 2013.

Fourteen trees containing hollows were observed within the defined study area (see Figure 7) though not all are likely to be suitable for WRPs to utilise. Forks in trees, subtle cavities in tree trunks, fallen hollow logs, rabbit burrows and dense ground cover (where present) are also used by WRPs for daytime refuge and therefore observations of dreys and hollows only provide a guide to WRP habitat use/quality as other opportunities for daytime refuge may exist.

No WRP scats were observed during the day survey.

A single WRP and five CBPs were observed on the night survey carried out on the 2 April 2013 (Figure 8).

### 5.2 BLACK COCKATOO HABITAT ASSESSMENT

The tree assessment identified 195 specimens within or very near the study area that fit DSEWPaC's criteria for black cockatoo breeding habitat (i.e. suitable tree species with a diameter at breast height (DBH) of >50cms) (Figure 9). The majority (181, ~92.8%) of the trees were not observed to contain hollows of any size. Thirteen (~6.7%) of the trees contained one or more "small" hollows (less than ~12cm entrance size) considered by the Author not to be suitable for black cockatoos to use for nesting purposes. One (~0.5%) tree contained a hollow with a larger entrance (greater than ~12cm) that appeared big enough and orientated favourably to possibly allow the entry of a black cockatoo into a suitably sized branch/trunk.

This assessment was based on the size of the entrance to an apparent hollow only. No evidence of actual use by a black cockatoo was seen (e.g. chew marks) at the large hollow and based on this observation it is considered unlikely to have been used by black cockatoos in the recent past.

One hundred and twenty seven of the trees were marri (*C. calophylla*), 60 were flooded gum (*E. rudis*) and four were jarrah (*E. marginata*). Four trees could not



be identified to species level as they were dead and had no distinguishing characteristics evident. It is the Authors understanding that flooded gum is rarely used for breeding by black cockatoos and this was supported by observations made in the field where trees, while having a DBH of >50cm, typically had a short (<2m) main trunks with many radiating branches of small diameter that would be unlikely to develop hollows large enough for black cockatoos to use for nesting purposes.

Additional details on each observed “habitat tree” can be found in Appendix A.

Foraging evidence attributed to two species of black cockatoo (the forested red-tailed black cockatoo and Carnaby’s black cockatoo) was observed during the site survey in the form of chewed marri fruits at several locations. All the marri and jarrah trees present with the study area represent potential foraging habitat. Flooded gum also have the potential to be utilised by black cockatoos as foraging habitat but typically they make up a very small component (if any) of any of the three species diets and they cannot be regarded as representing quality foraging habitat.

It is difficult to estimate the area of quality foraging habitat that may require removal as a consequence of the mine proceeding as many of the trees occur as scattered individuals or as emergent trees within otherwise non-foraging/poor quality foraging habitat. It has however been estimated, based on outlining trees using an air photo that about 1 ha of non-continuous black cockatoo foraging habitat falls with the current study area and may require clearing.

No existing roosting trees (trees used at night by black cockatoos to rest) were observed during the survey period. The closest documented black cockatoo roosting site known to the Author is however located just north of the proposed mine area within or on the boundary of Location 3819/Bussell Highway (Johnstone and Kirkby 2011 – Plan showing Greater Bunbury Region Scheme (GBRS) - potential habitat for the Carnaby's Black Cockatoo which may require further assessment), though no activity was noted here during the survey period.



## 6. CONCLUSION

The WRP survey re-confirmed that the project area is being used by WRPs as habitat. The current level of utilisation appears to be slightly lower than in 2006 (one individual in April 2013 compared to six June 2006) though results from different seasons can be difficult to compare as even within stable populations, numbers can vary by 40% over a yearly cycle of breeding, subsequent dispersal of young and the death of resident individuals (G. Harewood per. obs.). Estimates can also be out to varying degrees depending on the influence of potential survey shortcomings.

It is understood that management of WRPs at the site during clearing for mining will be consistent with that currently being employed at the current Wonnerup Mine Site which primarily involves the examination of potential habitat immediately prior to clearing, with any WRPs encountered being relocated to retained vegetation nearby (e.g. vegetation bordering Sabina River). The results of this most recent survey indicate that this management approach will be acceptable as the observations made suggest a relatively low number of individuals are likely to be displaced as a consequence of the proposed mining.

The project area was found to contain 195 trees that fit DSEWPaC's classification of "potential black cockatoo breeding habitat" (DBH > 50cm). Not all of these trees will require removal but a significant number do fall with currently defined ore body outline. The removal of some or all of these trees may be considered as likely to have a significant impact under the *EPBC Act* by DSEWPaC (and this will need to be taken into consideration prior to development at the site proceeding). The loss of a relatively small area of foraging habitat may also need to be taken into consideration as it may also compromise DSEWPaC's criteria for likely significant impact.



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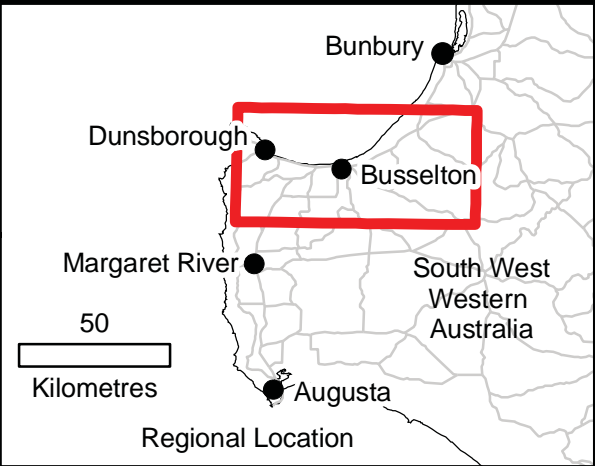
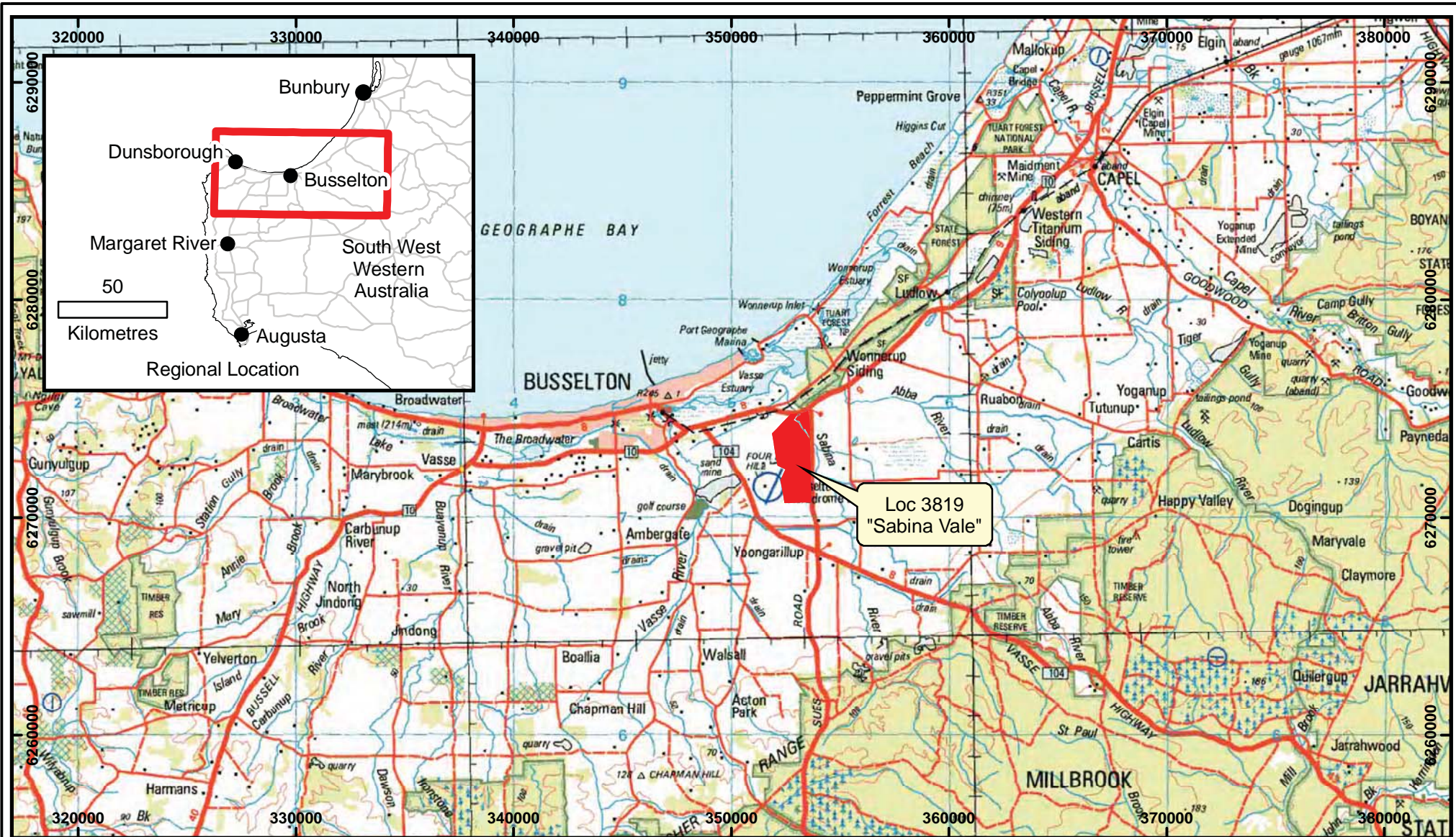
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# FIGURES







**Legend**

 Loc 3819



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Kilometres  
MGA Zone 50



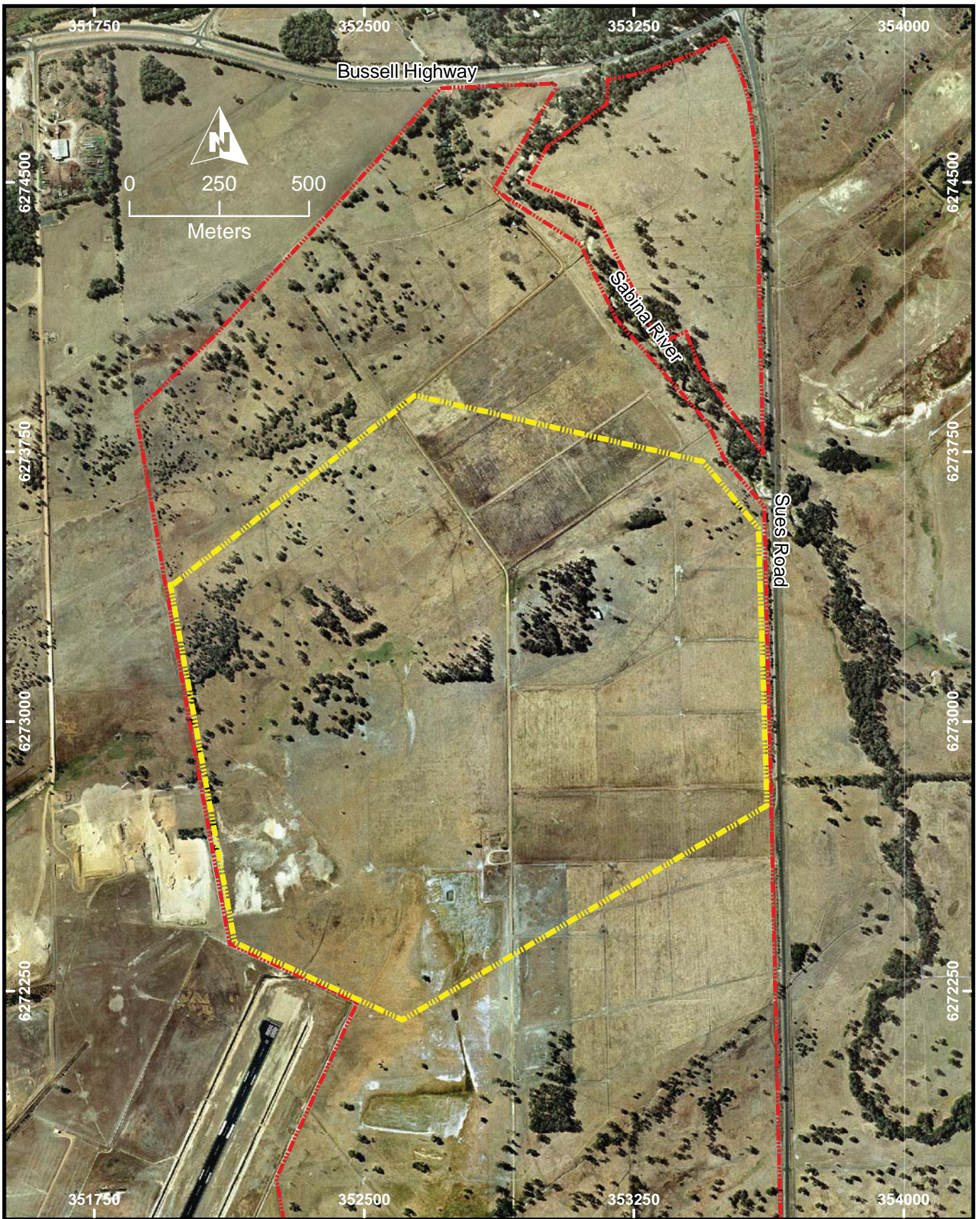
Fauna  
Survey

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Loc 3819 - Sabina Vale  
Wonnerup

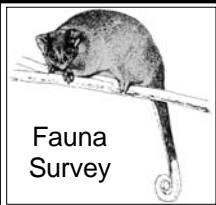
**Study Area  
and Surrounds**





**Legend**

-  Location 3819 Boundary
-  Survey Area (April 2013)



Fauna Survey

DRAWN: G Harewood

DATE : April 2013

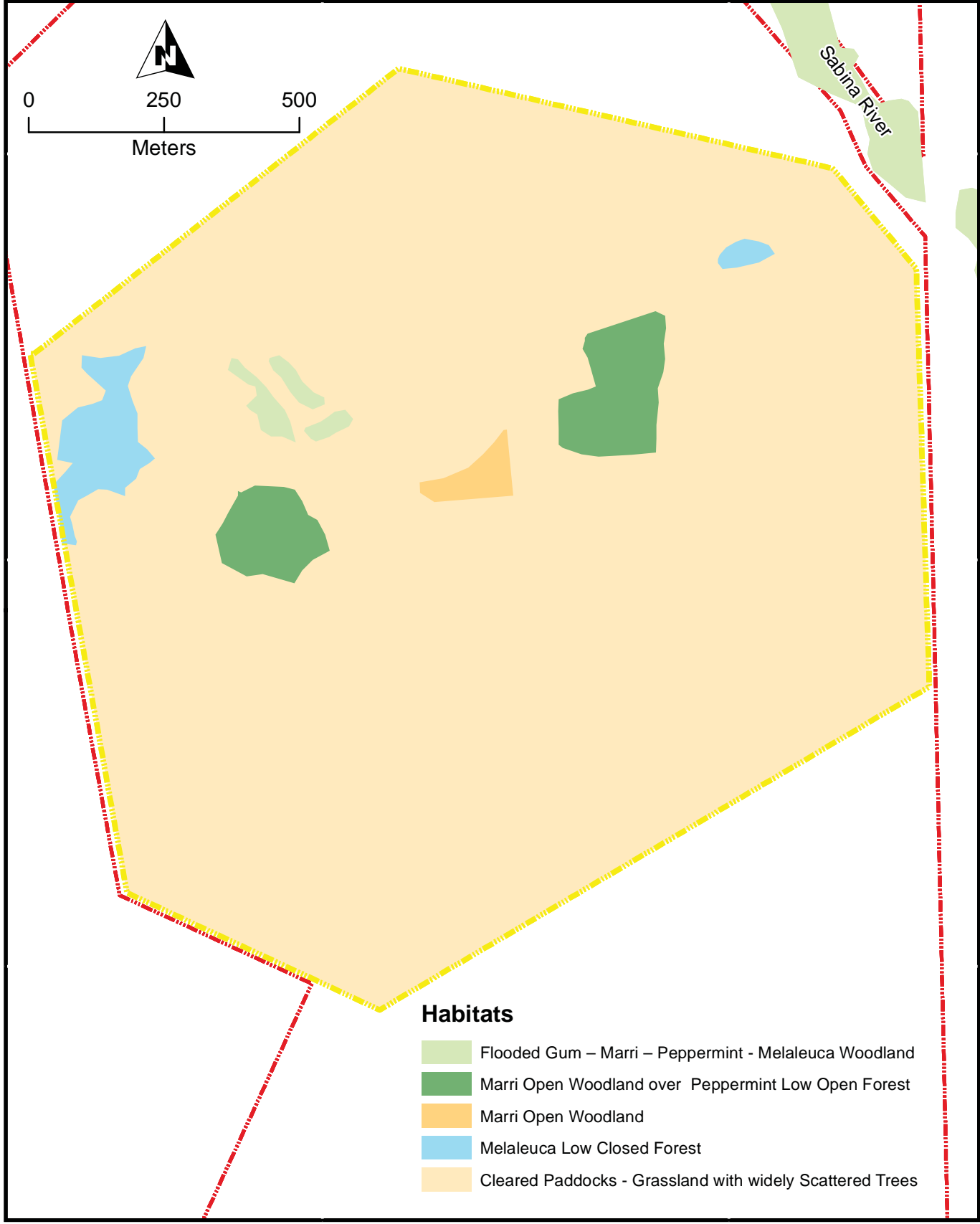
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MGA Zone 50



Loc 3819 - Sabina Vale  
Wonnerup

**Study Area  
Air Photo**







**Habitats**

-  Flooded Gum – Marri – Peppermint - Melaleuca Woodland
-  Marri Open Woodland over Peppermint Low Open Forest
-  Marri Open Woodland
-  Melaleuca Low Closed Forest
-  Cleared Paddocks - Grassland with widely Scattered Trees

**Legend**

-  Location 3819 Boundary
-  Survey Area (April 2013)

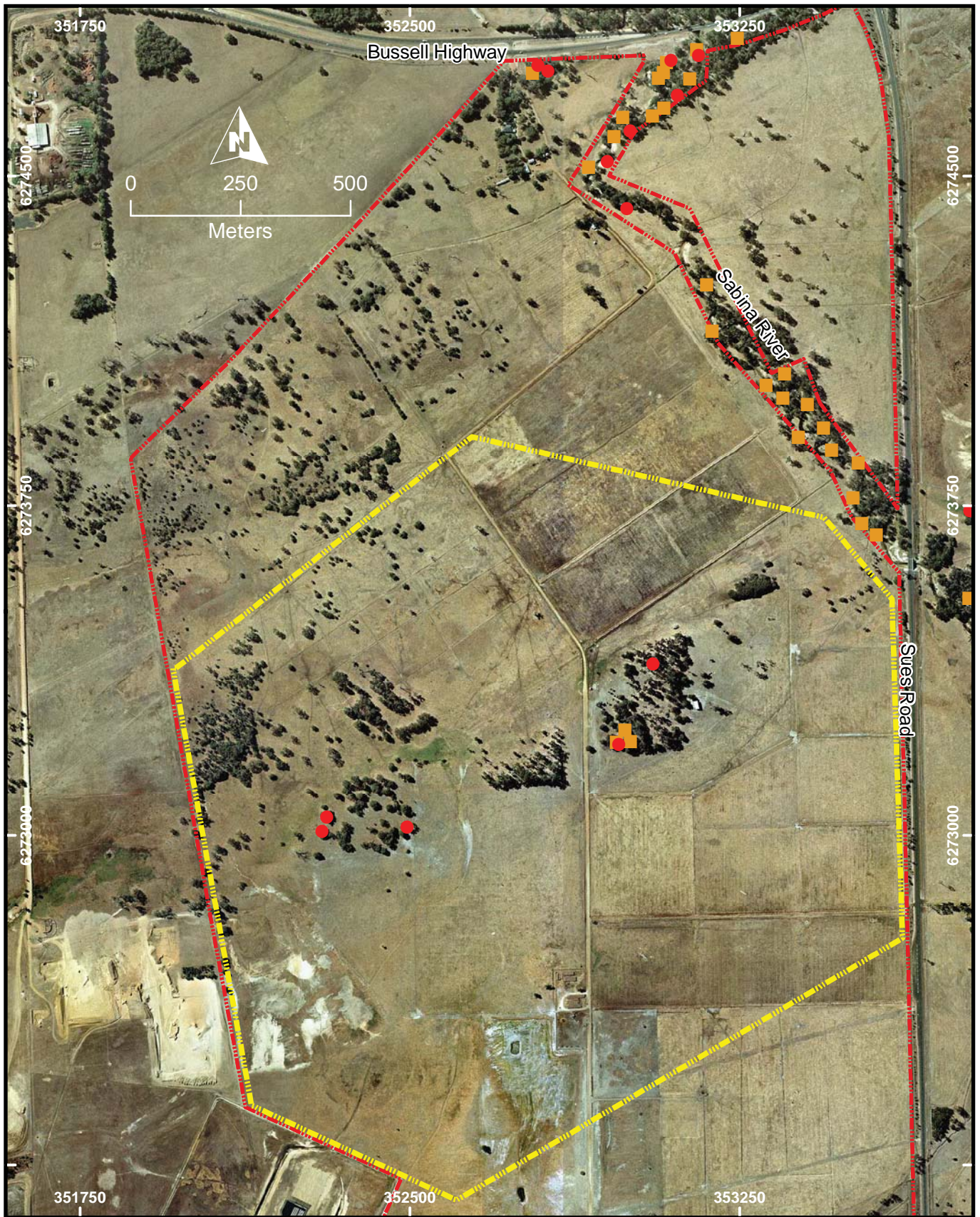


DRAWN: G Harewood  
 DATE : April 2013  
 SCALE: 1:10,000  
 MGA Zone 50





Loc 3819 - Sabina Vale  
 Wonnerup

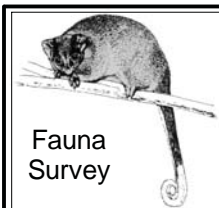
**Fauna Habitats**





### Legend

-  Location 3819 Boundary
-  Survey Area (April 2013)
-  WRP Drey
-  Tree Hollow



DRAWN: G Harewood

DATE : April 2013

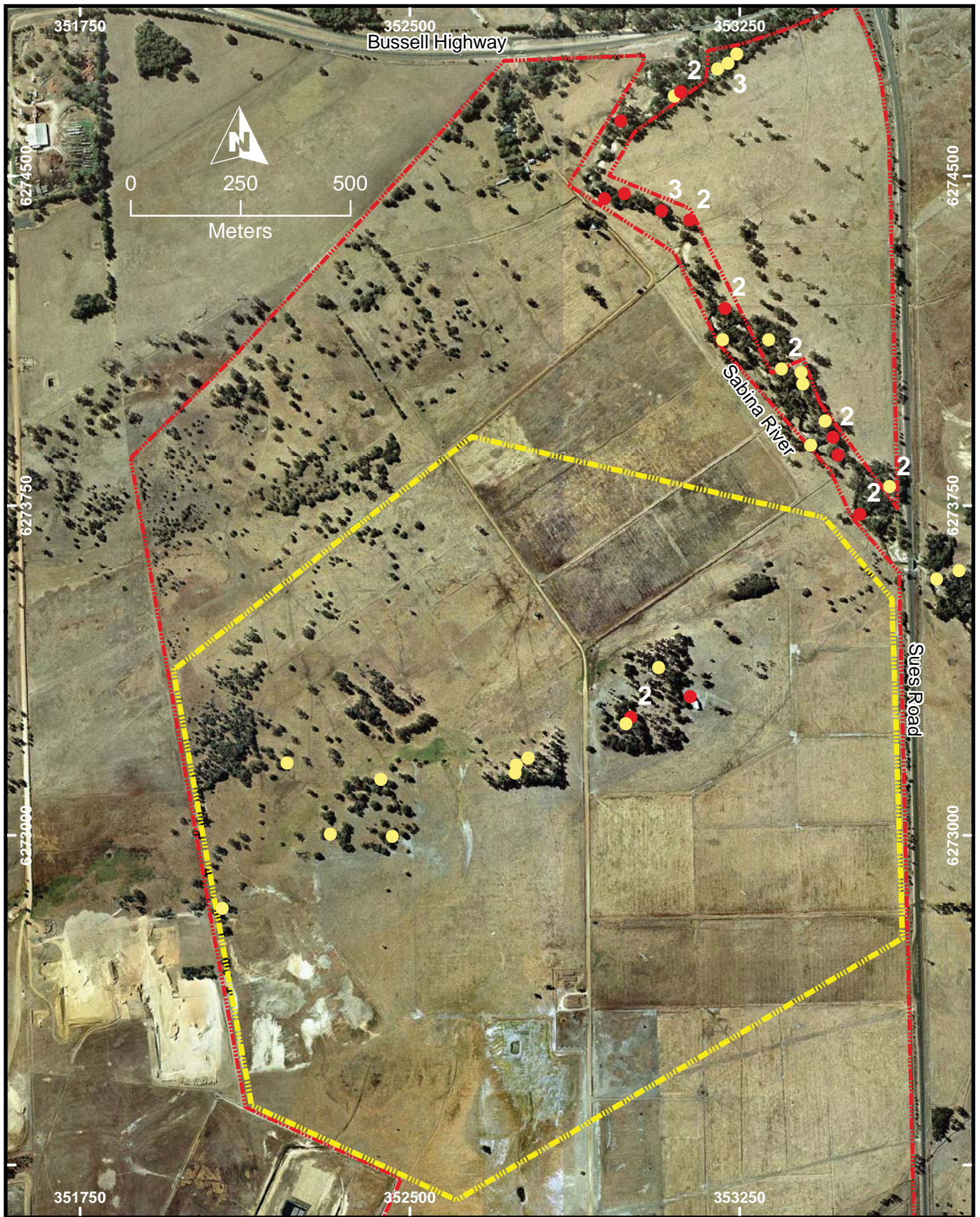
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MGA Zone 50





Loc 3819 - Sabina Vale  
Wonnerup

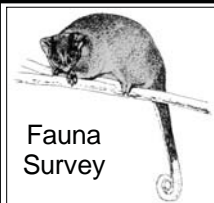
## Day Survey Results April/May 2006





## Legend

-  Location 3819 Boundary
-  Survey Area (April 2013)
-  Western Ringtail Possum
-  Common Brushtail Possum



DRAWN: G Harewood

DATE : April 2013

SCALE: 1:12,250

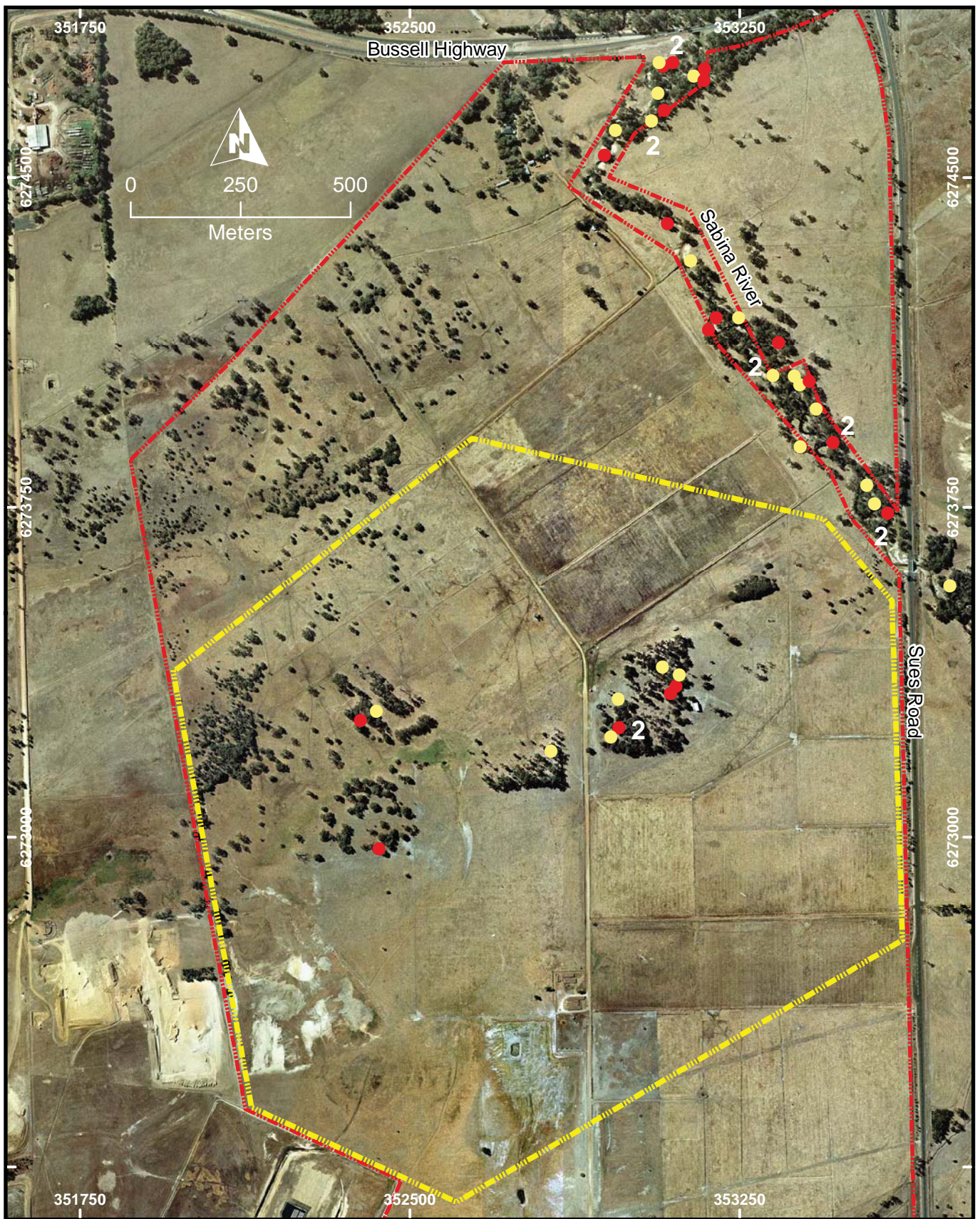
MGA Zone 50

Loc 3819 - Sabina Vale  
Wonnerup





Nocturnal Count  
May 2006

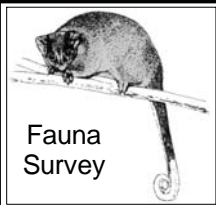
Figure: 5





### Legend

-  Location 3819 Boundary
-  Survey Area (April 2013)
-  Western Ringtail Possum
-  Common Brushtail Possum



DRAWN: G Harewood

DATE : April 2013

SCALE: 1:12,250

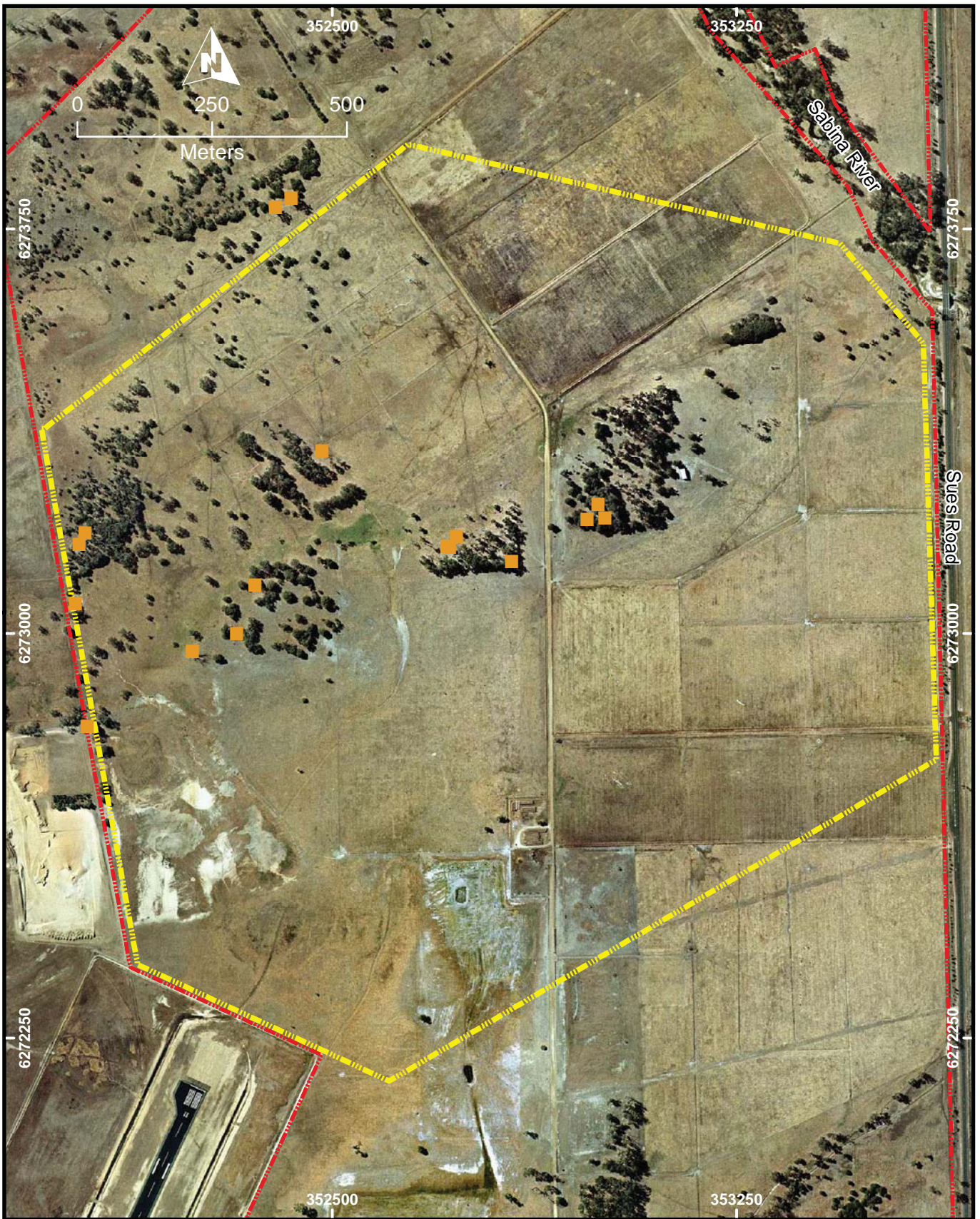
MGA Zone 50

Loc 3819 - Sabina Vale  
Wonnerup




Nocturnal Count  
June 2006

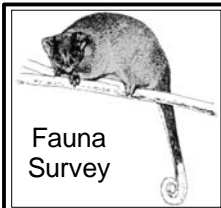
Figure: 6





### Legend

-  Location 3819 Boundary
-  Survey Area (April 2013)
-  Tree Hollow



Fauna Survey

DRAWN: G Harewood

DATE : April 2013

SCALE: 1:10,000

MGA Zone 50





Loc 3819 - Sabina Vale  
Wonnerup

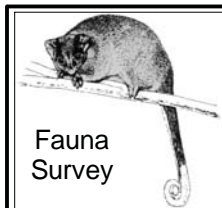
## Day Survey Results March 2013





### Legend

-  Location 3819 Boundary
-  Survey Area (April 2013)
-  Western Ringtail Possum
-  Common Brushtail Possum



Fauna Survey

DRAWN: G Harewood

DATE : April 2013

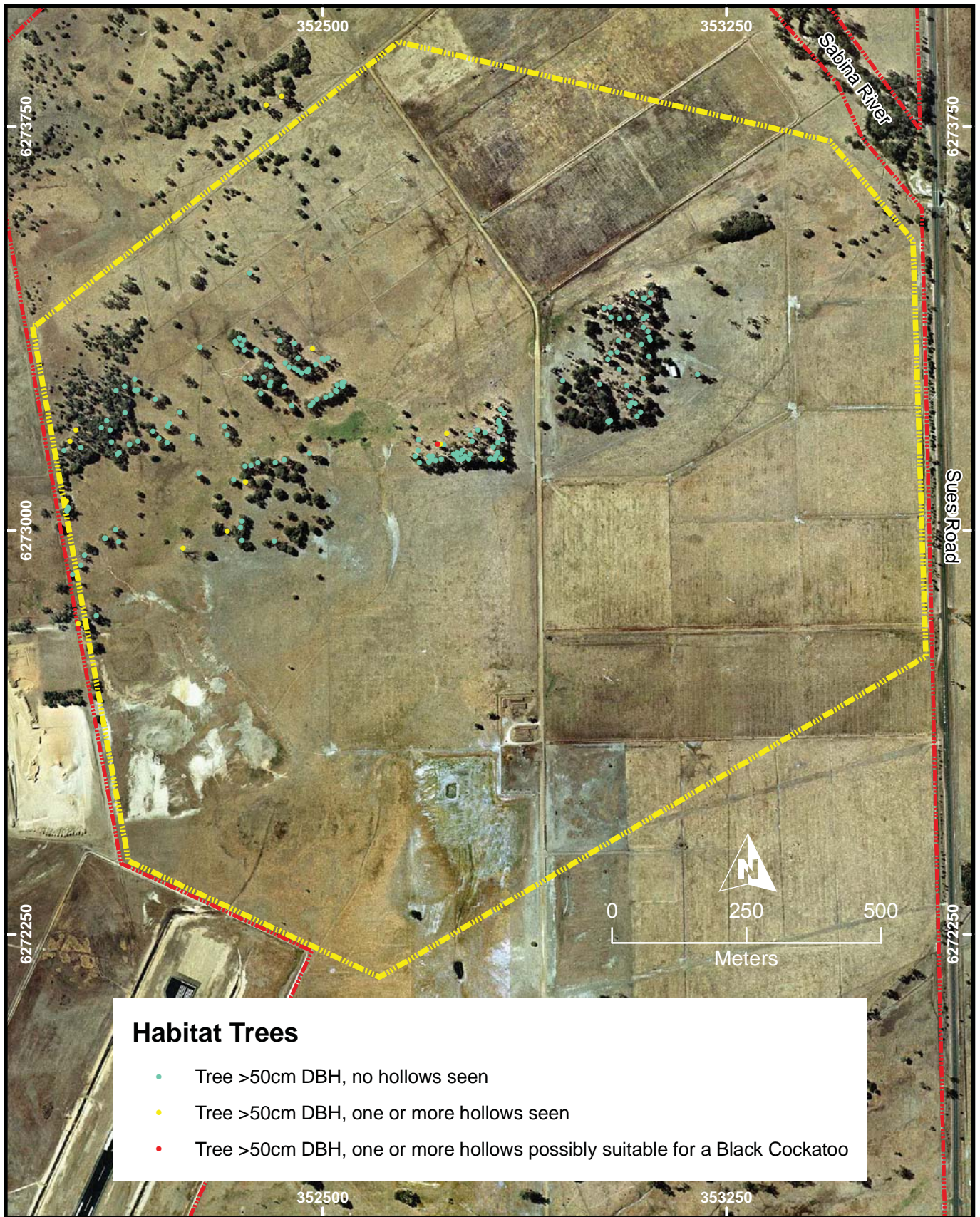
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MGA Zone 50

Loc 3819 - Sabina Vale  
Wonnerup

## Nocturnal Count April 2013



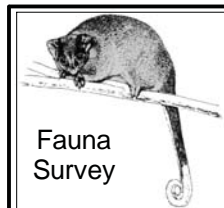


**Habitat Trees**

- Tree >50cm DBH, no hollows seen
- Tree >50cm DBH, one or more hollows seen
- Tree >50cm DBH, one or more hollows possibly suitable for a Black Cockatoo

**Legend**

- Location 3819 Boundary
- Survey Area (April 2013)



DRAWN: G Harewood  
 DATE : April 2013  
 SCALE: 1:10,000  
 MGA Zone 50

Loc 3819 - Sabina Vale  
 Wonnerup

**Habitat Trees  
 (>50cm DBH)**

# **APPENDIX A**

## **HABITAT TREE DETAILS**

HabitatTrees  
 Datum: GDA 94

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 5 (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt001	50H	352945	6273279	Marri	15-20	0											No Signs	No Signs	No	
wpt002	50H	353029	6273318	Marri	20+	0											No Signs	No Signs	No	
wpt003	50H	353034	6273330	Marri	20+	0											No Signs	No Signs	No	
wpt004	50H	353047	6273332	Marri	20+	0											No Signs	No Signs	No	
wpt005	50H	353050	6273300	Jarra	15-20	0											No Signs	No Signs	No	
wpt006	50H	353049	6273353	Marri	15-20	0											No Signs	No Signs	No	
wpt007	50H	353067	6273363	Marri	15-20	0											No Signs	No Signs	No	
wpt008	50H	353069	6273397	Marri	15-20	0											No Signs	No Signs	No	
wpt009	50H	353051	6273395	Marri	15-20	0											No Signs	No Signs	No	
wpt010	50H	353035	6273396	Marri	15-20	0											No Signs	No Signs	No	
wpt011	50H	353022	6273414	Marri	15-20	0											No Signs	No Signs	No	
wpt012	50H	353033	6273415	Marri	15-20	0											No Signs	No Signs	No	
wpt013	50H	353075	6273440	Marri	20+	0											No Signs	No Signs	No	
wpt014	50H	353095	6273433	Marri	20+	0											No Signs	No Signs	No	
wpt015	50H	353098	6273432	Marri	20+	0											No Signs	No Signs	No	
wpt016	50H	353109	6273442	Marri	20+	0											No Signs	No Signs	No	
wpt017	50H	353106	6273425	Marri	20+	0											No Signs	No Signs	No	
wpt019	50H	353101	6273400	Marri	20+	0											No Signs	No Signs	No	
wpt020	50H	353095	6273395	Marri	20+	0											No Signs	No Signs	No	
wpt021	50H	353095	6273378	Marri	15-20	0											No Signs	No Signs	No	
wpt022	50H	353104	6273370	Marri	20+	0											No Signs	No Signs	No	
wpt023	50H	353106	6273360	Marri	20+	0											No Signs	No Signs	No	
wpt024	50H	353108	6273355	Marri	15-20	0											No Signs	No Signs	No	
wpt025	50H	353092	6273346	Marri	20+	0											No Signs	No Signs	No	
wpt026	50H	353105	6273324	Jarra	15-20	0											No Signs	No Signs	No	
wpt027	50H	353196	6273291	Marri	20+	0											No Signs	No Signs	No	
wpt028	50H	353095	6273283	Jarra	15-20	0											No Signs	No Signs	No	
wpt029	50H	353065	6273269	Marri	20+	0											No Signs	No Signs	No	
wpt030	50H	353071	6273251	Jarra	15-20	0											No Signs	No Signs	No	
wpt031	50H	353074	6273238	Marri	15-20	0											No Signs	No Signs	No	
wpt032	50H	353080	6273236	Marri	20+	0											No Signs	No Signs	No	
wpt033	50H	353090	6273221	Marri	20+	0											No Signs	No Signs	No	
wpt034	50H	353083	6273213	Marri	15-20	0											No Signs	No Signs	No	
wpt035	50H	353070	6273231	Marri	15-20	0											No Signs	No Signs	No	
wpt036	50H	353034	6273205	Marri	20+	0											No Signs	No Signs	No	
wpt037	50H	353029	6273204	Marri	15-20	0											No Signs	No Signs	No	
wpt038	50H	353031	6273202	Marri	15-20	0											No Signs	No Signs	No	
wpt039	50H	353014	6273272	Marri	15-20	0											No Signs	No Signs	No	
wpt040	50H	352833	6273134	Dead Marri	5-10	1	Spout Trunk	20+									No Signs	No Signs	No	Too low and shallow
wpt041	50H	352831	6273135	Marri	15-20	0											No Signs	No Signs	No	
wpt042	50H	352822	6273138	Marri	20+	0											No Signs	No Signs	No	
wpt043	50H	352818	6273134	Marri	20+	0											No Signs	No Signs	No	
wpt044	50H	352812	6273135	Marri	20+	0											No Signs	No Signs	No	
wpt045	50H	352810	6273134	Marri	20+	0											No Signs	No Signs	No	
wpt046	50H	352825	6273146	Marri	20+	0											No Signs	No Signs	No	
wpt047	50H	352834	6273169	Marri	15-20	0											No Signs	No Signs	No	
wpt048	50H	352825	6273163	Marri	15-20	0											No Signs	No Signs	No	



Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 5 (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt049	50H	352817	6273156	Marri	15-20	0											No Signs	No Signs	No	
wpt050	50H	352828	6273185	Marri	20+	0											No Signs	No Signs	No	
wpt051	50H	352830	6273187	Marri	20+	0											No Signs	No Signs	No	
wpt052	50H	352831	6273194	Marri	20+	0											No Signs	No Signs	No	
wpt053	50H	352827	6273201	Marri	20+	0											No Signs	No Signs	No	
wpt054	50H	352827	6273205	Marri	15-20	0											No Signs	No Signs	No	
wpt055	50H	352836	6273218	Marri	15-20	0											No Signs	No Signs	No	
wpt056	50H	352830	6273226	Marri	15-20	0											No Signs	No Signs	No	
wpt057	50H	352801	6273183	Marri	20+	0											No Signs	No Signs	No	
wpt058	50H	352788	6273187	Marri	20+	0											No Signs	No Signs	No	
wpt059	50H	352773	6273178	Marri	15-20	0											No Signs	No Signs	No	
wpt060	50H	352778	6273166	Marri	15-20	0											No Signs	No Signs	No	
wpt061	50H	352773	6273142	Marri	20+	0											No Signs	No Signs	No	
wpt062	50H	352771	6273133	Marri	20+	0											No Signs	No Signs	No	
wpt063	50H	352764	6273139	Marri	20+	0											No Signs	No Signs	No	
wpt064	50H	352761	6273135	Marri	20+	0											No Signs	No Signs	No	
wpt065	50H	352757	6273134	Marri	20+	0											No Signs	No Signs	No	
wpt066	50H	352757	6273134	Marri	20+	0											No Signs	No Signs	No	
wpt067	50H	352752	6273132	Marri	20+	0											No Signs	No Signs	No	
wpt068	50H	352749	6273138	Marri	20+	0											No Signs	No Signs	No	
wpt069	50H	352756	6273144	Marri	20+	0											No Signs	No Signs	No	
wpt070	50H	352759	6273150	Marri	15-20	0											No Signs	No Signs	No	
wpt071	50H	352750	6273145	Marri	15-20	0											No Signs	No Signs	No	
wpt072	50H	352743	6273143	Marri	15-20	0											No Signs	No Signs	No	
wpt073	50H	352720	6273134	Marri	20+	0											No Signs	No Signs	No	
wpt074	50H	352725	6273160	Dead Unknown	15-20	0											No Signs	No Signs	No	
wpt075	50H	352718	6273161	Marri	15-20	5+	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Spout Branch	5-12	No Signs	No Signs	No	
wpt076	50H	352730	6273180	Dead Unknown	5-10	1	Spout Trunk	20+									No Signs	No Signs	No	Too low and shallow
wpt077	50H	352713	6273162	Marri	20+	1	Fissure	20+									No Signs	No Signs	Yes	Depth of hollow unkown
wpt078	50H	352710	6273130	Marri	15-20	0											No Signs	No Signs	No	
wpt079	50H	352702	6273134	Marri	20+	0											No Signs	No Signs	No	
wpt080	50H	352704	6273139	Marri	15-20	0											No Signs	No Signs	No	
wpt081	50H	352697	6273139	Marri	20+	0											No Signs	No Signs	No	
wpt082	50H	352697	6273128	Marri	20+	0											No Signs	No Signs	No	
wpt083	50H	352697	6273128	Marri	20+	0											No Signs	No Signs	No	
wpt084	50H	352679	6273126	Marri	15-20	0											No Signs	No Signs	No	
wpt085	50H	352672	6273139	Dead Marri	20+	0											No Signs	No Signs	No	
wpt086	50H	352677	6273149	Dead Unknown	15-20	0											No Signs	No Signs	No	
wpt087	50H	352678	6273169	Marri	20+	0											No Signs	No Signs	No	
wpt088	50H	352540	6273277	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt089	50H	352536	6273275	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt090	50H	352536	6273270	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt091	50H	352537	6273268	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt092	50H	352527	6273271	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt093	50H	352524	6273261	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt094	50H	352526	6273259	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt095	50H	352515	6273252	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt096	50H	352506	6273248	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt097	50H	352489	6273244	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt098	50H	352482	6273238	Flooded Gum	15-20	0											No Signs	No Signs	No	

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 5 (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt099	50H	352477	6273232	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt100	50H	352477	6273233	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt101	50H	352509	6273321	Marri	15-20	0											No Signs	No Signs	No	
wpt102	50H	352503	6273317	Marri	15-20	0											No Signs	No Signs	No	
wpt103	50H	352499	6273320	Marri	15-20	0											No Signs	No Signs	No	
wpt104	50H	352487	6273310	Marri	15-20	0											No Signs	No Signs	No	
wpt105	50H	352474	6273300	Marri	15-20	0											No Signs	No Signs	No	
wpt106	50H	352473	6273296	Marri	15-20	0											No Signs	No Signs	No	
wpt107	50H	352470	6273296	Marri	15-20	0											No Signs	No Signs	No	
wpt108	50H	352461	6273294	Marri	15-20	0											No Signs	No Signs	No	
wpt109	50H	352454	6273298	Marri	15-20	0											No Signs	No Signs	No	
wpt110	50H	352447	6273303	Marri	15-20	0											No Signs	No Signs	No	
wpt111	50H	352437	6273304	Marri	15-20	0											No Signs	No Signs	No	
wpt112	50H	352430	6273312	Marri	15-20	0											No Signs	No Signs	No	
wpt113	50H	352454	6273322	Marri	15-20	0											No Signs	No Signs	No	
wpt114	50H	352481	6273339	Dead Unknown	20+	5+	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	No Signs	No Signs	No	
wpt115	50H	352447	6273348	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt116	50H	352420	6273353	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt117	50H	352364	6273479	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt118	50H	352272	6273341	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt119	50H	352339	6273347	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt120	50H	352337	6273352	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt121	50H	352346	6273358	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt122	50H	352353	6273354	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt123	50H	352350	6273345	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt124	50H	352354	6273335	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt125	50H	352376	6273335	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt126	50H	352395	6273309	Marri	20+	0											No Signs	No Signs	No	
wpt127	50H	352403	6273305	Marri	20+	0											No Signs	No Signs	No	
wpt128	50H	352391	6273286	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt129	50H	352403	6273276	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt130	50H	352402	6273270	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt131	50H	352385	6273255	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt132	50H	352366	6273283	Marri	15-20	0											No Signs	No Signs	No	
wpt133	50H	352356	6273283	Marri	15-20	0											No Signs	No Signs	No	
wpt134	50H	352429	6273268	Flooded Gum	20+	0											No Signs	No Signs	No	
wpt135	50H	352442	6273232	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt136	50H	352475	6273144	Marri	20+	0											No Signs	No Signs	No	
wpt137	50H	352429	6273132	Marri	20+	0											No Signs	No Signs	No	
wpt138	50H	352412	6273127	Marri	15-20	0											No Signs	No Signs	No	
wpt139	50H	352380	6273127	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt140	50H	352367	6273122	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt141	50H	352356	6273120	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt142	50H	352335	6273095	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt143	50H	352357	6273091	Flooded Gum	15-20	5+	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	No Signs	No Signs	No	
wpt144	50H	352323	6273179	Marri	20+	0											No Signs	No Signs	No	
wpt145	50H	352318	6273195	Marri	20+	0											No Signs	No Signs	No	
wpt146	50H	352270	6273107	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt147	50H	352259	6273172	Marri	15-20	0											No Signs	No Signs	No	
wpt148	50H	352259	6273175	Marri	15-20	0											No Signs	No Signs	No	

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 5 (cm)	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt149	50H	352235	6273221	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt150	50H	352215	6273199	Marri	15-20	0											No Signs	No Signs	No	
wpt151	50H	352212	6273195	Marri	15-20	0											No Signs	No Signs	No	
wpt152	50H	352211	6273164	Marri	15-20	0											No Signs	No Signs	No	
wpt153	50H	352196	6273172	Marri	15-20	0											No Signs	No Signs	No	
wpt154	50H	352185	6273185	Marri	15-20	0											No Signs	No Signs	No	
wpt155	50H	352157	6273167	Marri	15-20	0											No Signs	No Signs	No	
wpt156	50H	352142	6273162	Marri	15-20	0											No Signs	No Signs	No	
wpt157	50H	352141	6273159	Marri	15-20	0											No Signs	No Signs	No	
wpt158	50H	352122	6273145	Marri	15-20	0											No Signs	No Signs	No	
wpt159	50H	352119	6273142	Marri	20+	0											No Signs	No Signs	No	
wpt160	50H	352108	6273165	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt161	50H	352105	6273188	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt162	50H	352133	6273219	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt163	50H	352189	6273244	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt164	50H	352156	6273262	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt165	50H	352151	6273262	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt166	50H	352151	6273281	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt167	50H	352132	6273268	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt168	50H	352116	6273260	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt169	50H	352099	6273205	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt170	50H	352089	6273191	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt171	50H	352042	6273187	Flooded Gum	15-20	5+	Knot Hole	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	No Signs	No Signs	No	
wpt172	50H	352031	6273166	Flooded Gum	10-15	5+											No Signs	No Signs	No	
wpt173	50H	352020	6273149	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt174	50H	352051	6273155	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt175	50H	352024	6273056	Flooded Gum	15-20	1	Fissure	5-12									No Signs	No Signs	No	
wpt176	50H	352027	6273043	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt177	50H	352027	6273041	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt178	50H	352026	6273039	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt179	50H	352025	6273037	Flooded Gum	15-20	0											No Signs	No Signs	No	
wpt180	50H	352115	6273002	Marri	20+	0											No Signs	No Signs	No	
wpt181	50H	352097	6272986	Marri	20+	0											No Signs	No Signs	No	
wpt182	50H	352095	6272986	Marri	20+	0											No Signs	No Signs	No	
wpt183	50H	352121	6272980	Flooded Gum	10-15	0											No Signs	No Signs	No	
wpt184	50H	352058	6272955	Marri	15-20	0											No Signs	No Signs	No	
wpt185	50H	352051	6272936	Flooded Gum	10-15	0											No Signs	No Signs	No	
wpt186	50H	352036	6272919	Flooded Gum	10-15	0											No Signs	No Signs	No	
wpt187	50H	352046	6272828	Marri	20+	2	Knot Hole	5-12	Knot Hole	5-12							Bees	No Signs	No	
wpt188	50H	352080	6272842	Marri	20+	0											No Signs	No Signs	No	
wpt189	50H	352241	6272968	Dead Marri	20+	5+	Knot Hole	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	No Signs	No Signs	No	
wpt190	50H	352323	6273000	Marri	15-20	1											No Signs	No Signs	No	
wpt191	50H	352347	6273007	Marri	15-20	0											No Signs	No Signs	No	
wpt192	50H	352350	6272982	Marri	20+	0											No Signs	No Signs	No	
wpt193	50H	352350	6273018	Marri	20+	0											No Signs	No Signs	No	
wpt194	50H	352410	6272981	Marri	20+	0											No Signs	No Signs	No	
wpt196	50H	352424	6273807	Marri	20+	5+	Knot Hole	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Bees	No Signs	No	
wpt197	50H	352395	6273791	Marri	20+	5+	Knot Hole	5-12	Branch	5-12	Branch	5-12	Branch	5-12	Branch	5-12	No Signs	No Signs	No	

# FAUNA ASSESSMENT

(Level 1)

Loc 7 and 3819  
(Sussex Land District)

Wonnerup South

JUNE 2006

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## TABLE OF CONTENTS

1. INTRODUCTION.....	1
2. PREVIOUS STUDIES .....	2
3. METHODOLOGY .....	3
3.1 FAUNA HABITAT ASSESSMENT .....	3
3.2 FAUNA INVENTORY.....	3
3.2.1 Opportunistic Fauna Survey.....	3
3.2.2 Potential Fauna .....	3
3.2.3 Fauna of Conservation Significance.....	4
3.2.4 Other Species of Significance .....	6
3.3 WESTERN RINGTAIL POSSUM SURVEY .....	6
4. LIMITATIONS OF THE STUDY.....	7
5. RESULTS.....	8
5.1 FAUNA HABITAT ASSESSMENT .....	8
5.1.1 Regional Biological Context.....	8
5.1.2 Fauna Habitats within the Study Area .....	9
5.2 FAUNA INVENTORY.....	10
5.2.1 Opportunistic Fauna Surveys .....	10
5.2.2 Potential Fauna .....	10
5.2.3 Fauna of Conservation Significance.....	11
5.2.4 Other Species of Significance .....	20
5.3 WESTERN RINGTAIL POSSUM SURVEY .....	20



5.3.1 Western Ringtail Possum Habitat.....	20
5.3.2 WRP Habitats within Study Area .....	21
5.3.3 WRP Habitats Adjacent to Development Site.....	22
5.3.4 Daytime Surveys .....	22
5.3.5 Night Time Surveys .....	23
6. POTENTIAL IMPACTS.....	23
7. MANAGEMENT .....	25
8. LEGISLATIVE OBLIGATIONS .....	27
8.1 WILDLIFE CONSERVATION ACT 1950.....	27
8.2 COMMONWEALTH ENVIRONMENTAL PROTECTION & BIODIVERSITY CONSERVATION ACT 1999 .....	27
9. CONCLUSION .....	28
10. REFERENCES.....	29

## **FIGURES**

FIGURE 1: Site Location

FIGURE 2: Study Area Airphoto

FIGURE 3: Fauna Habitats

FIGURE 4: Daytime Survey Results – 24<sup>th</sup> April and 15<sup>th</sup> May 2006

FIGURE 5: Nigh Time Survey Results – 11<sup>th</sup> and 24<sup>th</sup> May 2006

FIGURE 6: Nigh Time Survey Results – 7<sup>th</sup> and 8<sup>th</sup> June 2006

## **TABLES**

TABLE 1: Western Australian Threatened Fauna Categories

TABLE 2: CALM Priority Fauna Categories

TABLE 3: Summary of Potential Vertebrate Species

## **APPENDICES**

APPENDIX A: Potential Fauna Species List

APPENDIX B: CALM Threatened Fauna Database Search (May 2006)

## STATEMENT OF LIMITATIONS

### Scope of Services

This fauna assessment report (“the report”) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Greg Harewood (“the Author”). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

### Reliance on Data

In preparing the report, the Author has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report (“the data”). Except as otherwise stated in the report, the Author has not verified the accuracy of completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (“conclusions”) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. The Author will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to the Author.

### Environmental Conclusions

In accordance with the scope of services, the Author has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

Within the limitations imposed by the scope of services, the field assessment and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.



### **Report for Benefit of Client**

The report has been prepared for the benefit of the Client and no other party. The Author assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of the Author or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

### **Other Limitations**

The Author will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.



# 1. INTRODUCTION

This report has been prepared in response to an invitation from Bemax Resources to carry out a Level 1 (EPA 2004) fauna assemblage survey over an area of land south of Wonnerup in south west Western Australia.

The study site is located about 7 kilometres east of Busselton and is centred at approximately 33° 39' 37" S and 115° 25' 16" E. The site includes sections of Sussex Location 7 and 3819 (Figures 1 & 2). The properties are currently being assessed for their potential to support a heavy mineral sand mine. It should be noted that Location 7 is classified as "Mineral to Owner" and is therefore not covered by a mining tenement. The Abba River reserve, while it runs through Location 7 has no granted tenement over it and therefore does not form part of the mining proposal. Location 3819 and the Sabina River reserve are covered by Mining Lease 70/785. In this case permission from the Minister for State Development (in addition to other Government departments) is required prior to any mining taking place within the reserve.

The exact extent of mining operations, if they proceed, has not as yet been finalised and the fauna assessment reported on here has been limited to areas most likely to be impacted on based on know data. Some areas of vegetation in close proximity to potential mine areas were also assessed. In total the properties have an area in excess of 1,000 ha, with the area of potential impact being restricted to sections of the central and northern halves of each property.

The assessment was carried out with reference to guidance and position statements published by the WA Environmental Protection Authority on fauna surveys and environmental protection (EPA 2002b; EPA 2004). The minimum requirements for a Level 1 fauna assemblage survey as defined in these documents are:

## Background research or 'desktop' study

The purpose is to gather background information on the target area (usually at the locality scale). This involves a search of all sources for literature, data and map-based information.

## Reconnaissance survey

The purposes are:

- i) to verify the accuracy of the background study;
- ii) to further delineate and characterise the fauna and faunal assemblages present in the target area; and
- iii) to identify potential impacts.



This involves a target area visit by suitably qualified personnel to undertake selective, low intensity sampling of the fauna and faunal assemblages, and to provide habitat descriptions and habitat maps of the project area.

## 2. PREVIOUS STUDIES

The study area has previously been assessed for flora, vegetation and vertebrate fauna by Mattiske Consulting Pty Ltd and M.J. and A.R. Bamford in 1998 (Mattiske Consulting *et al* 1998).

The main objectives of this study were to document the vascular plant species in the area, review the conservation status of the species, search for any rare and endangered flora species, define and map the plant communities, document the vertebrate fauna species likely to be found in the area and review the local and regional significance of the flora and fauna species and the plant communities in the area.

During this assessment a total of fifteen vascular plant species from thirteen genera and ten families were recorded in the Grice(Loc 3819)/Location 7 area. The low number of species recorded was attributed to the high degree of clearing and agricultural activities within the properties. No Declared Rare Flora as defined under subsection (2) of section 23F of the Wildlife Conservation Act 1950 or Priority Species as defined by the Department of Conservation and Land Management (current in 1997) were found.

A vegetation map of the Grice/Location 7 Area was produced using information from foot traverses of areas supporting native vegetation, and interpretation of aerial photographs. Two plant communities supporting 16 taxa were mapped, consisting of agricultural land and woodland. The dominant plant community consisted of highly modified agricultural land, with negligible conservation value in relation to native vegetation. The woodland community, found along sections of the Abba River, the Sabina River and Woddidup Creek were noted as being very degraded and not under any “direct threat with respect to conservation significance”.

Strangely, some significant areas of vegetation such as the Marri-Banksia woodland found in the central area of Location 7 were not commented on or include in the vegetation mapping.

The vertebrate fauna assessment by M and A Bamford did not involve any field reconnaissance and was restricted to a desktop study utilising information gained from the botanical survey and various published and unpublished documents. The assessment concluded that, due to the substantially developed nature of the site, most of the fauna present or expected to be present would consist of relatively common species that favour cleared or partly



cleared agricultural environments and most are therefore not of conservation significance.

It was noted however that Isolated large trees in agricultural areas can be of conservation value as they may be nesting/roosting sites or provide "stepping stones" that allow fauna to move across otherwise inhospitable terrain. In addition it was stated that the most significant features of the site for fauna are the two strips of remnant woodland associated with the watercourses (Sabina and Abba Rivers) that run through the properties as they, if nothing else, provide a corridor for the movement of fauna through the site.

The fauna assessment determined that about 140 species of terrestrial vertebrate fauna could be expected to occur within the study area. This list has been reviewed as part of the assessment reported on here. This review has also included an update on the conservation status of each species.

### **3. METHODOLOGY**

#### **3.1 FAUNA HABITAT ASSESSMENT**

A habitat assessment was carried out specifically targeting the likely habitats of listed (under the relevant Federal and State Acts) threatened vertebrate species potentially occurring in the general area. The main aim of the habitat assessment was to determine if it was likely that any threatened species would be utilising the area, in addition to providing information on general fauna that may be present.

The initial phase of the assessment involved the review of available information on the habitats of the threatened species possibly occurring in the region. During the field survey the habitat at the site was assessed to determine its potential to be hosting any of the listed threatened species in addition to aiding in the compilation of a potential fauna list.

#### **3.2 FAUNA INVENTORY**

##### **3.2.1 Opportunistic Fauna Survey**

During the course of the reconnaissance field work non-systematic opportunistic observations of fauna species were made and recorded. Secondary evidence of fauna such as tracks, diggings and scats were also noted. Some active searching was undertaken in specific areas with the aim of locating the more elusive frog and reptile species that may inhabit the site.

##### **3.2.2 Potential Fauna**

A list of all vertebrate fauna potentially occurring within the study area was compiled from searches done on the WA Museum Database, the Department of



Conservation and Land Managements Threatened Fauna Database, Department of the Environment and Heritage Departments Commonwealth Environment Protection and Biodiversity Conservation Database, Birds Australia’s ‘birdata”, published and unpublished reports and specialist books detailing fauna of the general area. Species observed during field work have also been included. The results of the habitat assessment also provided information on the potential fauna assemblage.

Taxonomy and nomenclature for fauna species used in this report generally follow Aplin and Smith (2001) for amphibians and reptiles, How *et al.* (2001) for mammals and Johnstone (2001) for birds. Some names, including common names recommended for national and international use by Christidis and Boles (1994) for birds, are also used. Common names for reptiles and amphibians come from a variety of sources and are not necessarily generally accepted. Sources include Bush *et al* (2002), Tyler *et al.* (2000) and Glauret (1961).

### 3.2.3 Fauna of Conservation Significance

The conservation status of fauna species in Western Australia is assessed under the federal *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the state administered *Western Australian Wildlife Conservation Act 1950* (WAWC Act).

Under the EPBC Act threatened fauna may be listed in any one of the following categories as defined in Section 179 of the Act:

- Extinct;
- \*Extinct in the wild;
- \*Critically endangered;
- \*Endangered;
- \*Vulnerable; and
- Conservation dependent.

\*Only species in those categories marked with an asterisk are matters of national environmental significance under the EPBC Act.

The WAWC Act uses a set of schedules (see Table 1) in addition to utilising the categories defined by the EPBC Act.

**Table 1: Western Australian Threatened Fauna Categories**

Category	Code	Description
Schedule 1	S1	Fauna which is rare or likely to become extinct





Schedule 2	S2	Fauna which is presumed extinct
Schedule 3	S3	Birds which are subject to an agreement between the governments of Australia and Japan (JAMBA) relating to the protection of migratory birds and birds in danger of extinction
Schedule 4	S4	Fauna that is otherwise in need of special protection

In Western Australia, the Department of Conservation and Land Management (CALM) also produce a supplementary list of priority fauna. The species listed are not considered threatened under the WAWC Act, but due to lack of knowledge or where species are poorly represented in secure conservation reserves some concern for their long term survival exists. The five classifications levels are shown in Table 2.

**Table 2: CALM Priority Fauna Categories**

Category	Code	Description
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring (Not currently threatened or in need of special protection, but could be if present circumstances change)
Priority 5	P5	Taxa in need of monitoring (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)

The EPBC Act also requires the compilation of a list of migratory species that are recognized under international treaties including the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA) and the Bonn Convention (The Convention on the conservation of Migratory Species of Wild Animals). Species listed under JAMBA are also protected under Schedule 3 of the WAWC Act.

The conservation status of all the vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the study area have been assessed using the most recent lists published in accordance with the above-mentioned Acts



and CALM's priority fauna list and are indicated in the fauna listings of this report.

It should be noted that there are currently discrepancies between the Western Australian and Commonwealth threatened species lists. In an attempt to address this issue CALM and the Commonwealth Department of Environment and Heritage (DEH) have initiated an "alignment of lists" project where CALM provides advice on threatened species to the DEH so specific species can be assessed under the EPBC Act and the DEH database updated. This project is still in progress and subsequent changes in the DEH database may result in variations to the listings and classifications used for the project reported on here.

### 3.2.4 Other Species of Significance

A number of other species not listed in official lists can also be considered of regional conservation significance. These include species that have a restricted range, those that occur in breeding colonies and those at the limit of their range.

While not classified as rare, threatened or vulnerable under any State or Commonwealth legislation, a number of bird species have been listed as of significance on the Swan Coastal portion of the Perth Metropolitan Region (Bush Forever - Government of Western Australia 1998 and 2000). The bird species are often referred to as Bush Forever Decreaser Species. The two categories used for birds within the Bush Forever documents are:

- Habitat specialists with reduced distribution on the Swan Coastal Plain (code Bh)
- Wide ranging Species with reduced population's on the Swan Coastal Plain. (code Bp)

Other fauna species of regional significance due to declining populations on the Swan Coastal Plain, especially between Mandurah and Busselton, include the Honey Possum and Pygmy Possum (Dell 2000).

If present the species listed should be taken into consideration when determining the fauna value of an area to ensure actions are taken that will aid in their continued existence in the region. Bush forever decreaser bird species are indicated as such within the species list held in Appendix A.

### 3.3 WESTERN RINGTAIL POSSUM SURVEY

As the presence of Western Ringtail Possums (WRPs - *Pseudocheirus occidentalis*) was anticipated targeted surveys for this listed threatened species were undertaken. The survey followed development planning guidelines for Western Ringtail Possums (WRPs) issued by CALM (2003).



The aims of the WRP assessment were:

- To determine the impact of the proposed development on resident or local WRPs;
- To provide a snapshot of WRP management issues that would need to be addressed prior to the proposal proceeding; and
- To provide an opportunity for the proposal to be amended to incorporate WRP conservation management strategies.

The assessment included a daytime (carried out during other opportunistic and habitat surveys) and two night time surveys (two on each property – four in total) for WRP dreys (nests made of vegetation, located in trees), scats (droppings) and individuals both within the bounds of the development and in some adjacent areas. The amount and quality of WRP habitat within and adjacent to the proposed development site is documented.

Western Ringtail Possums are classified as threatened under the *Western Australian Wildlife Conservation Act* (1950) and under the federal *Environmental Protection and Biodiversity Conservation Act* (1999). The species distribution has reduced dramatically since European settlement for a number of reasons. Currently, in the south west, destruction of habitat is the main threatening process. The management strategies adopted to help maintain the existing populations in the region are aimed at minimising the impact of land developments. This is best achieved by encouraging the retention of as much in-situ habitat as possible. The translocation of individuals to other areas is the least preferred option.

#### 4. LIMITATIONS OF THE STUDY

The fauna assessment was designed and carried out to conform with a Level 1 survey as defined in EPA Guidance statement No. 56 (EPA 2004). The assessment was limited to a desktop analysis aimed at providing a list of expected species, daytime site visits primarily aimed at habitat assessment and opportunistic fauna observations in addition to night time surveys specifically targeting WRPs. No fauna trapping or seasonal sampling has been conducted. The lack of observational data on some species should not be taken as necessarily indicating that a species is absent from the site.

In recognition of survey limitations a precautionary approach has been adopted for this assessment. Any species that would possibly occur within the study area as identified through ecological databases, publications and the habitat knowledge of the Author has been assumed to potentially occur in the study area.



## 5. RESULTS

### 5.1 FAUNA HABITAT ASSESSMENT

#### 5.1.1 Regional Biological Context

The project area is situated within the south west margin of the Swan Coastal Plain. The Swan Coastal Plain Bioregion (SWA) is classified as part of the Interim Biogeographical Regionalisation for Australia. The SWA bioregion is described as being a:

*“Low lying coastal plain mainly covered with Woodlands. It is dominated by Banksia or Tuart on sandy soils, Casuarina obesa on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah Woodland. Warm Mediterranean. Three phases of marine sand dune development provide relief.*

*The outwash plains, once dominated by Casuarina obesa – Marri Woodlands and Melaleuca shrublands, are extensive only in the south.”* (Thackway and Cresswell, 1996; IBRA, 2000).

The study area mostly lies within a section of the Bassendean Dunes System which in this area consists of gently sloping low dunes and rises with well drained, deep, leached grey sands. Low lying areas to the north of the dune system consist of poorly drained flats with heavy clayey soils. Adjacent to the Sabina and Abba Rivers the landform typically consists of narrow floodplains or swampy depressions with clayey alluvial soils. Some sections of the low lying areas are subject to periodic flooding.

The study area falls within the Drummond Botanical Subdistrict of the Southwest Botanical Province (Beard 1990). This subdistrict was mainly Banksia low woodland on leached sands with Melaleuca swamps in poorly drained areas. Woodlands of Tuart (*Eucalyptus gomphocephala*), Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) occurred on less leached soils.

Mapping by Mattiske and Havel (1998) as part of the South West Regional Forest Agreement shows the study area as occurring on the interface between the Southern River, Ludlow and the Abba vegetation complexes. These complexes are dominated by open woodlands of Marri (*Corymbia calophylla*) – Jarrah (*Eucalyptus marginata*), *Banksia* spp. with the proportion of *Banksia* increasing on the drier sand dunes. On the drainage lines and the flats, Peppermint (*Agonis flexuosa*) occurs in association with Flooded Gum (*Eucalyptus rudis*) and Swamp Paperbark (*Melaleuca raphiophylla*).



## 5.1.2 Fauna Habitats within the Study Area

The extent of the broadly defined fauna habitats within the study area are shown in Figure 3 with a description of each given below.

1. **Cleared Pasture** – Cleared farmland with a mixture of introduced pasture grasses, clovers, weeds and degraded sedgelands. These areas also contains scattered trees in various densities (mostly *Agonis flexuosa*, *Corymbia calophylla*, *Eucalyptus rudis*, *Melaleuca* spp.). Some areas of the cleared pasture are inundated during winter and provide foraging habitat for birds of prey, waterbird species and breeding grounds for frogs. While scattered and limited in number, the remaining trees provide roosting, foraging and breeding opportunities (hollows) for fauna. No fallen logs or understorey are generally present.
2. **Flooded Gum (*Eucalyptus rudis*) – Marri (*Corymbia calophylla*) – Peppermint (*Agonis flexuosa*) - *Melaleuca* spp. Woodland:** Present along the Abba and Sabina Rivers. Understorey and ground cover has been severely degraded and typically consists only of introduced weeds and grasses. Some rehabilitation has been initiated along the Sabina River and this section has been fenced to keep stock out. The Abba River reserve is not fenced. Both rivers are seasonal and provide refuge and foraging opportunities for waterbirds and frog species. A significant number of hollows are found with the larger trees. Sub-dominant Peppermint provides potential Western Ringtail Possum habitat. The river vegetation (in particular the Sabina River) provides an important wildlife corridor across the coastal plain in this area.
3. **Marri (*Corymbia calophylla*) Open Woodland:** Parkland cleared marri is present over a section of pasture in Location 3819 and in the central section of Location 7. Most trees are relatively young and contain no hollows. Potential breeding and foraging habitat for a limited range of fauna species. No fallen logs or understorey are present.
3. **Peppermint (*Agonis flexuosa*) Open Forest:** Several small patches of Peppermint dominated, parkland cleared open forest are present in certain areas of the study area. These provide potential Western Ringtail Possum habitat. No understorey is present and a groundcover of grasses and weed species typically dominates.
4. **Marri (*Corymbia calophylla*) - *Banksia* sp - Jarrah (*Eucalyptus marginata*) - Peppermint (*Agonis flexuosa*) Open Forest over *Kunzea ericifolia*:** Present in the central area of Location 7. Density and ratio of various component species varies considerably. Some large marri with hollows. Open to grazing and some sections recently burnt. Understorey severely degraded to non existent (parkland cleared). Also contains some



*Nuytsia floribunda*, Woody Pear (*Xylomelum occidentale*). While degrade provides suitable habitat for a range of fauna species and is the largest area of remnant vegetation outside of the river reserves. Some small fallen logs present.

5. **Melaleuca spp Low Closed Forest:** Several small patches of seasonally inundated Melaleuca dominated swamps are present. The areas are open to grazing. No understorey is present and a groundcover of grasses and weed species dominates. Potential feeding and roosting sites for some waterbirds during wetter months.
6. **Melaleuca spp Low Open Woodland over Melaleuca spp Open Shrubland:** Covers a section of grazing land at the northern end of Location 7. Seasonally inundated.

## 5.2 FAUNA INVENTORY

### 5.2.1 Opportunistic Fauna Surveys

The results of the opportunistic fauna survey are summarised in Table 3 and listed in Appendix A. A total of 45 fauna species were observed (or positively identified from scats, tracks, skeletons or calls) within the study area during the reconnaissance survey, six of which are introduced feral species. Two listed threatened species were observed (Baudin's Black Cockatoo and the Western Ringtail Possum). Nine bush forever decreaser bird species were observed (includes 1 threatened species).

### 5.2.2 Potential Fauna

Table 3 summarises the numbers of potential species based on vertebrate class. A complete list of terrestrial vertebrate fauna possibly inhabiting or frequently the study area is held in Appendix A.

Details on specially protected and priority species expected and/or listed as potentially occurring in the general area are given in the section 5.2.3.

Not all species listed as potentially occurring within the study area (based on searches of the EPBC Act's Threatened Fauna and Migratory species lists, CALM's Threatened Fauna Database and various publications) are shown in the expected listing in Appendix A. Some species have been excluded from this list based largely on the lack of suitable habitat within the study area. Explanations of specific omissions are provided below.

Despite the omission of some species It should be noted that the list provided is very likely still an overestimation of the fauna species utilising the site (either on a regular or infrequent basis) as a result of the precautionary approach adopted for the assessment.



**Table 3: Summary of Potential Fauna Species (As listed in Appendix A)**

Group	Total number of potential species	Number of specially protected species	Number of priority /migratory species	Number of species observed
Amphibians	9	0	0	2
Reptiles	23	0	0	1
Birds	90 <sup>2</sup>	3	3	34 <sup>1</sup>
Mammals	25 <sup>7</sup>	1	4	8 <sup>3</sup>

Note: Some species fall into more than one category of protection, Superscript indicates number of introduced species

### 5.2.3 Fauna of Conservation Significance

A search of EPBC Act's Threatened Fauna list, CALM's Threatened Fauna Database and Priority List and scientific publications identified 17 specially protected, priority or migratory fauna species as potentially occurring in the general study area. A brief account of these species with details on their distribution and habitat preference are given below.

#### **Perth Lined Lerista *Lerista lineata***

Status and Distribution: Listed as Priority 3 by CALM. Found in the lower west coast from Perth to Mandurah. Records also exist for West Busselton, Rottnest Island and Garden Island (Storr *et al* 1999). The Busselton distribution is based on a single old WAM record and is considered erroneous by Bamford (1998).

Habitat: This small species of skink inhabits white sands (Storr *et a*, 1999) under areas of shrubs and heath where it inhabits loose soil and leaf litter (Nevill 2005) particularly in association with banksias (Bush *et al* 2002).

Likely presence in study area: The single record from West Busselton is considered erroneous and this species is therefore not considered likely to be present in the study area. The most southerly confirmed record of this species is 15km south of Mandurah (Youngson and Harold 1989).

Potential impact of proposed development: No Impact on this species is anticipated as it is unlikely to be present and it is not listed in this report as a potential species.

#### **Great Egret *Ardea alba***





Status and Distribution: This species of egret is listed as migratory under the *EPBC Act (1999)* and under international agreements to which Australia is a signatory. The Great Egret is common and very widespread in any suitable permanent or temporary habitat (Morcombe 2003).

Habitat: Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs (Morcombe 2003).

Likely presence in study area: Likely to infrequently visit select points across the site in low numbers, particularly areas inundated during winter and along the Sabina and Abba Rivers. No suitable breeding areas appear to present.

Potential impact of proposed development: No impact on this species is anticipated. The majority of existing natural habitat will remain unaffected and extensive areas of cleared pasture that is flooded in winter is present in surrounding areas. No evidence of breeding sites were found within the works footprint.

#### **Cattle Egret *Ardea ibis***

Status and Distribution: This species of egret is listed as migratory under the *EPBC Act 1999* and under international agreements to which Australia is a signatory. The Cattle Egret is common in the north sections of its range but is an irregular visitor to the better watered parts of the state (Johnstone and Storr 1998). The population is expanding (Morcombe 2003).

Habitat: Moist pastures with tall grasses, shallow open wetlands and margins, mudflats (Morcombe 2003).

Likely presence in study area: As with the Great Egret, possibly visits select points across the site in low numbers, particularly areas inundated during winter and along the Sabina and Abba Rivers. No suitable breeding areas appear to present.

Potential impact of proposed development: No impact on this species or its potential habitat is anticipated.

#### **White-bellied Sea Eagle *Haliaeetus leucogaster***

Status and Distribution: This species is listed as migratory under the *EPBC Act (1999)* and under international agreements to which Australia is a signatory. White-bellied sea eagles are moderately common to common on Kimberley and Pilbara islands, coasts and estuaries, on Bernier, Dorre and Dirk Hartog Is., in Houtman Abrolhos and in the Archipelago of the Recherche; rare to uncommon elsewhere (Johnstone and Storr 1998). Also found in New Guinea, Indonesia, China, southeast Asia and India. Scarce near major coastal cities (Morcombe 2003).



Habitat: They nest and forage usually near the coast over islands, reefs, headlands, beaches, bays, estuaries, mangroves, but will also live near seasonally flooded inland swamps, lagoons and floodplains, often far inland on large pools of major rivers. Established pairs usually sedentary, immatures dispersive (Morcombe 2003) . White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession.

Likely presence in study area: The species may occasionally fly over the study site but is very unlikely to specifically target the area for foraging or nesting.

Potential impact of proposed development: No impact on this species or its potential habitat is anticipated. It is not listed in this report as a potential species.

### **Peregrine Falcon *Falco perigrinus***

Status and Distribution: This species is listed as Schedule 4 under the *WC Act 1950*. Individuals of this species are uncommon/rare but wide ranging across Australia. Moderately common at higher levels of the Stirling Range, uncommon in hilly, north west Kimberley, Hamersley and Darling Ranges; rare or scarce elsewhere (Johnstone and Storr 1998).

Habitat: Diverse from rainforest to arid shrublands, from coastal heath to alpine (Morcombe 2003). Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes (Johnstone and Storr 1998). The species utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. It will also occasionally use the abandoned nests of other birds of prey.

Likely presence in study area: The species potentially utilises some sections of the study area as part of a much larger home range.

Potential impact of proposed development: Loss of any existing nest sites has the potential to impact on this species. The majority of the potential impact area is cleared with only scattered trees. No potential nest sites were observed in these areas. The remnant bushland in the centre of Location 7 contains some large trees (including broken spouts) that could potentially be used as nest sites by Peregrines but no evidence of use was found and it is uncertain if these will be impacted on in any event. It is therefore very unlikely that this species will suffer any impact as a result of the proposed mine.

### **Baudin's Black- Cockatoo *Calyptorhynchus baudinii***

Status and Distribution: Listed as Scheduled 1 under the *WC Act (1950)* and as Vulnerable under the *EPBC Act (1999)*. Confined to the south-west of Western Australia, north to Gidgegannup, east to Mt Helena, Wandering, Quindanning, Kojonup, Frankland and King River and west to the eastern strip of the Swan



Coastal Plain including West Midland, Byford, Nth Dandalup, Yarloop, Wokalup and Bunbury. (Johnstone and Storr 1998).

Habitat: Mainly eucalypt forests where it feeds primarily on the Marri seeds, (Morcombe 2003), Banksia, Hakea and *Erodium* sp. Also strips bark from trees in search of beetle larvae (Johnstone and Storr 1998).

Likely presence in study area: This species is likely to visit sections of the site on occasions as suitable, though limited, foraging and roosting habitat exists. Observed during the fauna survey as a small flock of about 10 birds flying overhead.

Potential impact of proposed development: Loss of any existing nest sites and foraging habitat has the potential to impact on this species. The majority of the potential impact area is cleared with only scattered trees. No potential nest sites were observed in these areas. The remnant bushland in centre of Location 7 contains a small number of large trees with hollows that could potentially be used as nest sites by these birds but no evidence of use was found and it is uncertain at this stage if these will be impacted on in any event. It is therefore very unlikely that this species will suffer any impact as a result of the proposed mine.

### **Carnaby's Black- Cockatoo *Calyptorhynchus latirostris***

Status and Distribution: Carnaby's Black Cockatoo is listed as Scheduled 1 under the *WAWC Act (1950)* and as Endangered under the *EPBC Act (1999)*. Confined to the south-west of Western Australia, north to the lower Murchison River and east to Nabawa, Wilroy, Waddi Forest, Nugadong, Manmanning, Durokoppin, Noongar (Moorine Rock), Lake Cronin, Ravensthorpe Range, head of Oldfield River, 20 km ESE of Condingup and Cape Arid; also casual on Rottnest Island (Johnstone and Storr 1998).

Habitat: Forests, woodlands, heathlands, farms; feeds on banksia, hakeas, dryandras and Marri. Breeding occurs in winter/spring mainly in eastern forest and wheatbelt where they can find mature hollow bearing trees to nest in (Morcombe 2003).

Likely presence in study area: This species is likely to infrequently visit the area during non breeding season as suitable foraging and roosting habitat, though limited in extent, exists on site. More likely to target extensive areas of pine forest nearby. Breeding record from the nearby Ludlow Forest (Bamford 2003).

Potential impact of proposed development: Loss of any existing nest sites and foraging habitat has the potential to impact on this species. The majority of the potential impact area is cleared with only scattered trees. No potential nest sites were observed in these areas. The remnant bushland in centre of Location 7 contains a small number of large trees with hollows that could



potentially be used as nest sites by these birds but no evidence of use was found and it is at this stage uncertain if these will be impacted on in any event. It is therefore very unlikely that this species will suffer any impact as a result of the proposed mine.

**Masked Owl *Tyto novaehollandae novaehollandae***

Status and Distribution: Listed as Priority 3 by CALM. Found north to Yanchep and east to Yealering, Gnowangerup and Albany, casual further north. Locally common in south west but generally uncommon (Johnstone and Storr 1998).

Habitat: Roosts and nests in heavy forest, hunts over open woodlands and farmlands (Morcombe 2003). Probably breeding in forested deep south west with some autumn–winter wanderings northwards (Johnstone and Storr 1998).

Likely presence in study area: Potentially inhabits or frequents on occasions areas of densest vegetation within the study area but extent of suitable habitat appears to be limited to areas along the Abba and Sabina Rivers and possibly sections of the vegetation in centre of Location 7.

Potential impact of proposed development: Only a small amount of habitat possibly suitable for this species has the potential to be affected by the proposed mine and therefore the impact on this species will be non-existent or negligible.

**Fork-tailed Swift *Apus pacificus***

Status and Distribution: The Fork-tailed Swift is listed as migratory under the *EPBC Act 1999* and under international agreements to which Australia is a signatory. It is a summer migrant (Oct-Apr) to Australia (Morcombe 2003).

Habitat: Low to very high airspace over varied habitat from rainforest to semi desert (Morcombe 2003).

Likely presence in study area: It is potentially an occasional summer visitor to the study area but is entirely aerial and largely independent of terrestrial habitats.

Potential impact of proposed development: No impact on this species is anticipated as it is likely to be only an infrequent visitor to the general area and it utilises a broad range of habitats.

**Rainbow Bee-eater *Merops ornatus***

Status and Distribution: This species is listed as migratory under the *EPBC Act (1999)* and under international agreements to which Australia is a signatory. The Rainbow Bee-eater is a common summer migrant to southern Australia but in the north they are resident (Morcombe 2003).



Habitat: Open Country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands (Morcombe 2003). Breeds underground in areas of suitable soft soil firm enough to support tunnel building.

Likely presence in study area: Potential seasonal visitor to site.

Potential impact of proposed development: No impact on this species is anticipated.

### **Chuditch *Dasyurus geoffroii***

Status and Distribution: Listed as Scheduled 1 under the *WC Act (1950)* and as Vulnerable under the *EPBC Act (1999)*. Formerly occurred over nearly 70 per cent of Australia. The Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of southwest Western Australia. Also occurs in very low numbers in the Midwest, Wheatbelt and South Coast Regions with records from Moora to the north, Yellowdine to the east and south to Hopetoun.

Habitat: Chuditch are known to have occupied a wide range of habitats from woodlands, dry sclerophyll (leafy) forests, riparian vegetation, beaches and deserts. Riparian vegetation appears to support higher densities of Chuditch, possibly because food supply is better or more reliable and better cover is offered by dense vegetation. Chuditch appear to utilise native vegetation along road sides in the wheatbelt (CALM 1994). The estimated home range of a male Chuditch is over 15 km<sup>2</sup> whilst that for females is 3-4 km<sup>2</sup> (Sorena and Soderquist 1995).

Likely presence in study area: There appears to be no recent documented records of the Chuditch from the general area and the species is rarely recorded anywhere on the Swan Coastal Plain (Dell 2000). Closest, most recent records are from surveys conducted at the proposed Gwindinup minesite 26km north east (Bamford 2000). Individuals may use vegetation adjacent to the Sabina River as a corridor from inland state forest areas and therefore the presence of this species can not be discounted, but it appears at best to be a very rare visitor to the study site.

Potential impact of proposed development: No impact on this species is anticipated.

### **Southern Brush-tailed Phascogale *Phascogale tapoatafa tapoatafa***

Status and Distribution: Listed as Priority 4 by CALM. Present range is believed to have been reduced to approximately 50 per cent of its former range. Now known from Perth and south to Albany, west of Albany Highway. Occurs at low densities in the northern Jarrah forest. Highest densities occur in the Perup/Kingston area, Collie River valley, and near Margaret River and



Busselton (CALM information pamphlet). Records are less common from wetter forests. Observed in *Agonis* parkland in central Busselton (Greg Harewood pers. obs. 2004)

Habitat: This subspecies has been observed in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover. A nocturnal carnivore relying on tree hollows as nest sites. The home range for a female Brush-tailed Phascogale is estimated at between 20 and 70 ha, whilst that for males is given as twice that of females. In addition, they tend to utilise a large number (approximately 20) of different nest sites throughout their range (Soderquist 1995).

Likely presence in study area: The majority of the site is unsuitable for this species as suitable hollows appear to be rare or absent. Potentially present in remnant bushland along Abba and Sabina Rivers where hollows are more common and in the centre of Location 7.

Potential impact of proposed development: Only a small amount of habitat possibly suitable for this species has the potential to be affected by the proposed mine and therefore the impact on this species will be non-existent or negligible.

#### **Quenda *Isoodon obesulus fusciventer***

Status and Distribution: Listed as Priority 5 by CALM. Widely distributed in the south west from near Cervantes north of Perth to east of Esperance, patchy distribution through the Jarrah and Karri forest and on the Swan Coastal Plain, and inland as far as Hyden. Has been translocated to Julimar State Forest, Hills Forest Mundaring, Tutanning Nature Reserve, Boyagin Nature Reserve, Dongolocking Nature Reserve, Leschenault Conservation Park, and Karakamia and Paruna Sanctuaries (CALM information pamphlet) and Nambung National Park (CALM pers. coms.)

Habitat: Dense scrubby, often swampy, vegetation with dense cover up to one metre high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. Populations inhabiting Jarrah and Wandoo forests are usually associated with watercourses. Quendas can thrive in more open habitat subject to exotic predator control (CALM information pamphlet).

Likely presence in study area: No evidence of this species was found within the study area. The only habitat that appears suitable is sections of fenced vegetation along the Sabina River where reasonably dense ground cover (principally introduced grasses) is present.

Potential impact of proposed development: No impact on this species is anticipated.





### **Bilby *Macrotis lagotis***

Status and Distribution: The Bilby is listed as Schedule 1 under the *WC Act 1950* and Vulnerable under the *EPBC Act 1999*. Current distribution in suitable habitat from Tanami Desert west to near Broome and south to Warburton. Former distribution extended south to Margaret River, though apparently absent from coastal plain (Burbidge 2004).

Habitat: Current habitat included Acacia shrublands, spinifex and hummock grassland (Menkhorst *et al.*, 2001).

Likely presence in study area: Historical records (rated as “not sure” with respect to certainty) in the CALM database from “Geographe” in 1972. There is however no doubt that this species is now extinct in the south west.

Potential impact of proposed development: No impact on this species is anticipated. Not included in potential species list.

### **Western Ringtail Possum *Pseudocheirus occidentalis***

Status and Distribution: Listed as Scheduled 1 under the *WC Act (1950)* and as Vulnerable under the *EPBC Act (1999)*. Most known populations are now restricted to near coastal areas of the south west from the Dawesville area to the Waychinicup National Park. Inland, it is also known to be relatively common in a small part of the lower Collie River valley, the Perup Nature Reserve and surrounding forest blocks near Manjimup.

Habitat: The Western Ringtail Possum was once located in a variety of habitats including Coastal Peppermint, Coastal Peppermint-Tuart, Jarrah-Marri associations, Sheoak woodland, and eucalypt woodland and mallee. Present populations mostly inhabit Coastal Peppermint-Tuart associations from near Bunbury to Albany. Along the Swan Coastal Plain near Busselton the highest densities occur in habitats with dense, relatively lush vegetation. In these areas the main determinants of suitable habitat for WRPs appears to be the presence of *Agonis flexuosa* either as the dominant tree or as an understorey component of Eucalypt forest or woodland (Jones *et al.* 1994a).

Likely presence in study area: Targeted surveys for this species show that it is present in significant numbers in suitable habitat across the study site. The results of the surveys which illustrate the distribution and abundance of WRPs is detailed in section 5.3. Known populations also exist in the nearby Ludlow forest and within remnant vegetation on adjacent properties e.g. Provence development site.

Potential impact of proposed development: The proposed mine has the potential to significantly impact on this species. Potential impact and





recommended management procedures are detailed in following sections of this report.

### **Western False Pipistrelle *Falsistrellus mackenziei***

Status and Distribution: Listed as Priority 4 by CALM. Confined to south west W.A. south of Perth and east to the wheat belt. Most records from Karri forests but also recorded in wetter stands of jarrah and tuart and woodlands on the Swan Coastal Plain (Menkhorst and Knight 2001).

Habitat: This species of bat occurs in high forest and coastal woodlands. It roosts in small colonies in tree hollows and forages at canopy level and in the cathedral-like spaces between trees.

Likely presence in study area: This species possibly inhabits the general area and may utilise hollows principally found along the Sabina and Abba Rivers and to a lesser extent the area of remnant vegetation within the central part of Location 7.

Potential impact of proposed development: Loss of any existing hollow trees has the potential to impact on this species. The majority of the potential impact area is cleared with only scattered trees. The remnant bushland in the centre of Location 7 also possibly contains a small number of trees with suitable hollows that could potentially be used by this species but no evidence of use was found and it is uncertain at this stage if these will be impacted on in any event. It is therefore very unlikely that this species will suffer any impact as a result of the proposed mine.

### **Water Rat *Hydromys chrysogaster***

Status and Distribution: Listed as Priority 4 by CALM. The water rat is widely distributed around Australia and its offshore islands, New Guinea and some adjacent islands. It occurs in fresh brackish water habitats in the south-west of Western Australia, but occurs in marine environments along the Pilbara coastline and offshore islands. Previous survey work in the south west suggested this species was relatively common and widespread though difficult to capture (Christensen *et al* 1985, How *et al* 1987).

Habitat: The water rat occupies habitat in the vicinity of permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south west (Christensen *et al* 1985).

Likely presence in study area: This species may frequent the two small seasonal rivers that run through the study area (Abba and Sabina Rivers),



though the degraded nature of the foreshore and banks, particularly along the Abba River, reduces the quality of the habitat for this species.

Potential impact of proposed development: No impact on habitat suitable for this species or on the species itself is anticipated.

#### 5.2.4 Other Species of Significance

Twenty eight species of birds potentially frequent or occur in the study area that are noted as Bush Forever Decreaser Species in the Perth metropolitan region though only nine species were sighted during the survey (see Appendix A). The lack of observational data suggests that the study site is largely unsuitable for significant populations of most of these species to persist, though it should be noted that some are wide ranging species that may only visit the site occasionally. The lack of understorey in most of vegetated areas of the study site reduces its suitability for some species such as the White-browed Scrub Wren and to a lesser extent the Broad-tailed Thornbill for example.

Decreaser species are a significant issue in biodiversity conservation in the Perth section of the Coastal Plain as there have been marked reductions in range and population levels of many sedentary bird species as a consequence of disturbance and land clearing (Dell & Hyder-Griffiths 2002). It can be expected that with increasing pressures on land use, populations and the ranges of some fauna species will further decline in regional areas unless preventative measures are implemented.

### 5.3 WESTERN RINGTAIL POSSUM SURVEY

#### 5.3.1 Western Ringtail Possum Habitat

The Western Ringtail Possum was once located in a variety of habitats including Coastal Peppermint, Coastal Peppermint-Tuart, Jarrah-Marri associations, Sheoak woodland, and eucalypt woodland and mallee. Present known populations mostly inhabit Coastal Peppermint-Tuart associations from Dawesville to east of Albany, both in natural settings and urban environments. Inland the largest known populations occur in the Upper Warren area east of Manjimup (Wayne *et al* 2005). In this area the peppermint tree is naturally absent and jarrah foliage constitutes the species staple diet (Jones 1994b).

Along the Swan Coastal Plain near Busselton the highest densities occur in habitats with dense, relatively lush vegetation. In these areas the main determinants of suitable habitat for WRPs appears to be the presence of *Agonis flexuosa* either as the dominant tree or as an understorey component of Eucalypt forest or woodland (Jones *et al.* 1994a).

The Western Ringtail Possum is highly arboreal, feeding, resting and socialising in the canopy, rarely venturing to the ground. In coastal areas, where



Peppermints are dominant, hollow bearing trees are relatively rare and dreys, constructed in any suitable tree or bush, are the usual daytime rest site. However, when present, hollows within peppermints or eucalypts are favoured. Within urban areas, almost any large shrub or tree with sufficiently dense foliage (or hollows) has the potential to be utilised for daytime refuge and drey construction, though WRPs still appear to favour peppermint leaves and small branches for the actual construction material if present nearby (pers. obs. Greg Harewood). WRPs will also utilise suitable man made structures such as roof cavities and broad, flat support beams in sheds for day time refuges.

WRPs maintain a relatively small and stable home range. In dense, coastal Peppermint forest, home ranges are about 0.5 hectares to 1.5 hectares and in eucalypt forests about 2.5 hectares. In contrast, in the northern jarrah forests, home ranges are larger and have been recorded to at least 5.6 hectares. Regardless of forest type, individuals use three to eight different nest sites (dreys or hollow trees) in the course of a year. Adjacent home ranges of females overlap as much as 70 per cent. While the home range of a male will overlap several female home ranges they are less tolerant of other males encroaching on their territory.

Social activity occurs at night, primarily by investigation of scent trails on tree limbs (marked with urine) and males may visit adjacent female home ranges. In some populations, most young disperse to home ranges adjacent to the natal range but in high-density groups, young travel across at least several home ranges.

Peppermint (*Agonis flexuosa*) leaves form the basis of the WRP diet in coastal areas, but when unavailable, the dominant myrtaceous species are eaten. In the inland forest, Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) are the main food source (Jones 1994a). The leaves of the Mohan (*Melaleuca viminea*) also seem to be eaten in considerable amounts when present (pers. obs. Greg Harewood). In urban areas WRPs also consume developing flower buds on a range of exotic species including Wisteria (*Wisteria sinensis*.) and the New Zealand Christmas tree (*Metrosideros excelsus*) (pers. obs. Greg Harewood).

### 5.3.2 WRP Habitats within Study Area

The vegetation within the project area has been discussed in section 5.1. Any area within the study site containing Peppermint trees must be regarded as potential WRP habitat though they will also utilise other vegetation types at least for temporary refuge (see Figure 3). The larger clumps (e.g. centre of Location 7) and those that are closest to or link with vegetation outside the project area (e.g. Abba and Sabina River vegetation) are the most valuable with respect to maintaining populations.



The smaller, more isolated remnants and individual trees are of a lesser value as it is unlikely they would support a stable sustainable core of individuals due to the high risk of predation and the low carrying capacity. These remnants are however important as they provide the only refuge for displaced individuals as they move across cleared farmland in search of more favourable habitats.

### 5.3.3 WRP Habitats Adjacent to Development Site

The study area is bounded on 3 sides by largely cleared agricultural land of a similar nature to the project area with respect to density and extent of remnant vegetation (scattered trees of various species and rarer, larger groves). Despite its overall degraded nature the trees along the Sabina River are more or less continuous along its length and form a link with inland state forest areas. The Abba River, in contrast, has significant sections that are totally cleared (Hanran-Smith 2002).

WRP surveys have been conducted on land to the west of the study site as part of the “Provence” development (ATA 2004). The vegetation is similar in nature to the study area and consists of scattered Peppermint, Marri and Jarrah in addition to some more continuous stands of Peppermint. During the survey of this area a total of 51 WRPS were found during the course of two night surveys.

Pine forest is present to the north of the study area. This contains some regrowth Peppermint in addition to remnant native vegetation along the banks of the Abba and Sabina Rivers and is likely to be used by WRPs to some degree. The pine forest directly adjoins the Ludlow Tuart Forest which is known to contain significant populations of WRPs (Jones 1994 a & b, Greg Harewood pers. obs.).

### 5.3.4 Daytime Surveys

Observations for dreys, tree hollows, scats and WRPs were carried out as part of the opportunistic fauna surveys and were conducted on the 24<sup>th</sup> of April and the 15<sup>th</sup> May 2006 with as many trees as practical being examined. Particular attention was paid the most likely habitat, where Peppermints were a dominant or subdominant component of the vegetation structure.

Drey sightings recorded during the daytime survey are shown in Figure 4. In total 40 WRP dreys were located within the general study area (including sections of the Sabina and Abba Rivers). Due to the location of the dreys generally high in trees it was not possible to positively determine if most were occupied by WRPs or not. A significant number of tree hollows, potentially suitable for use as day time refuge by possums (and other fauna), were recorded, particularly within Flooded Gums along Sabina River.

Three WRPs were sighted during the day surveys, one alive and two dead specimens. The dead WRPs were found along Bussell Highway directly north



of the project area (location of these specimens not indicated on plan). A WRP skull and jaw bone were found in the central bushland area of Location 7. A single Brushtail Possum (*Trichosurus vulpecular*) was sighted in a tree hollow within Lot 3819.

### 5.3.5 Night Time Surveys

Four separate night time surveys were conducted on foot with the aim of covering the general study area twice (i.e. the impact area on each property was examined on separate nights, twice). Surveys were conducted on Lot 3819 (“Grice”) on the 11<sup>th</sup> May and the 7<sup>th</sup> June, 2006. Night surveys were conducted on Location 7 on the 24<sup>th</sup> May and the 8<sup>th</sup> June 2006. The aims of the surveys were to document the distribution and abundance of WRPs. Close spaced traverses were conducted in the most likely habitat with wider spaced lines in areas considered less likely to be utilised by WRPs.

Figure 5 shows the location of WRPs sightings made during the first night surveys carried out on each property (i.e. surveys conducted on 11<sup>th</sup> May and the 24<sup>th</sup> May 2006).

A combined total of 37 Western Ringtail Possums were sighted, 20 within Lot 3819/Sabina River reserve and 17 within Location 7/Abba River reserve. A total of 45 Common Brushtail Possums were sighted, 26 within Lot 3819/Sabina River reserve and 19 within Location 7/Abba River reserve.

Figure 6 shows the location of WRPs sightings made during the second night surveys carried out on each property (i.e. surveys conducted on 7<sup>th</sup> June and the 8<sup>th</sup> June 2006).

A combined total of 36 Western Ringtail Possums were sighted, 21 within Lot 3819/Sabina River reserve and 15 within Location 7/Abba River reserve. A total of 37 Common Brushtail Possums were sighted, 22 within Lot 3819/Sabina River reserve and 15 within Location 7/Abba River reserve.

## 6. POTENTIAL IMPACTS

The exact extent of the proposed mine is unknown at this stage and therefore the degree of impact on the various fauna species will not be know with any certainty until the assessment of the mineral deposit is complete. As the majority of the potential impact area is cleared farmland with only scattered trees and relatively degraded vegetation remnants the impact on fauna species inhabiting the area is anticipated to be negligible in most cases.

Impact on some species may however be significant if the clearing of vegetation becomes necessary as it will result in the loss or degradation of potential fauna habitat. The potential impact on fauna species will vary depending on the each species population density and the quantity and quality of potential foraging and



breeding habitat that is affected. Anticipated impacts on species of conservation significance are discussed in section 5.2.3.

The most significant potential impacts are:

- Clearing and/or fragmentation of habitat utilised by Western Ringtail Possums. The survey results illustrate that WRPs are widespread and relatively abundant in almost all areas of the potential impact area that has remnant vegetation. Brushtail Possums displaced as a result of any clearing may also result in overpopulation in remaining areas which could have a detrimental effect of WRPs also. It should be noted that if WRP habitat requires clearing as part of the project then any WRPs displaced will very likely need to be translocated by CALM. This can be a time consuming and expensive process.
- Loss of hollow bearing trees, in particular those with larger hollows potentially suitable for larger birds species. A significant number of hollows are present within trees along the Sabina River. A small number of hollow trees were also observed in the large remnant vegetation within Location 7. No evidence of use by any of the conservation significant bird species was however observed.



## 7. MANAGEMENT

The following proposed management recommendations are provided as an initial guide only and should be reviewed for relevance when the proposed mine layout is known. The recommendations aim to reduce the impact on fauna as much as reasonable and practicable. Given that the majority of the study site is cleared of native vegetation little management, with respect to fauna, will be required in these areas.

It is recommended that:

- Where possible retain and protect all remnant vegetation on site, including single isolated trees. Large remnants (in particular those containing peppermints) and vegetation along the Sabina and Abba Rivers should be a priority for retention.
- Areas requiring clearing for the various project components should be kept to a minimum. Areas to be cleared should be clearly marked and access to other areas restricted to prevent accidental clearing. Design additional project infrastructure, including access routes, vehicle and plant storage and turn around areas etc so that:
  - previously disturbed areas are used where possible; and
  - areas of sensitive vegetation are avoided.
- Avoid clearing of hollow bearing trees. These should be left undisturbed if possible. Potential habitat trees should be checked for fauna prior to clearing. No dead, standing or fallen timber should be removed unnecessarily. Logs (hollow or not) and other debris resulting from land clearing should be used to enhance fauna habitat in untouched and rehabilitated areas if possible.
- Revegetation strategies for cleared areas not to be developed should be planned when and where possible. Landscaped areas should be revegetated with local seed stock that includes only native seed stock such as cockatoo food plants (e.g. *Corymbia* and *Allocasuarina* etc.) and Peppermint (*Agonis flexuosa*) in particular those adjoining existing Western Ringtail Possum habitat.
- All mine staff should be made aware that native fauna is protected. Personnel working on the project should not be allowed to bring firearms, other weapons or pets onsite.
- Native fauna injured during construction should be taken to a designated veterinary clinic or a CALM nominated wildlife carer.





- Fuel and chemical storage facilities should be located appropriate distance away from watercourses.
- Any trenching required should be kept open for only as long as necessary and suitable escape ramps and bridging provided if the site is to be left unattended for extended periods.
- Contractors should report the presence of all large bird nesting sites (e.g. large bird of prey nest sites or nesting colonies) so that they can be assessed prior to disturbance.

The results of the preliminary Western Ringtail Possum survey indicate that almost all remnant vegetation within the study area is used by WRPs to some extent. To ensure the long term survival of this species on the site the following recommendations, specific to this species, are made:

- Retention and long term protection of all areas of *Agonis* dominated vegetation on site.
- The retention, rehabilitation and linking (by plantings) of retained vegetation remnants, especially those containing Peppermint trees to aid in the long term survival of Western Ringtail Possums in the general area should be incorporated into the mine rehabilitation plan.
- Areas or individual peppermint trees to be cleared should be marked on the ground so that no unnecessary clearing is carried out. If confusion is likely, trees to be removed should be clearly marked. Areas where no clearing is required should be barricaded/bunted off to prevent accidental access and damage by large machinery.
- Clearing contractors to be briefed on areas to be cleared in addition to the main points of the management plan and its purpose.
- When the mining proposal is finalised showing exact location of areas to be cleared and in light of the above recommendations and those from other studies (i.e. flora), the impact of the development on WRPs should be reviewed. It is, at this stage not possible to determine if WRPs will need to be translocated from the site or if displaced individuals can be relocate in retained vegetation. As mentioned previously, given the high combined density of WRPs and Brushtails it is very likely that even if a small number of WRPs are displace, translocation will be required. It is therefore strongly recommended that every effort be made to negate the need for any clearing of vegetation, in particular the *Agonis* dominated remnants.



## 8. LEGISLATIVE OBLIGATIONS

### 8.1 WILDLIFE CONSERVATION ACT 1950

The objective of the *Wildlife Conservation Act 1950* is to provide for the protection of wildlife. The Act is administered by the Executive Director of the Department of Conservation and Land Management, under the direction and control of the Minister for the Environment. Under section 14, "Protection of Fauna", of this Act, all fauna is wholly protected throughout the State at all times, unless declared by the Minister by notice in the Government Gazette. Under section 14(2)(ba) of The Act, Fauna Notices are made by the Minister for the Environment listing specially protected fauna.

Disturbance or destruction of any native fauna over and above that reasonably required for construction works and access is considered an offence under the Act and necessary steps should be taken to inform mine personnel of this fact. The company should also, as part of their management plan implement procedures that will reduce the chances of wildlife being injured or killed during clearing and construction on the site.

### 8.2 COMMONWEALTH ENVIRONMENTAL PROTECTION & BIODIVERSITY CONSERVATION ACT 1999

A number of fauna species known to or potentially present within the study area are listed under the federal *Environmental Protection and Biodiversity Conservation Act* (EPBC Act, 1999). The objective of the EPBC Act is to provide for the protection of the environment, especially those aspects that are of national significance, promote ecologically sustainable development, the conservation of biodiversity and a cooperative approach to the protection and management of the environment.

If an action (i.e. the proposed development) is deemed to have a potential significant impact (taking into consideration the EPBC Act "Principal Significant impact Guidelines 1.1" - DEH 2005) on listed species a referral to the Department of Environment and Heritage (DEH) is required.

At this stage it is not possible to determine if any potential significant impact will occur to any listed threatened species as the details of the proposed mine are not finalised. The requirement to make a referral will need to be reviewed once the require information becomes available.



## 9. CONCLUSION

The majority of the potential impact area has been totally cleared of native vegetation with significant portions of the remaining vegetation being parkland cleared and highly degraded. As a consequence the diversity of fauna has been reduce significantly from that which would have originally been present in the area prior to its development and use as a farm.

Despite this the results of the fauna assessment indicate that the study site potentially hosts a range of fauna species, some of which are of special conservation significance, in particular the Western Ringtail Possum.

The impact of the proposed mine is not as yet clear though given the degraded nature of most of the site the effect, in general terms, on fauna species will be negligible. Development of the site does however have the potential impact significantly on some fauna species such as the Western Ringtail Possum.

Mine planning should aim to retain as much of the existing remnant vegetation as possible with particular emphasis on those areas favoured by the Western Ringtail Possum. The maintenance, enhancement and the creation of vegetated linkages between areas of remnant vegetation on the site and the Abba and Sabina River reserves should be incorporated into any mine rehabilitation plan

The impact on fauna and in particular the Western Ringtail Possum will need to be reviewed when detailed mine plans become available.



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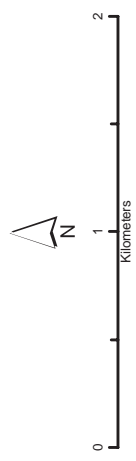
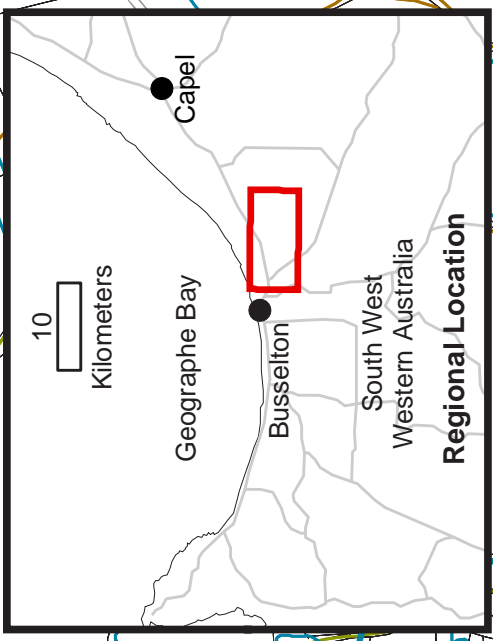
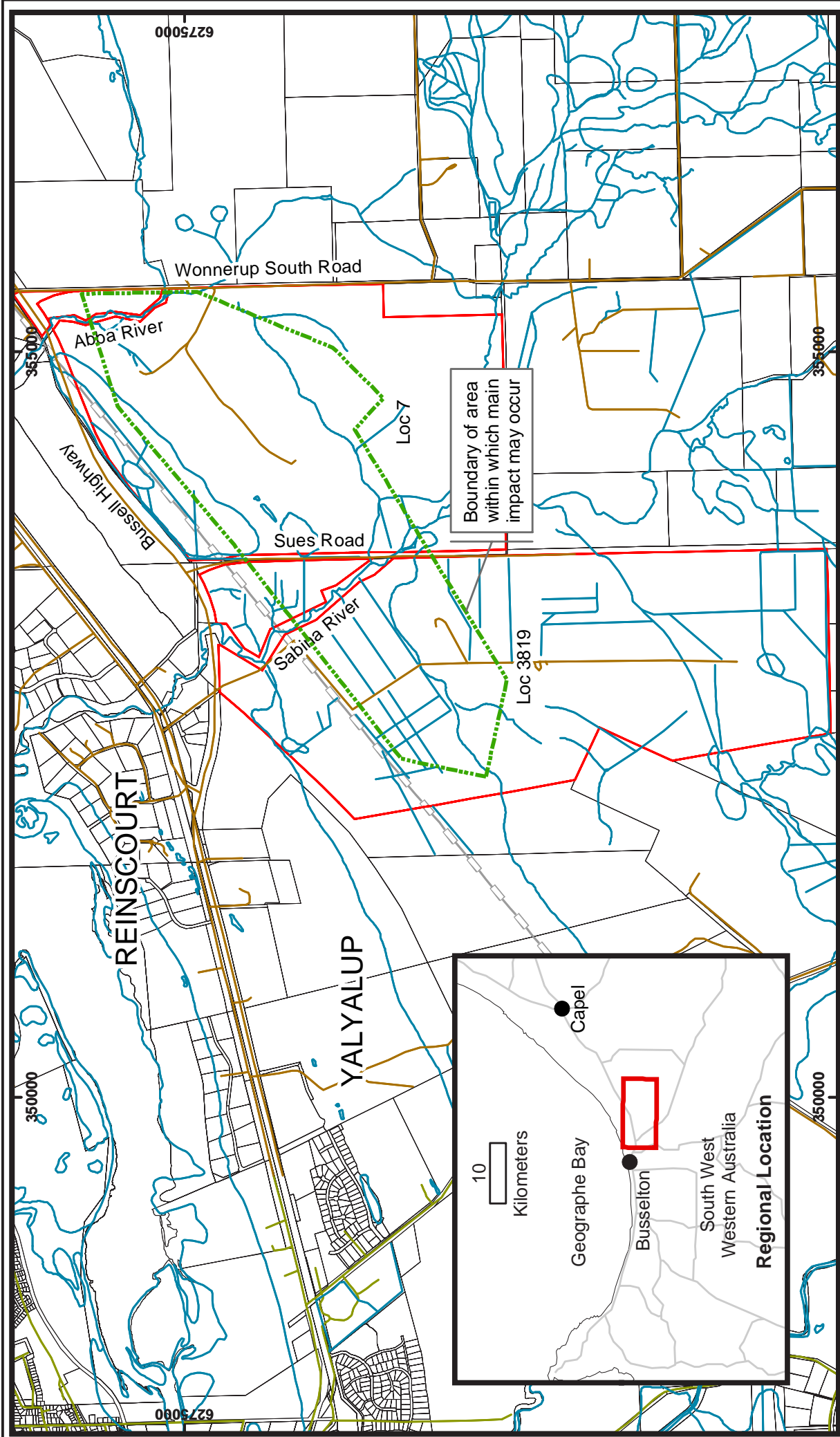


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# FIGURES





- Legend**
- Property Boundaries
  - Cadastral Boundaries
  - Powerline

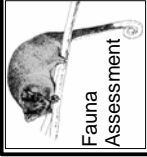


Fauna  
Assessment

Loc 7 & Loc 3819 (Grice)

**Site Location**

DRAWN: G Harewood  
DATE: May 2006  
SCALE: 1:35,000



Fauna Assessment

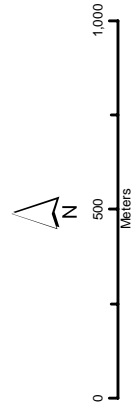
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DATE: May 2006

SCALE: 1:20,000

Loc 7 & Loc 3819 (Grice)

# Study Area Air Photo



MGA Zone 50

## Legend

- Property Boundaries
- Cadastral Boundaries
- Powerline

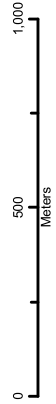


### Fauna Habitats

- Cleared Pasture - Scattered Trees
- Flooded Gum - Marri - Peppermint - Melaleuca Woodland
- Marri - Banksia - Jarrah - Peppermint Open Forest
- Peppermint Open Forest
- Marri Open Woodland
- Melaleuca Low Closed Forest
- Melaleuca Low Open Woodland

### Legend

- Property Boundaries
- Cadastral Boundaries



MGA Zone 50

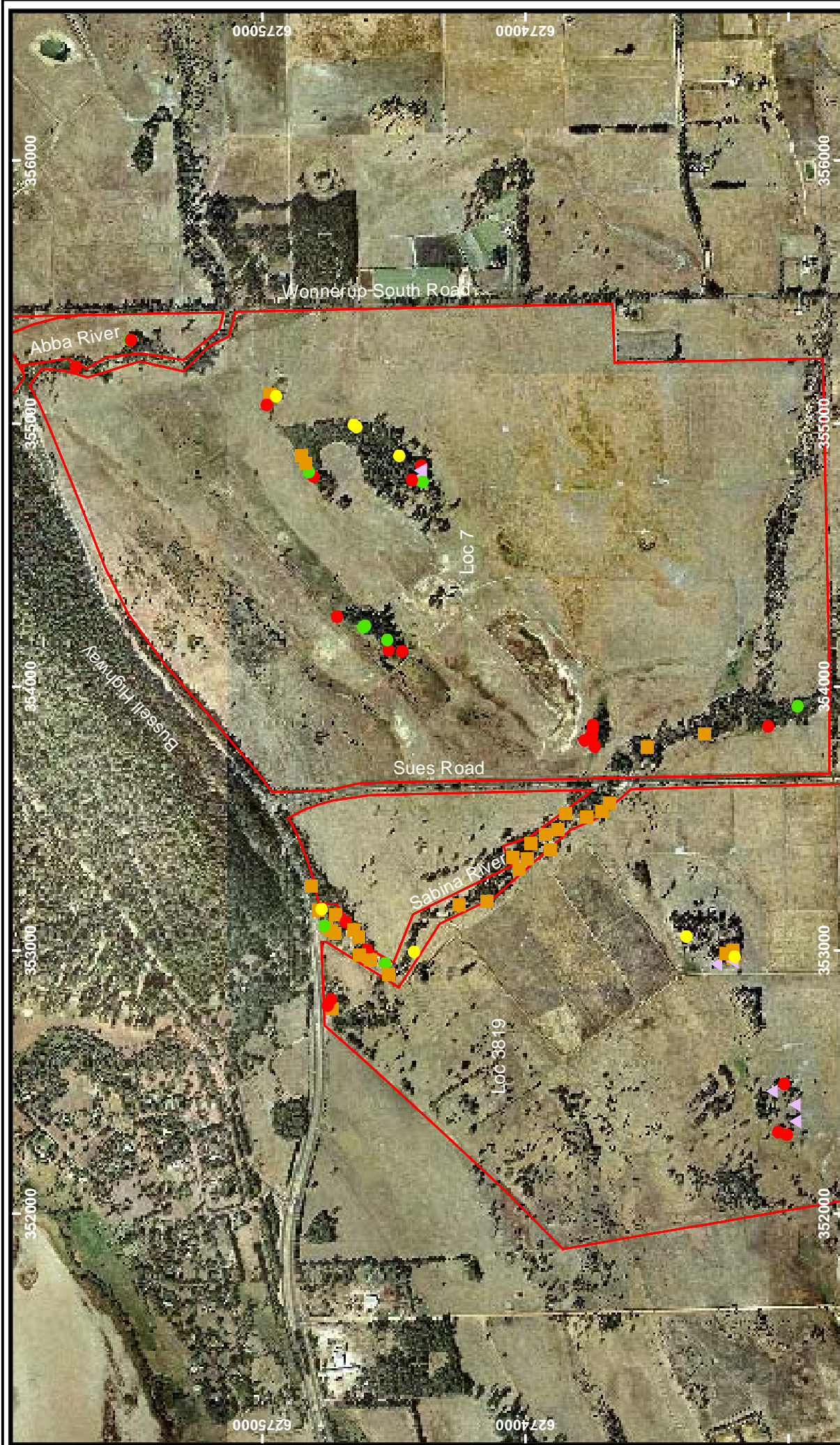


**Fauna Assessment**  
 DRAWN: G Harewood  
 DATE: May 2006  
 SCALE: 1:20,000

Loc 7 & Loc 3819 (Grice)

## Fauna Habitats





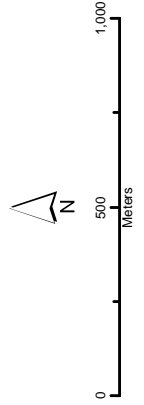
Fauna Assessment  
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 DATE: June 2006  
 SCALE: 1:20,000

Loc 7 & Loc 3819 (Grice)

# Day Survey Results

24th April/15th May 2006

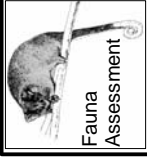
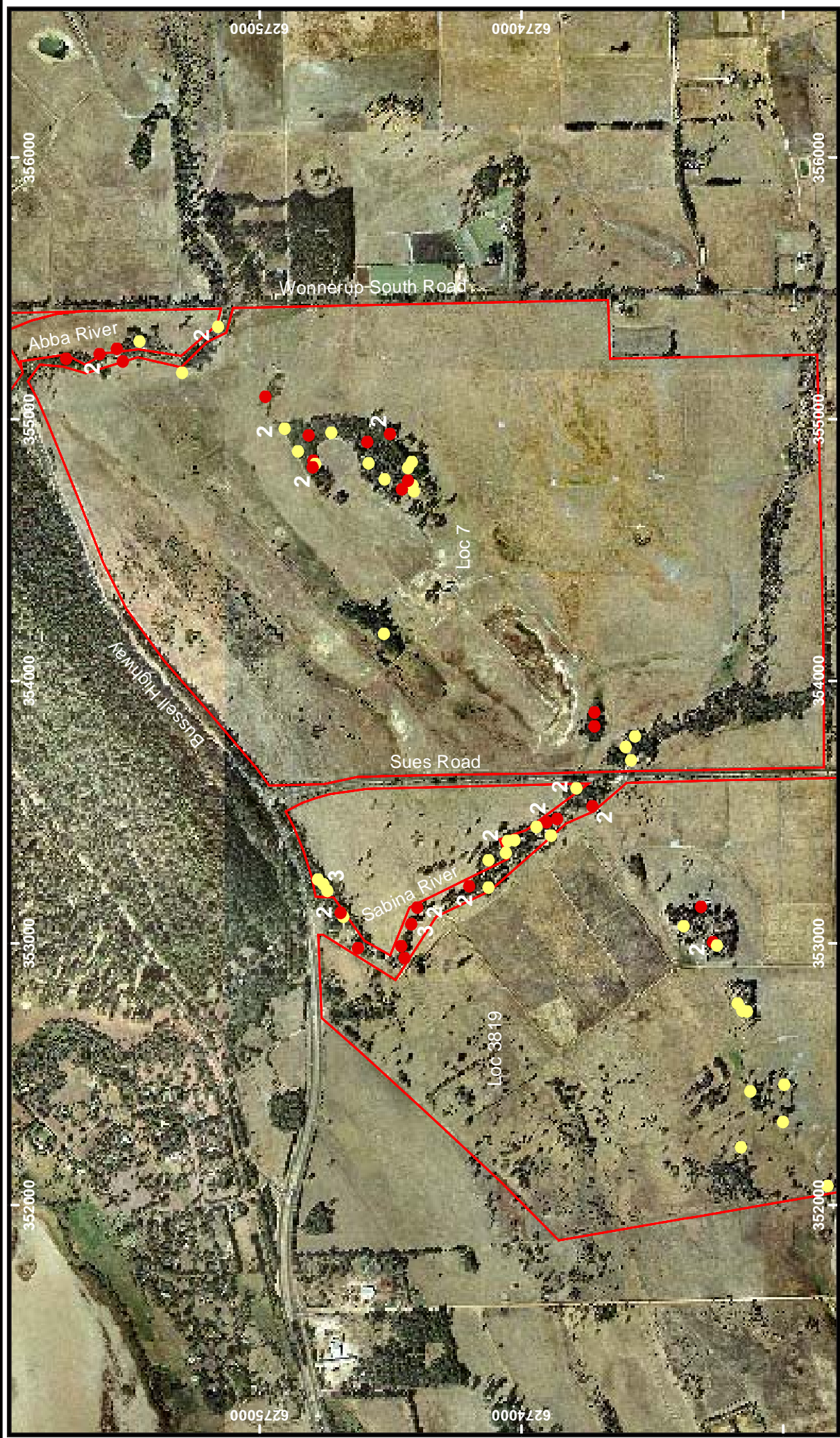
Figure: 4



MGA Zone 50

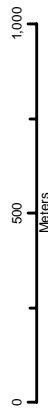
- Legend**
- Property Boundaries
  - Drey - Good Condition
  - Drey - Poor Condition
  - Drey - Deteriorating Condition
  - Tree Hollow
  - ▲ Large Birds Nest (typically Raven)





Fauna Assessment  
 DRAWN: G Harewood  
 DATE: June 2006  
 SCALE: 1:20,000

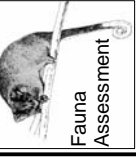
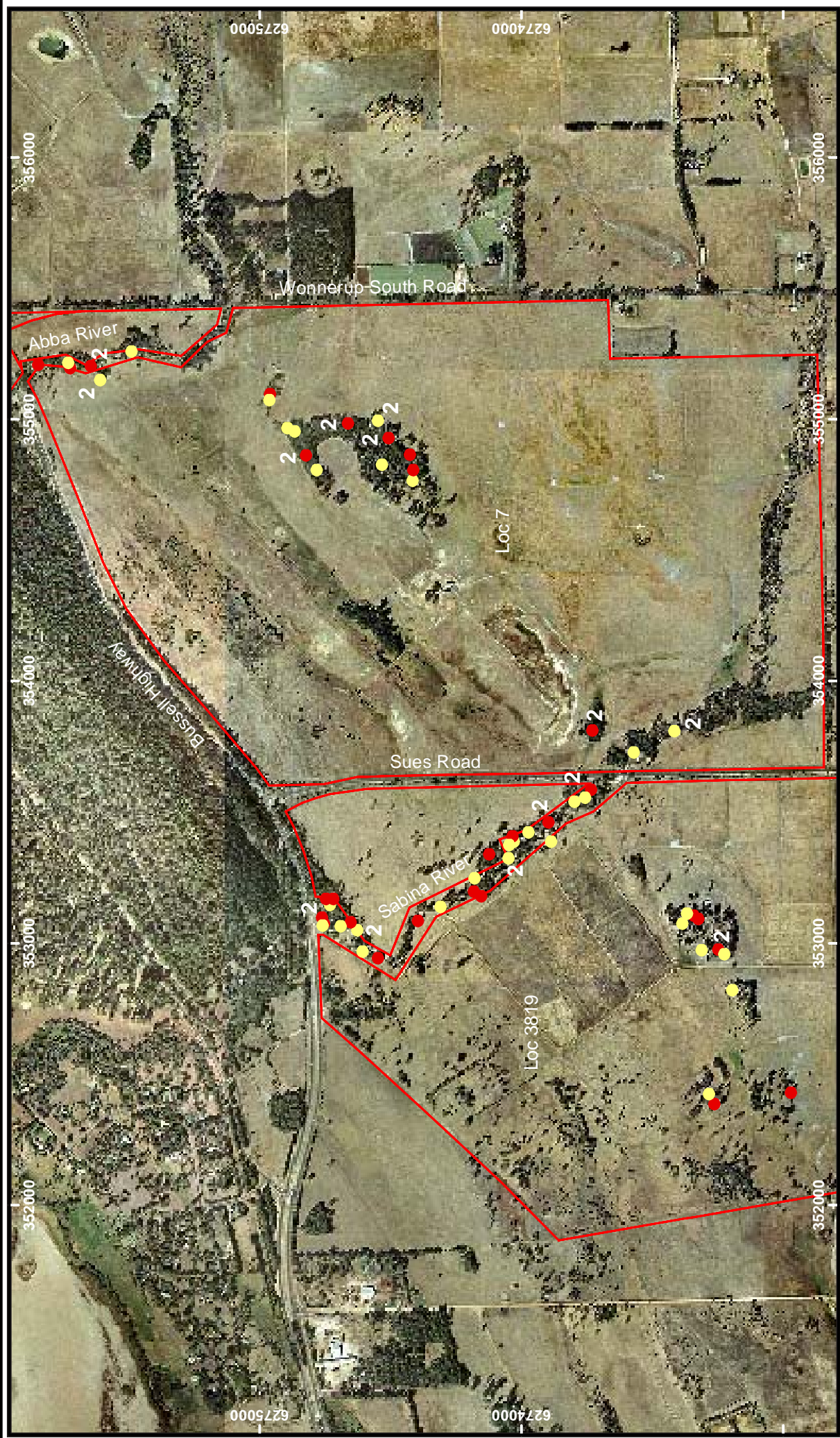
Loc 7 & Loc 3819 (Grice)  
**Night Survey Results**  
 11th/24th May 2006



MGA Zone 50

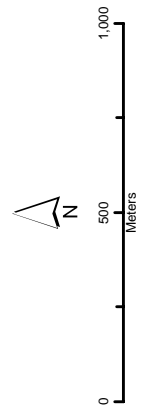
**Legend**

- Property Boundaries
- Western Ringtail Possum
- Common Brushtail Possum



Loc 7 & Loc 3819 (Grice)  
**Night Survey Results**  
 7th/8th June 2006

DRAWN: G Harewood  
 DATE: June 2006  
 SCALE: 1:20,000



MGA Zone 50

- Legend**
- Property Boundaries
  - Western Ringtail Possum
  - Common Brushtail Possum

# **APPENIDIX A**

## **POTENTIAL FAUNA SPECIES LIST**

# Fauna Observed or Potentially in Study Area

Grice/Location 7

Modified from M Bamford (1998) by G Harewood (2006)

Sighted/Heard/Signs = +

Class Family Species	Common Name	Conservation Status	Observed May/June 06
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## Amphibians

### Myobatrachidae

Ground or Burrowing Frogs

<i>Crinia georgiana</i>	Quacking Frog		
<i>Crinia glauerti</i>	Glauert's Froglet		
<i>Crinia insignifera</i>	Squelching Froglet		+
<i>Geocrinia leai</i>	Lea's Frog		
<i>Heleioporus eyrei</i>	Moaning Frog		+
<i>Limnodynastes dorsalis</i>	Banjo Frog		
<i>Pseudophryne guentheri</i>	Güenther's Toadlet		

### Hylidae

Tree Frogs

<i>Litoria adelaidensis</i>	Slender Tree Frog		
<i>Litoria moorei</i>	Motorbike Frog		

## Reptiles

### Chelidae

Side-necked Tortoises

<i>Chelodina oblonga</i>	Long-necked Tortoise		
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### Gekkonidae

Geckoes

<i>Phyllodactylus marmoratus</i>	Marbled Gecko		
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### Pygopodidae

Legless Lizards

<i>Aprasia repens</i>	Sand-plain Worm Lizard		
<i>Lialis burtonis</i>	Common Snake Lizard		
<i>Pygopus lepidopus</i>	Common Scaleyfoot		

### Agamidae

Dragon Lizards

<i>Pogona minor</i>	Bearded Dragon		
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### Varanidae

Monitor's or Goanna's

<i>Varanus gouldii</i>	Gould's Sand Monitor		
<i>Varanus rosenbergi</i>	Rosenbergs Monitor		

WC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, CALM Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region.



Class Family Species	Common Name	Conservation Status	Observed May/June 06
<b>Scincidae</b>			
Skinks			
<i>Acritoscincus trilineatum</i>	South-west Cool Skink		
<i>Cryptoblepharus plagiocephalus</i>	Fence Skink		
<i>Ctenotus impar</i>	South-western Odd-striped Ctenotus		
<i>Ctenotus labillardieri</i>	Red-legged Skink		
<i>Egernia kingii</i>	King's Skink		
<i>Egernia luctuosa</i>	Mourning Skink		
<i>Egernia napoleonis</i>	Salmon-bellied Skink		
<i>Hemiergis peronii</i>	Three-toed Skink		+
<i>Lerista distinguenda</i>	South-western Four-toed Lerista		
<i>Menetia greyii</i>	Dwarf Skink		
<i>Morethia lineocellata</i>	Western Pale-flecked Morethia		
<i>Tiliqua rugosa</i>	Bobtail		
<b>Typhlopidae</b>			
Blind Snakes			
<i>Ramphotyphlops australis</i>	Southern Blind Snake		
<b>Elapidae</b>			
Elapid Snakes			
<i>Notechis scutatus</i>	Tiger Snake		
<i>Pseudonaja affinis</i>	Dugite		
<b>Birds</b>			
<b>Phasianidae</b>			
Quails, Pheasants			
<i>Coturnix pectoralis</i>	Stubble Quail		+
<i>Coturnix ypsilophora</i>	Brown Quail		
<b>Anatidae</b>			
Geese, Swans, Ducks			
<i>Anas gracilis</i>	Grey Teal		
<i>Anas superciliosa</i>	Pacific Black Duck		+
<i>Chenonetta jubata</i>	Australian Wood Duck		
<i>Tadorna tadornoides</i>	Australian Shelduck		
<b>Phalacrocoracidae</b>			
Cormorants			
<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant		

Class Family Species	Common Name	Conservation Status	Observed May/June 06
<b>Ardeidae</b>			
Hérons, Egrets, Bitterns			
<i>Ardea alba</i>	Great Egret	Migratory CA JA	
<i>Ardea ibis</i>	Cattle Egret	Migratory CA JA	
<i>Ardea pacifica</i>	White-necked Heron		
<i>Egretta novaehollandiae</i>	White-faced Heron		+
<i>Nycticorax caledonicus</i>	Rufous Night Heron	Bp	
<b>Threskiornithidae</b>			
Ibises, Spoonbills			
<i>Platalea flavipes</i>	Yellow-billed Spoonbill		+
<i>Threskiornis molucca</i>	Australian White Ibis		+
<i>Threskiornis spinicollis</i>	Straw-necked Ibis		
<b>Accipitridae</b>			
Kites, Goshawks, Eagles, Harriers			
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	Bp	
<i>Accipiter fasciatus</i>	Brown Goshawk	Bp	
<i>Aquila audax</i>	Wedge-tailed Eagle	Bp	+
<i>Aquila morphnoides</i>	Little Eagle	Bp	
<i>Circus assimilis</i>	Spotted Harrier		
<i>Elanus caeruleus</i>	Black-shouldered Kite		+
<i>Haliastur sphenurus</i>	Whistling Kite	Bp	+
<i>Hamirostra isura</i>	Square-tailed Kite	Bp	
<b>Falconidae</b>			
Falcons			
<i>Falco berigora</i>	Brown Falcon	Bp	
<i>Falco longipennis</i>	Australian Hobby		
<i>Falco peregrinus</i>	Peregrine Falcon	S4 Bp	
<i>Falco subniger</i>	Black Falcon		
<b>Rallidae</b>			
Rails, Crakes, Swampheens, Coots			
<i>Fulica atra</i>	Eurasian Coot		
<i>Gallinula tenebrosa</i>	Dusky Moorhen	Bh	
<i>Gallinula ventralis</i>	Black-tailed Native-hen		
<i>Gallirallus philippensis</i>	Buff-banded Rail		
<i>Porphyrio porphyrio</i>	Purple Swamphean		

WC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, CALM Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region.

Class Family Species	Common Name	Conservation Status	Observed May/June 06
<b>Turnicidae</b>			
Button-quails			
<i>Turnix varia</i>	Painted Button-quail	Bp	+
<b>Columbidae</b>			
Pigeons, Doves			
<i>Ocyphaps lophotes</i>	Crested Pigeon		+
<i>Phaps chalcoptera</i>	Common Bronzewing	Bh	
<i>Streptopelia senegalensis</i>	Laughing Turtle-Dove	Introduced	
<b>Cacatuidae</b>			
Cockatoos, Corellas			
<i>Calyptorhynchus baudinii</i>	Baudin`s Cockatoo	S1 VU Bp	+
<i>Calyptorhynchus latirostris</i>	Carnaby`s Cockatoo	S1 EN Bp	
<b>Psittacidae</b>			
Parrots			
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet		
<i>Neophema elegans</i>	Elegant Parrot		+
<i>Platycercus icterotis</i>	Western Rosella	Bp	
<i>Platycercus spurius</i>	Red-capped Parrot		+
<i>Platycercus zonarius</i>	Twenty-eight Parrot		+
<i>Polytelis anthopeplus</i>	Regent Parrot		
<b>Cuculidae</b>			
Parasitic Cuckoos			
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo		
<i>Chrysococcyx basalis</i>	Horsfield`s Bronze Cuckoo		
<i>Chrysococcyx lucidus</i>	Shining Bronze Cuckoo		
<i>Cuculus pallidus</i>	Pallid Cuckoo		
<b>Strigidae</b>			
Hawk Owls			
<i>Ninox novaeseelandiae</i>	Boobook Owl		+
<b>Tytonidae</b>			
Barn Owls			
<i>Tyto alba</i>	Barn Owl		+
<i>Tyto n.novaehollandiae</i>	Masked Owl	P3 Bp	
<b>Podargidae</b>			
Frogmouths			
<i>Podargus strigoides</i>	Tawny Frogmouth		+

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Class Family Species	Common Name	Conservation Status	Observed May/June 06
<b>Caprimulgidae</b> Nightjars			
<i>Eurostodopus argus</i>	Spotted Nightjar		
<b>Aegothelidae</b> Owlet-nightjars			
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar		
<b>Apodidae</b> Swifts, Swiftlets			
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory CA JA	
<b>Halcyonidae</b> Tree Kingfishers			
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	Introduced	+
<i>Todiramphus sanctus</i>	Sacred Kingfisher		
<b>Meropidae</b> Bee-eaters			
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory JA	
<b>Pardalotidae</b> Pardalotes, Bristlebirds, Scrubwrens, Gerygones, Thornbills			
<i>Acanthiza apicalis</i>	Broad-tailed Thornbill	Bh	+
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	Bh	+
<i>Gerygone fusca</i>	Western Gerygone		+
<i>Pardalotus punctatus</i>	Spotted Pardalote		
<i>Pardalotus striatus</i>	Striated Pardalote		
<b>Meliphagidae</b> Honeyeaters, Chats			
<i>Acanthorhynchus superciliosus</i>	Western Spinebill		
<i>Anthochaera carunculata</i>	Red Wattlebird		+
<i>Anthochaera lunulata</i>	Western Little Wattlebird	Bp	
<i>Epthianura albifrons</i>	White-fronted Chat		
<i>Lichmera indistincta</i>	Brown Honeyeater		
<i>Melithreptus lunatus</i>	White-naped Honeyeater	Bp	
<i>Phylidonyris melanops</i>	Tawny-crowned Honeyeater	Bp	
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	Bp	
<b>Petroicidae</b> Australian Robins			
<i>Petroica multicolor</i>	Scarlet Robin	Bh	+

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Class Family Species	Common Name	Conservation Status	Observed May/June 06
<b>Neosittidae</b>			
Sittellas			
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Bh	
<b>Pachycephalidae</b>			
Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers			
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	Bh	
<i>Pachycephala pectoralis</i>	Golden Whistler	Bh	
<i>Pachycephala rufiventris</i>	Rufous Whistler		+
<b>Dicruridae</b>			
Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo			
<i>Grallina cyanoleuca</i>	Magpie-lark		+
<i>Rhipidura fuliginosa</i>	Grey Fantail		+
<i>Rhipidura leucophrys</i>	Willie Wagtail		+
<b>Campephagidae</b>			
Cuckoo-shrikes, Trillers			
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		+
<b>Artamidae</b>			
Woodswallows, Butcherbirds, Currawongs			
<i>Artamus cinereus</i>	Black-faced Woodswallow	Bp	+
<i>Artamus cyanopterus</i>	Dusky Woodswallow	Bp	
<i>Cracticus tibicen</i>	Australian Magpie		+
<i>Cracticus torquatus</i>	Grey Butcherbird		
<b>Corvidae</b>			
Ravens, Crows			
<i>Corvus coronoides</i>	Australian Raven		+
<b>Motacillidae</b>			
Old World Pipits, Wagtails			
<i>Anthus novaeseelandiae</i>	Australian Pipit		+
<b>Hirundinidae</b>			
Swallows, Martins			
<i>Hirundo neoxena</i>	Welcome Swallow		+
<i>Hirundo nigricans</i>	Tree Martin		
<b>Sylviidae</b>			
Old World Warblers			
<i>Cincloramphus mathewsi</i>	Rufous Songlark		

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Class	Common Name	Conservation Status	Observed May/June 06
Family Species			
<b>Zosteropidae</b>			
White-eyes			
<i>Zosterops lateralis</i>	Grey-breasted White-eye		
<b>Mammals</b>			
<b>Tachyglossidae</b>			
Echidnas			
<i>Tachyglossus aculeatus</i>	Echidna		
<b>Dasyuridae</b>			
Carnivorous Marsupials			
<i>Phascogale tapoatafa tapoatafa</i>	Southern Brush-tailed Phascogale	P3	
<b>Peramelidae</b>			
Bandicoots			
<i>Isoodon obesulus fusciventer</i>	Southern Brown Bandicoot	P5	
<b>Phalangeridae</b>			
Brush-tail Possums, Cuscuses			
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		+
<b>Burramyidae</b>			
Pygmy Possums			
<i>Cercartetus concinnus</i>	Western Pygmy-possum		
<b>Tarsipedidae</b>			
Honey Possum			
<i>Tarsipes rostratus</i>	Honey Possum		
<b>Pseudocheiridae</b>			
Ringtail Possums			
<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum	S1 VU	+
<b>Macropodidae</b>			
Kangaroos, Wallabies			
<i>Macropus fuliginosus</i>	Western Grey Kangaroo		+
<b>Molossidae</b>			
Freetail Bats			
<i>Mormopterus planiceps</i>	Western Freetail Bat		
<i>Tadarida australis</i>	White-striped Freetail-bat		

Class Family Species	Common Name	Conservation Status	Observed May/June 06
<b>Vespertilionidae</b>			
Ordinary Bats			
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		
<i>Chalinolobus morio</i>	Chocolate Wattled Bat		
<i>Falsistrellus mackenziei</i>	Western False Pipistrelle	P4	
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat		
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat		
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat		
<i>Vespadelus regulus</i>	Southern Forest Bat		
<b>Muridae</b>			
Rats, Mice			
<i>Hydromys chrysogaster</i>	Water Rat	P4	
<i>Mus musculus</i>	House Mouse	Introduced	
<i>Rattus norvegicus</i>	Brown Rat	Introduced	
<i>Rattus rattus</i>	Black Rat	Introduced	+
<b>Canidae</b>			
Dogs, Foxes			
<i>Vulpes vulpes</i>	Red Fox	Introduced	+
<b>Felidae</b>			
Cats			
<i>Felis catus</i>	Cat	Introduced	+
<b>Bovidae</b>			
Horned Ruminants			
<i>Bos taurus</i>	European Cattle	Introduced	+
<b>Leporidae</b>			
Rabbits, Hares			
<i>Oryctolagus cuniculus</i>	Rabbit	Introduced	+

# **APPENIDIX B**

**CALM DATABASE SEARCH RESULTS (MAY 2006)**



Grid: 50 350038 mE 6277545 mN / 357221 mE 6270578 mN

Wonnerup South

\* *Date* *Certainty* *Seen* *Location Name* *Method***Schedule 1 - Fauna that is rare or is likely to become extinct*****Macrotis lagotis*** **Bilby** *1 records*

This species shelters in burrows and occupies a range of habitats from grassland on clayey and stony soils or sandplains to mulga scrub and woodlands on red earths. It has suffered a large decline and contraction in distribution. It is unlikely to occur in the area in question.

1972	3	Geographe
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***Pseudocheirus occidentalis*** **Western Ringtail Possum** *2 records*

This species occurs in areas of forest and dense woodlands and requires tree hollows and/or dense canopy for refuge and nesting.

1991	1	11	Busselton
2004	1	24	Reinscourt

Night sighting

***Calyptorhynchus baudinii*** **Baudin's Black-Cockatoo** *0 records*

This species is a seasonal visitor to the northern forests and adjacent eastern edge of the coastal plain, feeding on the seeds of eucalypts and various proteaceous species. It breeds in spring/summer in the southern forests, nesting in tree hollows (primarily in Marri). It may occur in the area in question.

***Calyptorhynchus latirostris*** **Carnaby's Black-Cockatoo** *0 records*

This species moves around seasonally in flocks to feeding areas in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeding occurs in winter/spring, mainly in the eastern forests and wheatbelt where they can find mature hollow-bearing trees to nest in. It may occur in the area in question.

**Schedule 4 - Other specially protected fauna*****Falco peregrinus*** **Peregrine Falcon** *1 records*

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land.

1994	1	1	Busselton
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Day sighting

**Priority Three: Taxa with several, poorly known populations, some on conservation lands*****Lerista lineata*** **Lined Skink** *1 records*

A small, slender skink that inhabits white sands.

1	1	West Busselton
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Caught or trapped

**Priority Five: Taxa in need of monitoring (conservation dependent)*****Isoodon obesulus fusciventer*** **Quenda** *1 records*

This species prefers areas with dense understorey vegetation, particularly around swamps and along watercourses, that provides ample protection from predators.

1981	1	1	Wonnerup
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\* Information relating to any records provided for listed species:-

Date: date of recorded observation

Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.

Seen: Number of individuals observed.

Location Name: Name of reserve or nearest locality where observation was made

Method: Method or type of observation



# Fauna values of the Busselton Regional Airport expansion area



May 2011

Prepared by:  
S. Elscot

## **GREEN IGUANA**

For:  
The Shire of Busselton  
Locked Bag 1, Southern Drive  
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**Cover photo:** Remnant Marri woodland at the northern end of the proposed airport expansion footprint.

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## Executive Summary

The Busselton Regional Airport commenced operation in 1997 as a general and recreational aviation airport however the current capacity of the airport is currently limited by runway length and other issues. The Shire of Busselton has been undertaking planning for the redevelopment of the facilities at the Busselton Regional Airport to allow for the future growth and development of the region by operating regular passenger transport services (RPT) with interstate and international capabilities. To enable this to occur, the current runway will need to be extended and upgraded, and remnant vegetation stands in the immediate vicinity may be impacted to enable the obstacle surface limit (OSL) requirements to be met.

This report has been prepared to provide information on the fauna values of the Busselton Regional Airport runway extension footprint ('the site'). The specific objectives of the fauna values survey and this report were to:

- Complete a desktop review to identify all vertebrate species that are *likely* to occur within the site, and undertake a limited field survey to assess habitats present and identify significant fauna attributes;
- Identify all species of conservation significance (local, state and federal) that are *likely* to occur within the site; and,
- Provide advice on measures to minimise environmental impacts and impacts on protected species (both State and Commonwealth).
- Provide an assessment of the site in relation to the EPBC Act.

The literature review identified 87 vertebrate species that potentially may occur in the vicinity of the Busselton Regional Airport expansion area. These comprised three frogs, 33 reptiles, 54 birds and eight mammals, including one introduced bird and five introduced mammals. Ten species are of conservation significance (9 CS1, 0 CS2 and 1 CS3 species).

Eight species are listed under the EPBC Act, five of which are migratory bird species listed under International treaties (i.e. JAMBA, CAMBA, ROKAMBA or the Bonn Convention) and two of which are threatened bird species (Carnaby's Cockatoo and Baudin's Cockatoo).

The Busselton Regional Airport expansion footprint is highly degraded as a result of many decades of livestock grazing. The proposal may impact on fauna in two main ways:

- Direct impacts on habitat and fauna arising from the loss of the Marri Woodland and possibly also the Peppermint woodland area, as well as a small seasonal wetland area;
- Disturbance to fauna using the surrounding areas. Potential disturbance impacts to the waterbirds of the Vasse-Wonnerup Ramsar site is the subject of another report being carried out in May 2011 (Elscot, 2011).

To enable the runway extension to proceed, the Marri woodland at the northern end of the runway will need to be removed, resulting in the loss of approximately 90 mature Marri trees and a small number of Christmas Trees. All but one of the trees do not contain hollows suitable for use by possums, bats or cockatoos, and one tree has hollows suitable for use by the Brushtail Phascogale. These trees also provide foraging opportunities for the threatened Carnaby's and Baudin's Cockatoo, although no suitable nesting hollows are present.

The Peppermint woodland to the northwest of the runway may need to be pruned or removed to meet the upgraded airport's obstacle surface limit requirements. One Western Ringtail Possum drey was found within the stand and it is likely that the species is present although in very low densities. Because the Western Ringtail Possum is present within the site, any clearing in this area should be carried out in accordance with the DEC Western Ringtail Possum clearing guidelines (DEC, 2010), and should also be carried out under a Regulation 15 Licence to take Fauna for Public Purposes issued by DEC under the Wildlife Conservation Act (1950).

The highly degraded seasonal wetland areas to the north of the proposed new runway corridor will need to be drained to allow the runway extension to proceed. The wetlands appear to be

palusplain type wetlands that experience ephemeral inundation at times. As a result, it is possible that some waterbird species which prefer open habitats and shallow waters may visit the wetlands on occasion. Four of the waterbirds that may use the wetlands are listed as migratory species under the EPBC Act (Great Egret, Long-toed Stint, Pectoral Sandpiper, and Curlew Sandpiper). Two of these species (the Long-toed Stint and the Curlew Sandpiper) have been counted in numbers greater than the 1% of the global population within the Vasse-Wonnerup Ramsar site. Because of the proximity of the wetlands to the airport site (approximately 5km away), it is likely that the wetlands are occasionally used by low numbers of these species however this habitat would be considered extremely marginal.

To enable the airport expansion to proceed, loss of these habitats is unavoidable. All three of the habitats are highly degraded as a result of long-term livestock grazing and similar habitats are available across the surrounding agricultural land. Higher quality habitats for these species occur within the Vasse-Wonnerup Ramsar site and the Tuart Forest National Park, both of which lie approximately 5km north of the site. Because of the degradation, the habitats within the site all provide very limited opportunities to threatened fauna and cannot be considered to be significant habitat for the species'.

This survey identified eight species listed under the EPBC Act that may occur within the Busselton Regional Airport expansion area. Of these, seven are bird species and one is a mammal (the Western Ringtail Possum). Five species are listed as migratory species under International treaties (i.e. JAMBA, CAMBA, ROKAMBA or the Bonn Convention) (Great Egret, Long-toed Stint, Pectoral Sandpiper, Curlew Sandpiper and the Fork-tailed Swift). Two of these migratory waders, the Long-toed Stint and the Curlew Sandpiper, have been counted in numbers greater than 1% of the national population within the Vasse-Wonnerup Ramsar site which is located approximately 5km north of the site. The remaining two bird species are Carnaby's Black Cockatoo, which is listed as Endangered, and Baudin's Black Cockatoo which is listed as Vulnerable.

Only one of the EPBC Act listed species, the Vulnerable Western Ringtail Possum, is likely to be resident within the site. One Western Ringtail Possum drey was located within the Peppermint woodland at the northern end of the footprint area, however despite a search of all the trees within the stand, no other dreys were found and as there are no alternative rest sites within the area, it appears that the species may be present in very low numbers only. Spotlighting would need to be carried out to confirm this. The Busselton Regional Airport site lies outside of the area defined to be important for the species within the Commonwealth significant impact guidelines for the Western Ringtail Possum on the southern Swan Coastal Plain (DEWHA, 2009). Therefore, removal of the Peppermint woodland area to allow for the airport's obstacle surface limit requirements to be met is unlikely to constitute a significant impact under the EPBC Act.

Four of the five listed migratory species are all known to occur on the Vasse-Wonnerup Ramsar site, located 5km north of the Busselton Regional Airport site. They are likely to only use the seasonal wetland within the site transiently, and in very low numbers. The wetland area cannot be considered to be important habitat for these species. Similarly, the fifth migratory species, the Fork-tailed Swift, is a relatively common and widespread species that is expected to occur only as an occasional, non-breeding visitor to the project area.

Removal of the degraded remnant Marri woodland at the northern end of the runway extension area will remove some foraging habitat for Carnaby's and Baudin's Cockatoo, however, there are no suitable nesting trees within the site. As the nearest suitable breeding habitat is likely to be Tuart Forest National Park, located 5km to the north of the site, this habitat patch is not considered to be 'important habitat' for these species.

To minimise the impacts of the proposed airport expansion on the site's fauna and fauna habitats, the following recommendations are made:

- (1) Clearing of Marri and Peppermint woodland should be offset by a comparable area of rehabilitation of both vegetation communities within a suitable distance of the site.
- (2) Clearing of the Peppermint woodland should be carried out in accordance with DEC clearing guidelines for the Western Ringtail Possum, including obtaining a Regulation 15



Licence to Take Fauna for Public Purposes issued by DEC under the WA Wildlife Conservation Act (1950).

- (3) Loss of seasonal wetland habitat within the site should be offset by rehabilitation of seasonal wetland habitat elsewhere, preferably within the boundaries of the Vasse-Wonnerup Ramsar site.

## CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>7</b>
1.1	BACKGROUND.....	7
1.2	OBJECTIVES .....	7
<b>2</b>	<b>METHODS .....</b>	<b>7</b>
2.1	LEVEL OF ASSESSMENT .....	7
2.2	PERSONNEL.....	7
2.3	NOMENCLATURE AND TAXONOMY.....	8
2.4	ASSESSMENT OF CONSERVATION SIGNIFICANCE .....	8
2.5	LITERATURE SEARCH/SOURCES OF INFORMATION.....	9
2.6	SITE ASSESSMENT .....	9
2.7	LIMITATIONS OF THIS STUDY .....	9
<b>3</b>	<b>THE EXISTING BIOLOGICAL ENVIRONMENT .....</b>	<b>10</b>
3.1	LANDFORMS, SOILS AND CLIMATE.....	10
3.2	BIOGEOGRAPHY AND ZOOGEOGRAPHY .....	10
3.3	VEGETATION AND FLORA .....	11
3.4	PREVIOUS FAUNA SURVEYS .....	11
<b>4</b>	<b>RESULTS AND DISCUSSION .....</b>	<b>11</b>
4.1	ASSESSMENT OF FAUNA HABITATS PRESENT.....	11
4.2	OVERVIEW – VERTEBRATE SPECIES LIKELY TO OCCUR .....	11
4.2.1	<i>Amphibians</i> .....	11
4.2.2	<i>Reptiles</i> .....	11
4.2.3	<i>Birds</i> .....	12
4.2.4	<i>Mammals</i> .....	12
4.2.5	<i>Overview of species of conservation significance</i> .....	12
4.3	SIGNIFICANT SPECIES.....	12
4.3.1	<i>Birds</i> .....	13
4.3.2	<i>Mammals</i> .....	13
<b>5</b>	<b>CONCLUSION .....</b>	<b>14</b>
5.1	IMPACTS ON AND MANAGEMENT OF FAUNA VALUES .....	14
5.2	EPBC ACT ASSESSMENT .....	15
5.3	RECOMMENDATIONS .....	16
<b>6</b>	<b>FAUNA TABLES .....</b>	<b>18</b>
<b>7</b>	<b>FIGURES.....</b>	<b>22</b>
<b>8</b>	<b>REFERENCES.....</b>	<b>27</b>
	<b>APPENDIX 1: CATEGORIES USED IN THE ASSESSMENT OF CONSERVATION STATUS.....</b>	<b>30</b>

## 1 Introduction

### 1.1 Background

The Busselton Regional Airport commenced operation in 1997 as a general and recreational aviation airport supporting the Royal Flying Doctor Service, local aero clubs, Department of Environment and Conservation, Royal Australian Air Force, private individuals and more recently Fly-in Fly-out (FIFO) charter operations. Use of the airport by light aircraft and FIFO charter services has increased in recent years. Capacity of the airport is currently limited by runway length and other issues.

Development of the Busselton Regional Airport has been identified as a high priority for tourism and economic development within the Busselton Shire and the South West Region by the Shire of Busselton, Tourism WA and the South West Development Commission (RDA, 2010). As a result, the Shire of Busselton has been undertaking planning for the redevelopment of the facilities at the Busselton Regional Airport to allow for the future growth and development of the region by operating regular passenger transport services (RPT) with interstate and international capabilities. To enable this to occur, the current runway will need to be extended and upgraded, and remnant vegetation stands in the immediate vicinity may be impacted to enable the obstacle surface limit (OSL) requirements to be met.

In April 2011, the Shire of Busselton commissioned Green Iguana to undertake a Level 1 fauna survey of the footprint area for the proposed runway expansion at the Busselton Regional Aerodrome.

### 1.2 Objectives

This report has been prepared to provide information on the fauna values of the Busselton Regional Airport runway extension footprint ('the site'), for use in any environmental impact assessment that may be undertaken.

The specific objectives of the fauna values survey and this report were to:

- Complete a comprehensive desktop review to identify all vertebrate species that are *likely* to occur within the site, and undertake a limited field survey to assess habitats present and identify significant fauna attributes;
- Identify all species of conservation significance (local, state and federal) that are *likely* to occur within the site; and,
- Provide advice on measures to minimise environmental impacts and impacts on protected species (both State and Commonwealth).
- Provide an assessment of the site in relation to the EPBC Act.

## 2 Methods

### 2.1 Level of assessment

The fauna assessment and report preparation were carried out with reference to guidance and position statements published by the Western Australian Environmental Protection Authority (EPA) on fauna surveys for environmental impact assessment and biodiversity protection (EPA 2002; EPA 2004), and the requirements of the *Commonwealth Environment Protection and Biodiversity Conservation Act (1999)* ('the EPBC Act'). The report provides the results of a literature review and a site inspection, and is classified as a Level 1 survey (desktop study, reconnaissance survey) according to the EPA Position Statement No. 3 (EPA 2002) and the more recent Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA and DEC 2010). No permits were required to carry out this work.

### 2.2 Personnel

The desktop survey, site inspection and report preparation were carried out by Sue Elscot *BSc (Biol)*, Green Iguana, Dunsborough.

### 2.3 Nomenclature and taxonomy

As per the recommendations of EPA (2004), the nomenclature and taxonomic order presented in this report are based on the Western Australian Museum's *Checklist of the Vertebrates of Western Australia*. The authorities used for each vertebrate group are: amphibians and reptiles (Aplin and Smith 2001), birds (Johnstone 2001), and mammals (How *et al.* 2001). Where available, English common names follow Christidis and Boles (1994) or Johnstone (2001) for birds, and Bush *et al.* (1995) or the WA Museum's Faunabase for amphibians and reptiles.

### 2.4 Assessment of conservation significance

The conservation status of fauna species is assessed under the Commonwealth EPBC Act and the *Western Australian Wildlife Conservation Act* 1950. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN 2001). The *WA Wildlife Conservation Act* 1950 uses a set of schedules but also classifies species using some of the IUCN categories. These categories and schedules are described in Appendix 1.

The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals). The list of migratory species under the EPBC Act has been revised to include species only, thus excluding family listings. Those species listed in JAMBA are also protected under Schedule 3 of the *WA Wildlife Conservation Act*.

The EPBC Act also protects species listed under the Convention on the International Trade in Endangered Species (CITES). There is a separate list of marine species under the EPBC Act, but this only applies to land and waters under Commonwealth management. Therefore, marine listings are not included in this report.

Predecessors of the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) (formerly the Department of Environment, Water, Heritage and the Arts, and prior to that the Department of Environment and Water Resources, and the Department of Environment and Heritage, and Environment Australia) have also supported the publication of reports on the conservation status of most vertebrate fauna species: freshwater fish (Wager and Jackson 1993), reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al.* 1996), rodents (Lee 1995) and bats (Duncan *et al.* 1999). These publications also use the IUCN categories, although those used by Cogger *et al.* (1993) differ in some respects because this report pre-dates categories reviewed by Mace and Stuart (1994) and revisited since by IUCN (2001).

In Western Australia, the Department of Environment and Conservation (DEC) maintains a supplementary list of Priority Fauna, being species that are not considered threatened under the *WA Wildlife Conservation Act* but for which the Department feels there is cause for concern. Some Priority species, however, are also assigned to the IUCN Conservation Dependent category. Levels of Priority are described in Appendix 1. Assessments in this report are based on the most recent version of the DEC priority fauna list (August 2010).

Fauna species included under conservation acts and/or agreements are formally recognised as having conservation significance under state or federal legislation. Species listed only as Priority by DEC, or that are included in publications such as Garnett and Crowley (2000) and Cogger *et al.* (1993), but not in State or Commonwealth Acts, are also of recognised conservation significance. In addition, species that are at the limit of their distribution, those that have a very restricted range and those that occur in breeding colonies, such as some waterbirds, can be considered of conservation significance, although this level of significance has no legislative or published recognition and is based on interpretation of distribution information.

On the basis of the above comments, three levels of conservation significance are recognised in this report:

- *Conservation Significance (CS) 1:* Species listed under State or Commonwealth Acts.

- **Conservation Significance (CS) 2:** Species not listed under State or Commonwealth Acts, but listed in publications on threatened fauna or as Priority species by DEC.
- **Conservation Significance (CS) 3:** Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution. This level may have links to preserving biodiversity at the genetic level (EPA Position Statement No. 3, EPA 2002). For example, if a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as CS3.

In addition to these statuses, species that have been introduced (INT) are also indicated.

This method of assessing conservation significance has been developed by, and used with kind permission of, Dr. Mike Bamford of Bamford Consulting Ecologists, Kingsley.

## 2.5 Literature search/Sources of information

A list of fauna that would be expected to occur in the area of interest was generated by searching available databases and literature. Sources of information included:

- The Western Australian Department of Conservation and Environment (DEC) threatened fauna database.
- The Commonwealth Department of Sustainability, Environment, Water, Population and Communities' EPBC Act protected matters database.
- The Western Australian Museum's 'Faunabase'.
- Birds Australia's database for the second Atlas of Australian Birds.
- Information and species distribution maps provided by Allen *et al.* (2003), Tyler *et al.* (2000), Storr *et al.* (1983; 1990; 1999), Wilson and Swan (2003), Cogger (2000), Johnstone and Storr (1998), Strahan (1995), Menkhorst and Knight (2004), Churchill (1998) and de Tores *et al.* (2007).
- Published and unpublished fauna surveys and environmental impact assessment reports (CFMP & F Pty Ltd, 1995; EPA 1989, 1993; Satterley Property Group, 2011).

## 2.6 Site assessment

A site assessment was carried out by Sue Elscot on April 29, 2011. The site assessment was carried out with the following objectives:

- iii) to broadly characterise fauna habitats within the site,
- iv) to verify the accuracy of the desktop survey and to further characterise the terrestrial vertebrate fauna and faunal assemblages present within the vicinity of the site, and
- v) to identify potential impacts of development of the site.

Prior to the site assessment aerial photographs, vegetation maps and land-system maps were used to broadly identify vegetation within and surrounding the site which may support fauna of conservation significance. The site assessment involved an inspection of the site to characterise and describe the fauna habitats present within the site and to identify, and record the location of, any potentially significant fauna habitat within the site. Where possible, habitats capable of supporting fauna of conservation significance were inspected for evidence (scat, diggings, tracks, burrows, nests, runs) of any threatened fauna and opportunistic observations of fauna were also recorded.

## 2.7 Limitations of this study

This study presents the results of a desktop study and site assessment to determine a list of terrestrial vertebrate fauna species *likely* to be present within the site. Species for which no suitable habitat (roosting or foraging) occurs within the site have been excluded while those species which may use the site for foraging only have been included. Species which are expected to occur only as occasional vagrants have also been excluded.



No trapping of fauna, spotlighting or bird counts were carried out. This study also provides no information relating to invertebrate species, and this is due to a paucity of information on these faunal groups within the bioregion.

The degraded seasonal wetland area to the northeast of the footprint area was dry and sandy at the time of the site assessment, and the rush species present suggest that the area is generally only a seasonally waterlogged wetland however some older aerial photography of the site shows standing water on surface in some parts of the wetlands. The bird species tables include species which may use a shallow body of open water as has been observed on the aerial photography, as well as frog species which may occur, however this habitat may only be present for short periods within the site. No information on the long-term hydrology of this wetland area is available.

### 3 The Existing Biological Environment

#### 3.1 Landforms, soils and climate

The site lies within the southern Swan Coastal Plain. Landforms and soils of the study area have been mapped by the Department of Agriculture (2003). The site lies wholly within the Abba Land System, which encompasses the poorly drained Swan Coastal Plain to the south and west of Capel (Department of Agriculture, 2003). The geology of the Abba Land System is alluvium over sedimentary rocks. Two land units have been mapped within the site – the majority of the site is Abba Flats (AB1) while the northeastern low-lying areas are mapped as Abba Wet Flats (ABw) (Department of Agriculture, 2003). The Abba Flats are a plain consisting of very low rises, pale sandy earths, semi-wet soils and pale deep sands with some deep grey sandy duplexes. Vegetation of the Abba Flats is Jarrah (*Eucalyptus marginata*) Marri (*Corymbia calophylla*) woodland. The Abba Wet Flats are poorly drained flats and depressions with semi-wet soils, pale sandy earths and pale deep sands. Vegetation of the Abba Wet Flats is Paperbark (*Melaleuca* spp.) Marri woodland.

The study area experiences a moderate Mediterranean climate and receives an average of between 800 – 1000 mm annual rainfall, the majority of which falls between May and October each year (BOM, 2008). During summer (December to February) daily temperatures range from an average maximum of 28°C to an average minimum of 12°C (BOM, 2011). In winter (June to August) daily temperatures range from an average maximum of 16°C to an average minimum of 5°C (BOM, 2011).

#### 3.2 Biogeography and zoogeography

Western Australia is broadly divided into three main zoogeographic regions: The mesic Bassian region which encompasses the southwest of the state, the arid Eyrean region which encompasses the greatest part of the state, and the subtropical Torresian region which encompasses the northern parts of the state. The study area lies within the Bassian region.

Some researchers use climatic zones within the state to delineate the distribution patterns of fauna, particularly avians and herpetofauna. These comprise five zones: (1) the humid zone of the wet southwest; (2) a subhumid zone which occurs in both in the southwest and the northern Kimberley; (3) the semi-arid zone which occurs in both the drier parts of the southwest (north to the mulga-eucalypt line) and the greater Kimberley area; (4) the arid zone, which encompasses the greater parts of the mid and northwest of the state, including the Pilbara; (5) and the desert zone which includes all of the inland desert areas (Johnstone and Storr, 1998; Storr *et al.*, 1999). The study area lies within the sub-humid zone.

On a finer scale, Australia has been divided into 85 biogeographic regions based on affinities in climate, geology, vegetation and fauna, of which 26 bioregions have been identified within WA (EA, 2000). The site lies within the southern Swan Coastal Plain (SWA) Bioregion, and the Swan Coastal Plain subregion (SWA2). This sub-region has been described as:

*“The Swan Coastal Plain is a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, Casuarina obesa on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland. The climate is Warm Mediterranean. Three phases of*

*marine sand dune development provide relief. The outwash plains, once dominated by C. obesa-marri woodlands and Melaleuca shrublands, are extensive only in the south (Mitchell et al., 2002:606)."*

The Swan Coastal Plain is placed within the Bioregion Group 1 classification of EPA, which encompasses those bioregions within the South West Botanical Province that are extensively cleared for agriculture (EPA, 2004).

### 3.3 Vegetation and flora

The vegetation and flora of the site has not been assessed by a botanist. The site is heavily degraded, and vegetation present was recorded during the site assessment and is described in Section 4.1.

### 3.4 Previous fauna surveys

A Consultative Environmental Review document was prepared for the initial development of the current Busselton Regional Airport site in 1995 (CMPS & F Pty Ltd, 1995). In that document, it was noted that the Four Mile Hill airport site was located in an area in which the fauna assemblages had received little study. A desktop study, discussions with the then Department of Environment and Conservation (now DEC), and subsequent site inspections were carried out to assess the likelihood of rare or threatened fauna occurring within the site. The study concluded that *"the likelihood of rare or endangered species occupying the site was extremely low given the site is predominantly clear of all native stands of vegetation which would provide habitat for faunal species"* (CMPS & F Pty Ltd, 1995:21). It was also noted that disturbance from sand mining activities was likely to have reduced the likelihood of threatened species occurring. Fauna expected to occur within the site were listed as the Rabbit (*Oryctolagus cuniculus*), the Red Fox (*Vulpes vulpes*) and the Western Grey Kangaroo (*Macropus irma*) (CMPS & F Pty Ltd, 1995).

The Western Ringtail Possum and Common Brushtail Possum are known to occur in the Provence housing estate located approximately 3km north of the runway expansion area (Satterley Property Group, 2011).

Assessments for sand mining to the north of the site carried out in the early 1990s identified that the Western Ringtail Possum was present within the local area (EPA, 1989; 1993). Commitments were made by the mining company to translocate possums from the mining footprint prior to mining. No other fauna were discussed in those reports although it was noted that the area was heavily degraded as a result of livestock grazing and that was likely to have limited available fauna habitats.

## 4 Results and Discussion

### 4.1 Assessment of fauna habitats present

The Busselton Regional Airport site lies 6.5km southeast of the Busselton CBD (figure 1). The airport site lies within farmland used for livestock grazing and the surrounding area has also been subject to sand mining in the past (EPA, 1989; 1993). The nearest remnant vegetation to the site lies 1.6km west, while residential developments occur approximately 2km north of the site.

The development footprint for the runway extension encompasses a total area of 58.158 ha which is heavily degraded as a result of long-term livestock grazing and use of the area as an aerodrome since 1995. Most of the area is cleared pasture consisting solely of introduced flora. There are two stands of remnant vegetation at the northern end of the footprint. One is a stand of Marri (*Corymbia calophylla*) with a small number of Christmas Trees (*Nyctia floribunda*) which encompasses a total area of 1.352 ha, all of which is within the proposed footprint area (hereafter referred to as the 'Marri woodland', see figures 2 and 3). No understorey is present and no regeneration is occurring due to ongoing grazing impacts. Approximately 90 trees occur within the stand, the majority of which are healthy. No significant habitat trees occur, and no tree hollows were observed in all but one tree within the stand. One Marri with a diameter at breast height of greater than 1m has small hollows forming in limbs however they were not large enough to be used by any possums or the large Cockatoo species however it may potentially be used by the

Brushtail Phascogale (*Phascogale tapoatafa tapoatafa*) (location AMG Zone 50 - 352711 mE and 6273160 mN). This Marri stand will need to be removed as part of the airport redevelopment.

To the northeast of the proposed runway extension lies a remnant stand of approximately 40 large, mature Peppermint trees (*Agonis flexuosa*) spread over an area of 2.852 ha of which 2.106 ha is within the footprint area (hereafter referred to as the 'Peppermint woodland', see figures 4 and 5). As for the Marri woodland area, there is no understorey and no regeneration occurring due to grazing impacts. There is some canopy connectivity between Peppermints in this area, although many are also isolated trees. Several Woody Pear trees (*Xylomelum occidentale*) also occur. One Western Ringtail Possum (*Pseudochierus occidentalis*; WRP) drey was located in the upper canopy of a large mature Peppermint tree (location AMG Zone 50 – 352480 mE and 6273065 mN). No other WRP dreys were located when the entire stand was searched, and there are no alternative WRP rest sites, such as tree hollows or grass trees, within the area. No WRP scat could be located however the area had experienced very heavy rainfall in the previous few days. Trees within this stand may need to be either removed or pruned to meet the obstacle surface limit (OSL) requirements within the runway corridor.

Two small seasonal wetland areas occur within the proposed runway corridor, immediately north of the existing runway (figures 6 and 7). These encompass a total area of 0.675 ha and 0.767 ha, of which 0.532 ha and 0.767 ha lie within the footprint area. The wetland areas are heavily degraded by cattle grazing and trampling, and there is a sparse cover of the native Pale Rush (*Juncus pallidus*) which has been heavily grazed by cattle so there is no regeneration occurring. The wetlands were dry and sandy at the time of the field assessment, so it is not clear what the hydrological regime is, however the presence of Pale Rush suggests that the area is seasonally waterlogged only (i.e. a palusplain type wetland) as Pale Rush does not generally tolerate inundation. Lower-lying parts appear to support some inundation during winter as pools of water are visible on some aerial photography of the site. There was no evidence of any fauna use of the wetland.

Fauna species observed during the site assessment are marked with an asterisk on the fauna tables (section 5). No fauna of conservation significance were observed during the field assessment.

## **4.2 Overview – Vertebrate species likely to occur**

The literature review identified 87 vertebrate species that potentially may occur in the vicinity of the Busselton Regional Airport expansion area. These comprised three frogs, 33 reptiles, 54 birds and 8 mammals, including one introduced bird and five introduced mammals (tables 1 to 4). Another 9 species, comprising three birds and six mammals, are considered to be locally extinct (table 5). The species lists exclude species for which no suitable habitat (roosting or foraging) occurs within the site, even though the species may occur within the surrounding locality, and also excludes occasional vagrants. The list includes some species such as waterbirds and waders which are expected to occur only as casual visitors and in low numbers only when sufficient water is present with the highly degraded seasonal wetland area. The list also includes all reptile species which may occur, however given the highly degraded nature of the site because of livestock grazing, it is likely that many species will be absent from the site and those that do occur are likely to do only in very low numbers. Species which may use the site for foraging, such as some raptor species, although no suitable roosting habitat occurs, have also been included.

### **4.2.1 Amphibians**

There are three species of frog that have the potential to occur within the project area. The three frog species (table 1) that may occur within the site are all ground-dwelling, burrowing frogs that are common throughout the southwest, especially in open areas where water is present. As they are a burrowing species, they are impacted by livestock trampling so they are likely only to occur in very low numbers, if at all. No frog species of conservation significance are likely to occur within the project area.

### **4.2.2 Reptiles**

The 22 reptile species that may occur in the project area includes all possible small skinks and reptiles which can occur in degraded areas providing sufficient litter and cover is available.

Because the study area is highly degraded as a result of many decades of livestock grazing, it is likely that only a few of the reptiles from that list are actually present, and then only in very small numbers. One reptile which may occur is of regional conservation significance (CS3), the small skink *Hemiergis quadrilineata*, because it is endemic to the southwest of Western Australia (table 2). No reptiles listed under the EPBC Act are expected to occur in the vicinity of the project area, and no reptiles were observed during the site visit.

#### 4.2.3 Birds

The list of 54 bird species from 23 families (table 3) includes 23 species of waterbirds that may occasionally occur within the seasonal wetland areas within the site, as well as the drainage network of the existing runway corridor. Seven birds of conservation significance may occur within the site, of which all are of CS1. All seven are also listed under the EPBC Act, five as migratory species which are listed under the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) or the Bonn Convention, one Endangered species Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and one Vulnerable species Baudin's Cockatoo (*Calyptorhynchus baudinii*). An account of the seven birds of conservation significance is given below (section 4.3). Five bird species were observed during the site visit, all within the Marri woodland at the northern end of the runway expansion area, none of which are of conservation significance; these species are shown with an asterisk on table three.

#### 4.2.4 Mammals

There are few native mammals likely to occur within the site due to the lack of suitable habitat, particularly the lack of any understorey or hollow logs within the site's remnant vegetation as well as the lack of trees with suitable hollows. The eight mammal species expected to occur in the vicinity of the site (table 4) includes five introduced species and excludes six native mammal species that are considered to be locally extinct (table 5). One threatened mammal has been excluded from the lists as no suitable habitat occurs within the project area, even though the site is within the known distribution of the species (the Chuditch *Dasyurus geoffroii*), and the Brush-tail Phascogale *Phascogale tapoatafa tapoatafa*) which is of CS1 has been included because of the presence of one tree which may potentially provide a den site for the species. Another mammal of CS1, the Western Ringtail Possum (*Pseudocheirus occidentalis*) is likely to occur within the Peppermint woodland vegetation to the north of the runway expansion area and one drey of the species was located during the site assessment (figure 1). The Western Ringtail Possum is listed under the EPBC Act as a Vulnerable species. No other threatened mammals are likely to occur within the site.

#### 4.2.5 Overview of species of conservation significance

Of the 87 species of terrestrial vertebrate that may occur in the vicinity of the Busselton Regional Airport expansion area, there are ten species of conservation significance (9 CS1, 0 CS2 and 1 CS3 species). Eight species are listed under the EPBC Act, five of which are migratory bird species listed under International treaties (i.e. JAMBA, CAMBA, ROKAMBA or the Bonn Convention). The number of significant species in each of the vertebrate classes was:

Amphibia (Frogs)	3 (0 CS1, 0 CS2, 0 CS3, 0 EPBC)
Reptilia (Reptiles)	1 (0 CS1, 0 CS2, 1 CS3, 0 EPBC)
Aves (Birds)	7 (7 CS1, 0 CS2, 0 CS3, 7 EPBC)
Mammalia (Mammals)	2 (2 CS1, 0 CS2, 0 CS3, 1 EPBC)

### 4.3 Significant species

This section of the report provides accounts of all species of conservation significance that may occur in the vicinity of the Busselton Regional airport expansion area. For each species, their status under State and Commonwealth legislation is given, as is information on their known distribution and habitat requirements (where information is available). An assessment of their status within the vicinity of the site is also given.

#### 4.3.1 Birds

Five bird species that may occur within the project area are of CS1 as they are listed as migratory species under the EPBC Act because they are listed under JAMBA, CAMBA, ROKAMBA or the Bonn Convention. Mostly they are trans-equatorial migrants which breed in the northern hemisphere in the boreal summer and migrate to Australia for the austral summer. These species generally arrive in Australia during spring (September to November) and leave on their northward migration by autumn (i.e March to April) (Johnstone and Storr, 1998). Four of these species are only likely to occur transiently within the site, when and if the hydrology of the seasonal wetland area is suitable, and as the wetland area is so heavily degraded from cattle trampling and grazing, the area is likely to only support those species in very low numbers. The 5 listed migratory species are:

<i>Ardea alba</i>	Great Egret
<i>Calidris subminuta</i>	Long-toed Stint
<i>Calidris melanotos</i>	Pectoral Sandpiper
<i>Calidris ferruginea</i>	Curlew Sandpiper
<i>Apus pacifica</i>	Fork-tailed Swift

Both the Long-toed Stint and the Curlew Sandpiper have been counted in numbers greater than 1% of the national population within the Vasse-Wonnerup Ramsar wetland located approximately 5km north of the Busselton Regional Airport site (Jaensch *et al.*, 1988; DEWHA, 2011; Bamford, 1995, 1997; Gole *et al.* 2008). The Fork-tailed Swift is a relatively common and widespread species that is expected to occur only as an occasional, non-breeding visitor to the project area.

The following two birds are also of CS1:

##### *Calyptorhynchus latirostris*

##### Carnaby's Black Cockatoo

Carnaby's Black Cockatoo is listed as an Endangered species under Schedule 1 of the WA Wildlife Conservation Act, the EPBC Act and by Garnett and Crowley (2000). It is endemic to the southwest of Western Australia. This species prefers proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests, although it also feeds in pine plantations. The main threats to the species are the loss of both breeding and feeding habitat. This species forms large flocks during the summer period (often in conjunction with Baudin's Cockatoo, see below) and moves towards coastal areas to feed on the predominantly proteaceous heathland habitats. This species may forage within the Marri woodland at the northern end of the site however there are no suitable nesting trees within the study area. Information on this species is derived from Johnstone and Storr (1998).

##### *Calyptorhynchus baudinii*

##### Baudin's Black Cockatoo

Baudin's Black Cockatoo is listed as an Endangered species under Schedule 1 of the WA Wildlife Conservation Act and as a vulnerable species under the EPBC Act. It was classified as near threatened by Garnett and Crowley (2000). It is endemic to the southwest of Western Australia. Baudin's Black Cockatoo prefers eucalypt forests and the main threats to the species are the loss of both breeding and feeding habitat. Baudin's Black Cockatoo may forage within the Marri woodland at the northern end of the site however there are no suitable nesting trees within the study area. Information on this species is derived from Johnstone and Storr (1998).

#### 4.3.2 Mammals

The following two mammals are of CS1:

##### *Pseudocheirus occidentalis*

##### Western Ringtail Possum

The Western Ringtail Possum is listed as a Vulnerable species under Schedule 1 of the WA Wildlife Conservation Act, the EPBC Act and in the Action Plan for Australian Marsupials and Monotremes (Maxwell *et al.* 1996). The Western Ringtail Possum is endemic to the southwest of Western Australia. It was formerly patchily distributed through the near-coastal southwest from 120km south of Geraldton to the southern edge of the Nullabor Plain and its range has now substantially contracted. Extant populations now occur mostly on the coastal strip from Yalgorup (100km south of Perth) to Waychinicup National Park (just east of Albany), with isolated inland



populations in the lower Collie River valley and at Manjimup. The Western Ringtail Possum is a nocturnal, arboreal folivore and, with the exception of the isolated population at Perup, it now occurs only in coastal Peppermint (*Agonis flexuosa*) woodland or Peppermint/Tuart (*Eucalyptus gomphocephala*) woodland associations. The Western Ringtail Possum is known to occur in the surrounding district (DEC Threatened fauna database) and one drey of the species was located within the Peppermint woodland area at the northern end of the runway expansion area (figure 1). No other WRP dreys were located when the entire stand was searched, and there are no alternative WRP rest sites, such as tree hollows or grass trees, within the area. No WRP scat could be located however the area had experienced very heavy rainfall in the previous few days. Therefore, although the WRP is likely to be present within the Peppermint woodland area, it appears that it is present in low densities only, however some spotlighting would be needed to identify numbers present within the area. Information on this species was sourced from Strahan (1995), Menkhorst and Knight (2004) and Maxwell *et al.* (1996).

*Phascogale tapoatafa tapoatafa*

Brush-tailed Phascogale (southern)

The Brush-tailed Phascogale is listed under Schedule 1 of the WA Wildlife Conservation Act as Vulnerable although it is not listed under the EPBC Act. This subspecies was formerly widespread in eastern and southwestern Australia however its range is now reduced by approximately half, occurring from Perth south to Albany with highest densities in the Perup and Busselton to Margaret River areas. The Brush-tailed Phascogale prefers dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover. Records are less frequent from the wetter forests. The Brush-tailed Phascogale may be present within the Marri woodland area however there are few trees of sufficient age to contain hollows suitable for use as den sites by this species, and only one suitable hollow-bearing tree was found during the site assessment. Information on this species was sourced from Strahan (1995), Menkhorst and Knight (2004) and Maxwell *et al.* (1996).

## 5 Conclusion

### 5.1 Impacts on and management of fauna values

This survey identified 87 species of terrestrial vertebrate that may occur in the vicinity of the Busselton Regional Airport expansion area, of which ten species of conservation significance (9 CS1, 0 CS2 and 1 CS3 species). Eight species are listed under the EPBC Act, five of which are migratory bird species listed under International treaties (i.e. JAMBA, CAMBA, ROKAMBA or the Bonn Convention) and two of which are threatened bird species (Carnaby's Cockatoo and Baudin's Cockatoo).

Expansion of the Busselton Regional Airport footprint may impact on fauna in two main ways:

- Direct impacts on habitat and fauna arising from the loss of the Marri woodland and possibly also the Peppermint woodland area, as well as two small seasonal wetland areas;
- Disturbance to fauna using the surrounding areas. Potential disturbance impacts to the waterbirds of the Vasse-Wonnerup Ramsar site is the subject of another report being carried out in May 2011 (Elscot, 2011).

To enable the runway extension to proceed, the Marri woodland at the northern end of the runway will need to be removed. This will result in the loss of approximately 90 mature Marri trees and a small number of Christmas Trees. All but one of the trees do not contain hollows suitable for use by possums, bats or cockatoos, and one tree has hollows suitable for use by the Brushtail Phascogale. These trees also provide foraging opportunities for the threatened Carnaby's and Baudin's Cockatoo, although no suitable nesting hollows are present.

The Peppermint woodland to the northwest of the runway may need to be pruned or removed to meet height restrictions to meet the obstacle surface limit requirements. One Western Ringtail Possum drey was found within the upper canopy of a Peppermint tree within the stand, however no other dreys were located during a search of the area. It is highly likely that the species is present in the woodland, however given the lack of dreys or other available rest sites, it is likely to occur in very low densities. Because the Western Ringtail Possum is present within the site, any clearing in this area should be carried out in accordance with the DEC Western Ringtail Possum

clearing guidelines (DEC, 2010), and should also be carried out under a Regulation 15 Licence to take Fauna for Public Purposes issued by DEC under the Wildlife Conservation Act (1950). The Peppermint woodland is likely to support a number of bird and reptile species but no other species of conservation significance.

The highly degraded seasonal wetland areas to the north of the proposed new runway corridor will need to be drained to allow the runway extension to proceed. The wetland areas have been subject to livestock trampling and grazing for many decades and although some native rushes still remain there is little regeneration occurring. The wetlands were dry at the time of the site assessment and the hydrology is not clear. Rush species which remain in the wetland areas are only tolerant of ephemeral flooding and generally are found in seasonally waterlogged areas however aerial photographs of the site show water pooling in the surface in the area at times. This suggests that these are palusplain type wetlands that experience ephemeral inundation at times. As a result, it is possible that some wader species which prefer open habitats and shallow waters may visit the wetlands on occasion. Four of the waders are listed as migratory species under the EPBC Act (Great Egret, Long-toed Stint, Pectoral Sandpiper, and Curlew Sandpiper, see section 5.2 below). Two of these species (the Long-toed Stint and the Curlew Sandpiper) have been counted in numbers greater than the 1% of the global population within the Vasse-Wonnerup Ramsar site. Because of the proximity of the wetlands to the airport site (approximately 5km away), it is likely that the wetlands are occasionally used by low numbers of these species however this habitat would be considered extremely marginal. There are numerous examples of similar degraded palusplain wetlands within the agricultural parts of the southern Swan Coastal Plain.

To enable the airport expansion to proceed, loss of these habitats is unavoidable. All three of the habitats are highly degraded as a result of long-term livestock grazing, and similar habitats are available across the surrounding agricultural land. Much higher quality habitats for these species occur within the Vasse-Wonnerup Ramsar site and the Tuart Forest National Park both of which lie approximately 5km north of the site. Because of the degradation, the habitats within the site all provide very limited opportunities to threatened fauna and cannot be considered to be significant habitat for the species'.

## 5.2 EPBC Act assessment

This survey has identified eight species listed under the EPBC Act that may occur within the Busselton Regional Airport expansion area. Of these, seven are bird species and one is a mammal (the Western Ringtail Possum). Five species are listed as migratory species under International treaties (i.e. JAMBA, CAMBA, ROKAMBA or the Bonn Convention) (Great Egret, Long-toed Stint, Pectoral Sandpiper, Curlew Sandpiper and the Fork-tailed Swift). Two of these migratory waders, the Long-toed Stint and the Curlew Sandpiper, have been counted in numbers greater than 1% of the national population within the Vasse-Wonnerup Ramsar site which is located approximately 5km north of the site. The remaining two bird species are Carnaby's Black Cockatoo, which is listed as Endangered, and Baudin's Black Cockatoo which is listed as Vulnerable.

The EPBC Act provides protection for matters of National Environmental Significance (NES), and all listed nationally threatened species and migratory species are defined as matters of NES, as are wetlands listed under the Ramsar Convention. Under the EPBC Act, any action that is likely to have a significant impact on a matter of NES requires assessment and approval by the Commonwealth Minister for the Environment. Guidelines for determining whether an action is likely to have a significant impact on a listed species are provided in the '*EPBC Act Policy Statement 1.1: Significant Impact Guidelines, Matters of National Environmental Significance (May 2006)*' (available online at the Federal Department of Sustainability, Environment, Water, Populations and Communities' (SEWPaC) website at:

<http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf>. Under these guidelines an action has, will have, or is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of migratory species.

Under these guidelines an action has, will have, or is likely to have a significant impact on an endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of a population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to the species becoming established in the species' habitat, or
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

Similarly, an action is deemed to have a significant impact on a vulnerable species if any of the above listed effects may occur to an *important population* of the species (which is a population that is necessary for a species' long-term survival and recovery). This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

While the habitats within the Busselton Regional Airport expansion area are likely to at times support eight species that are listed under the EPBC Act, only one, the Vulnerable Western Ringtail Possum, is likely to be resident within the site. One Western Ringtail Possum drey was located, however despite a search of all the trees within the stand, no other dreys were found and as there are no alternative rest sites within the area, it appears that the species may be present in very low numbers only. Spotlighting would need to be carried out to confirm this. The Busselton Regional Airport site lies outside of the area defined to be important for the species within the Commonwealth significant impact guidelines for the Western Ringtail Possum on the southern Swan Coastal Plain (DEWHA, 2009). Therefore, removal of the Peppermint woodland area to allow for the airport's obstacle surface limit requirements to be met is unlikely to constitute a significant impact under the EPBC Act.

Four of the five listed migratory species are all known to occur on the Vasse-Wonnerup Ramsar site, located 5km north of the Busselton Regional Airport site. They are likely to only use the seasonal wetland within the site transiently, and in very low numbers. The wetland area cannot be considered to be important habitat for these species. Similarly, the fifth migratory species, the Fork-tailed Swift, is a relatively common and widespread species that is expected to occur only as an occasional, non-breeding visitor to the project area.

Removal of the degraded remnant Marri woodland at the northern end of the runway extension area will remove some foraging habitat for Carnaby's and Baudin's Cockatoo. However, there are no suitable nesting trees within the site. As the nearest suitable breeding habitat is likely to be Tuart Forest National Park, located 5km to the north of the site, this habitat patch cannot be considered to be 'important habitat' for these species.

### 5.3 Recommendations

To minimise the impacts of the proposed airport expansion on fauna and fauna habitats, the following recommendations are made:

- (1) Clearing of Marri and Peppermint woodland should be offset by a comparable area of rehabilitation of both vegetation communities within a suitable distance of the site.

- (2) Clearing of the Peppermint woodland should be carried out in accordance with DEC clearing guidelines for the Western Ringtail Possum, including obtaining a Regulation 15 Licence to Take Fauna for Public Purposes issued by DEC under the WA Wildlife Conservation Act (1950).
- (3) Loss of seasonal wetland habitat within the site should be offset by rehabilitation of seasonal wetland habitat elsewhere, preferably within the boundaries of the Vasse-Wonnerup Ramsar site.

## 6 Fauna Tables

The following tables (tables 1-5) present the lists of vertebrate species that may occur within the vicinity of the Busselton Regional Airport expansion area. Table 6 provides a list of locally extinct species. All species observed during the site assessment are marked with an asterisk in the status column.

Table 1. Frogs that may occur in the vicinity of Busselton Regional Airport expansion area. Status is assigned as described in Methods.

Species	Status	State	EPBC Act
<b>Myobatrachidae</b> (ground frogs)			
<i>Crinia georgiana</i> Quacking Frog			
<i>Crinia insignifera</i> Sandplain Froglet			
<i>Helioporus eyrei</i> Moaning Frog			

Table 2. Reptiles that may occur in the vicinity of Busselton Regional Airport expansion area. Status is assigned as described in Methods.

Species	Status	State	EPBC Act
<b>Gekkonidae</b> (geckoes)			
<i>Christinus marmoratus</i> Marbled Gecko			
<b>Pygopodidae</b> (legless lizards)			
<i>Aprasia repens</i>			
<i>Pygopus lepidopodus</i>			
<b>Scincidae</b> (skinks)			
<i>Acritoscincus trilineatum</i>			
<i>Cryptoblepharus plagiocephalus</i>			
<i>Ctenotus catenifer</i> Chain-striped Skink			
<i>Ctenotus impar</i>			
<i>Ctenotus labillardieri</i> Red-legged Skink			
<i>Hemiergis peronii</i> Four-toed Earless Skink			
<i>Hemiergis quadrilineata</i>	CS3		
<i>Lerista distinguenda</i>			
<i>Lerista elegans</i>			
<i>Lerista lineate</i>			
<i>Lerista microtis</i>			
<i>Menetia greyii</i> Dwarf Skink			
<i>Morethia lineoocellata</i>			
<i>Morethia obscura</i>			
<i>Tiliqua rugosa</i> Bobtail			
<b>Varanidae</b> (monitors or goannas)			
<i>Varanus gouldii</i> Bungarra			
<i>Varanus rosenbergi</i> Rosenberg's Monitor			
<b>Elapidae</b> (front-fanged snakes)			
<i>Notechis scutatus</i> Tiger Snake			
<i>Pseudonaja affinis</i> Dugite			



Table 3. Birds that may occur in the vicinity of Busselton Regional Airport expansion area. Status is assigned as described in methods. <sup>W</sup> denotes waterbirds which occur only within the seasonal wetland area when sufficient standing water is present.

Species	Status	State	EPBC Act
<b>Casuariidae</b> (emus and cassowaries)			
<i>Dromaius novaehollandiae</i> Emu			
<b>Phasianidae</b> (pheasants and quails)			
<i>Coturnix pectoralis</i> Stubble Quail			
<b>Anatidae</b> (ducks, geese and swans)			
<i>Cygnus artratus</i> Black Swan <sup>W</sup>			
<i>Tadorna tadornoides</i> Australian Shelduck <sup>W</sup>			
<i>Chenonetta jubata</i> Australian Wood Duck <sup>W</sup>			
<i>Anas gracilis</i> Grey Teal <sup>W</sup>			
<i>Anas superciliosa</i> Pacific Black Duck <sup>W</sup>			
<b>Podicipedidae</b> (grebes)			
<i>Tachybaptus novaehollandiae</i> Australasian Grebe <sup>W</sup>			
<i>Poliiocephalus poliocephalus</i> Hoary-headed Grebe <sup>W</sup>			
<b>Ardeidae</b> (herons and bitterns)			
<i>Ardea pacifica</i> White-necked heron <sup>W</sup>			
<i>Ardea alba</i> Great Egret <sup>W</sup>	CS1		Migratory
<i>Ardea novaehollandiae</i> White-faced Heron <sup>W</sup>			
<b>Threskiornithidae</b> (ibises and spoonbills)			
<i>Plegadis falcinellus</i> Glossy Ibis <sup>W</sup>			
<i>Threskiornis molucca</i> Australian White Ibis <sup>W</sup>			
<i>Threskiornis spinicollis</i> Straw-necked Ibis <sup>W</sup>			
<i>Haliastur sphenurus</i> Whistling Kite			
<i>Aquila audax</i> Wedge-tailed Eagle			
<i>Circus assimilis</i> Spotted Harrier			
<i>Circus approximans</i> Swamp Harrier			
<b>Falconidae</b> (falcons)			
<i>Falco cenchroides</i> Australian Kestrel			
<b>Scolopacidae</b> (sandpipers)			
<i>Numenius minutus</i> Little Curlew <sup>W</sup>			
<i>Calidris subminuta</i> Long-toed Stint <sup>W</sup>	CS1		Migratory
<i>Calidris melanotos</i> Pectoral Sandpiper <sup>W</sup>	CS1		Migratory
<i>Calidris ferruginea</i> Curlew Sandpiper <sup>W</sup>	CS1		Migratory
<b>Recurvirostridae</b> (stilts and avocets)			
<i>Himantopus himantopus</i> Black-winged Stilt <sup>W</sup>			
<i>Cladorhynchus leucocephalus</i> Banded Stilt <sup>W</sup>			
<i>Recurvirostra novaehollandiae</i> Red-necked Avocet <sup>W</sup>			
<b>Charadriidae</b> (plovers and dotterels)			
<i>Vanellus tricolor</i> Banded Lapwing <sup>W</sup>			
<i>Charadrius melanops</i> Black-fronted Dotterel <sup>W</sup>			
<i>Erythrogonys cinctus</i> Red-kneed Dotterel <sup>W</sup>			
<b>Laridae</b> (gulls and terns)			
<i>Larus novaehollandiae</i> Silver Gull			
<b>Psittacidae</b> (lorikeets and parrots)			
<i>Calyptorhynchus latirostris</i> Carnaby's Black Cockatoo	CS1	Schedule 1	Endangered
<i>Calyptorhynchus baudinii</i> Baudin's Cockatoo	CS1	Schedule 1	Vulnerable

Table 3. Birds that may occur in the vicinity of Busselton Regional Airport expansion area. Status is assigned as described in methods. <sup>w</sup> denotes waterbirds which occur only within the seasonal wetland area when sufficient standing water is present.

Species	Status	State	EPBC Act
<i>Cacatua roseicapilla</i> Galah			
<i>Platycercus icterotis</i> Western Rosella			
<i>Platycercus zonarius</i> Australian Ringneck	*		
<i>Neophema elegans</i> Elegant Parrot			
<b>Apodidae</b> (swifts)			
<i>Apus pacificus</i> Fork-tailed Swift	CS1		Migratory
<b>Alcelinidae</b> (kingfishers)			
<i>Dacelo navaeguinea</i> Laughing Kookaburra	INT		
<b>Meropodidae</b> (bee-eaters)			
<i>Merops ornatus</i> Rainbow Bee-eater			
<b>Meliphagidae</b> (honeyeaters)			
<i>Lichmera indistincta</i> Brown Honeyeater	*		
<i>Melthreptis chloropsis</i> White-naped Honeyeater			
<i>Epthianura crocea</i> White-fronted Chat			
<b>Neosittidae</b> (sittellas)			
<i>Daphoenositta chrysoptera</i> Varied Sittella			
<b>Dicruridae</b> (fantails and flycatchers)			
<i>Rhipidura leucophrys</i> Willie Wagtail	*		
<i>Grallina cyanoleuca</i> Magpie Lark			
<b>Campephagiade</b> (cuckoo-shrikes)			
<i>Coracina novaehollandiae</i> Black-faced Cuckoo-shrike			
<i>Lalage tricolor</i> White-winged triller			
<b>Artamidae</b> (woodswallows)			
<i>Artamus cinereus</i> Black-faced Woodswallow			
<b>Cracticidae</b> (butcherbirds and currawongs)			
<i>Gymnorhina tibicen</i> Australian Magpie	*		
<i>Strepera versicolor</i> Grey Currawong			
<b>Corvidae</b> (ravens and crows)			
<i>Corvus coronoides</i> Australian Raven	*		
<b>Hirundinidae</b> (swallows)			
<i>Hirundo neoxena</i> Welcome Swallow			
<i>Hirundo nigricans</i> Tree Martin			

Table 4. Mammals that may occur in the vicinity of Busselton Regional Airport expansion area. Status is assigned as described in Methods.

Species	Status	State	EPBC Act
<b>Macropodidae</b> (kangaroos and wallabies)			
<i>Macropus fuliginosus</i> Western Grey Kangaroo	*		
<b>Muridae</b> (rats and mice)			
<i>Mus musculus</i> House Mouse	INT		
<i>Rattus rattus</i> Black Rat	INT		
<b>Pseudocheiridae</b> (ringtail possums)			
<i>Pseudocheirus occidentalis</i> Western Ringtail Possum	CS1	Schedule 1	Vulnerable
<b>Leporidae</b> (rabbits and hares)			
<i>Oryctolagus cuniculus</i> Rabbit	INT		
<b>Canidae</b> (foxes and dogs)			
<i>Vulpes vulpes</i> European Red Fox	INT		
<b>Felidae</b> (cats)			
<i>Felis catus</i> Feral Cat	INT		

Table 5. Vertebrate species presumed to be extinct within the localities surrounding the Busselton Regional Airport expansion area.

Species	Status	State	EPBC Act
<b>Birds</b>			
<i>Burhinus grallarius</i> Bush Stone-curlew	CS2	Priority 4	
<i>Dasyornis broadbenti litoralis</i> Rufous Bristlebird	Extinct	Schedule 2	Extinct
<i>Psophodes nigrogularis nigrogularis</i> Western Whipbird	CS1	Schedule 1	Vulnerable
<b>Mammals</b>			
<i>Setonix brachyurus</i> Quokka	CS1	Schedule 1	Vulnerable
<i>Bettongia penicillata ogilbyi</i> Woylie	CS1	Schedule 1	
<i>Potorus gilbertii</i> Gilbert's Potoroo	CS1	Schedule 1	Critically Endangered
<i>Macropus eugenii derbianus</i> Tammar Wallaby	CS2	Priority 4	
<i>Pseudomys fieldii</i> Shark Bay Mouse, Djoongari	CS1	Schedule 1	Vulnerable
<i>Pseudomys shortridgei</i> Dayang, Heath Mouse	CS1	Schedule 1	Vulnerable

## 7 Figures

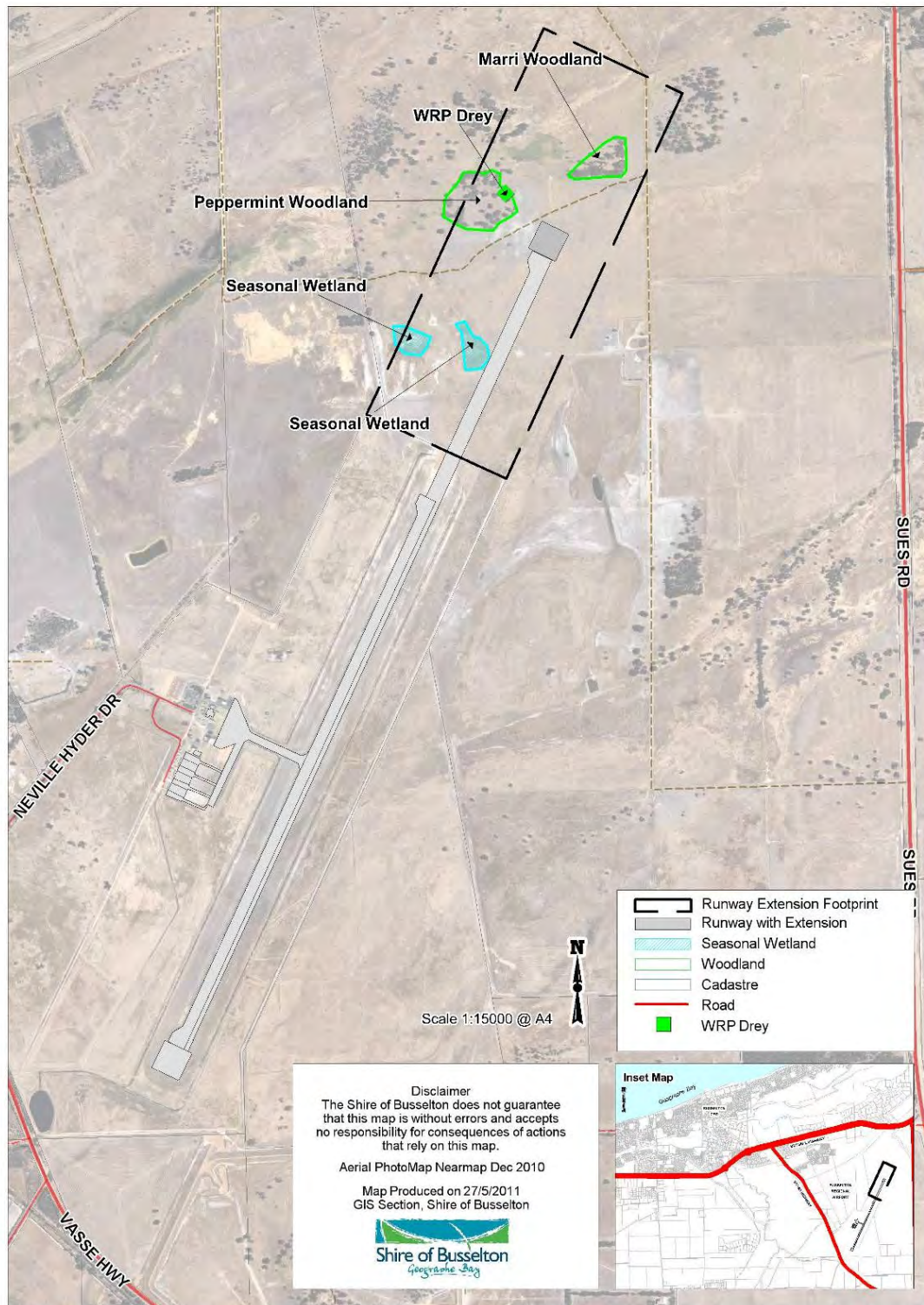


Figure 1. Busselton Regional Airport runway extension footprint





Figure 1. Marri woodland at the northern end of the runway expansion area.



Figure 2. Marri woodland at the northern end of the runway expansion area.





Figure 3. Peppermint woodland at the northern end of the runway expansion area.



Figure 4. Peppermint woodland at the northern end of the runway expansion area.





Figure 5. Seasonal wetland area within the northwestern part of the runway expansion area.



Figure 6. Heavily grazed native rushes within the seasonal wetland area within the northwestern part of the runway expansion area.



Figure 7. Degraded farmland where the runway extension is proposed to lie.



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## **Appendix 1: Categories used in the assessment of conservation status.**

### **IUCN categories (based on review by Mace and Stuart 1994) as used for the Environmental Protection and Biodiversity Conservation (EPBC) Act and the WA Wildlife Conservation Act**

**Extinct** - Taxa not definitely located in the wild during the past 50 years.

**Extinct in the Wild** - Taxa known to survive only in captivity.

**Critically Endangered** - Taxa facing an extremely high risk of extinction in the wild in the immediate future.

**Endangered** - Taxa facing a very high risk of extinction in the wild in the near future.

**Vulnerable** - Taxa facing a high risk of extinction in the wild in the medium-term future.

**Near Threatened** - Taxa that risk becoming Vulnerable in the wild.

**Conservation Dependent** - Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

**Data Deficient (Insufficiently Known)** - Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

**Least Concern** - Taxa that are not Threatened.

### **Schedules used in the WA Wildlife Conservation Act**

**Schedule 1.** Rare and likely to become extinct.

**Schedule 2.** Extinct.

**Schedule 3.** Migratory species listed under international treaties.

**Schedule 4.** Other specially protected fauna.

### **WA Department of Conservation and Land Management Priority species (species not listed under the Conservation Act, but for which there is some concern).**

**Priority 1.** Taxa with few, poorly known populations on threatened lands.

**Priority 2.** Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.

**Priority 3.** Taxa with several, poorly known populations, some on conservation lands.

**Priority 4.** Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.

**Priority 5.** Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependent).