Fauna Assessment of Cardup Business Park

South Western Highway

Cardup

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On behalf of: Emerge Associates Suite 4, 6 Centro Ave SUBIACO WA 6008 T: 08 9380 4988

Prepared by: Greg Harewood Zoologist A.B.N. 95 536 627 336 PO Box 755 BUNBURY WA 6231 M: T/F: (08) 9725 0982 E:



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SUMMARY

This report details the results of a fauna assessment of the proposed Cardup Business Park, South Western Highway, Cardup (Figure 1). The proposed development area is made of seven individual lots (Lot 1, 6, 7, 10, 21, 41 and 60) and has a total area of about 208 hectares (ha) most of which is cleared of native vegetation (Figure 2). The largest expanse of continuous vegetation (~30ha) is present in the southern section of the site and forms Bush Forever (BF) site 361.

It is understood that the proponents are currently undertaking local structure planning to support a "business park" development within the subject site. The current concept plan is shown as Figure 3. A range of investigations, including this fauna survey, have been undertaken in order to fully understand the suite of environmental values across the area.

The scope of works was to conduct a level 1 fauna survey as defined by the Environmental Protection Authority (EPA 2004). Because some listed threatened species (i.e. several species of black cockatoo) are known to occur in the general area, the scope of the survey work was expanded to include targeted assessment of the site's significance to these particular species. The assessment has included a desktop study and single daytime reconnaissance survey.

The study area is situated on the extreme eastern margin of the central part of the Swan Coastal Plain and lies at the foot of the Darling Scarp over a section of the Yoganup Formation and associated colluvial deposits.

Descriptions of the broadly defined fauna habitats, mainly based on the remaining vegetation units onsite, as mapped by Cardno (2009) are given below, with the extent of each identified unit being shown in Figure 4. Plates 1 to 5 illustrate the nature of the vegetation units/habitats present inside the boundary of the study area.

- Marri (Corymbia calophylla) and Salmon White Gum (Eucalyptus lane-poolei) open woodland with scattered Banksia attenuata and Banksia menzeisii over Kingia australis over Hakea spathulata, Banksia armata and Lepidosperma pubisquameum on sandy soils (Plate 1). This area makes up all of Bush Forever Site 361 (Norman Road Bushland Cardup);
- Degraded dampland with scattered *Casuarina obesa* over scattered *Juncus pallidus* over **Pennisetum clandestinum* (Plate 2). The dampland flows as a small, indistinct rivulet in the wetter months of the year and drains out of the study area at a point along the western boundary near its centre;
- Cleared paddocks with scattered native species Marri (*C. calophylla*) and Jarrah (*E. marginata*) over paddock grasses and broadleaf weeds (Plate 3);

- Cleared paddocks with planted non-endemic *Eucalyptus* species along property boundaries and around residential dwellings (Plate 4); and
- Man-made dams Several **s**mall man-made dams are present in various sections of the study area (Plate 5).

Overall fauna habitat values at the site have been severely compromised by total or partial clearing of native vegetation and ongoing livestock grazing. Most areas lack any natural attributes and are now only utilised by generally common and widespread fauna species with non-specific requirements that allow them to persist in highly disturbed habitats. The Bush Forever area in the southern section of the site has the most value as fauna habitat though the lack of native groundcover/shrubs and microhabitats such as hollow logs, presumably a consequence of livestock grazing, logging and frequent fires has also seen the biodiversity values of this section of the site diminish from its original natural state.

Nonetheless the Bush Forever area has significant value to some specific fauna species such as all three species of black cockatoo as it represents foraging habitat and potential breeding and roosting habitat

Opportunistic fauna observations are listed in Appendix B. A total of 39 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the single day time survey. Six introduced species were also seen.

Evidence of two listed threatened species was observed (the forest red-tailed black cockatoo – individuals and foraging evidence (chewed marri fruits) and Baudin's Black Cockatoo - foraging evidence (chewed marri fruits). No evidence of any migratory or Department of Parks and Wildlife (DPaW) priority fauna species using the area was found.

The habitat tree assessment identified eighty eight (88) specimens within the areas examined (excluding the bulk of BF site 361) that fit the federal Department of Sustainability, Environment, Water, Population and Communities criteria for black cockatoo breeding habitat (i.e. suitable tree species with a diameter at breast height (DBH) of >50cms (DSEWPaC 2012)) (Figure 5). Most of the trees were marri (*C. calophylla*) (82 specimens), while the balance were comprised of jarrah (*E. marginata* (6 specimens) and one possible non-endemic unidentified species.

Fifteen (15) of the 88 trees were observed to contain hollows of some type with two (2) assessed at the time to possibly have large enough hollows for black cockatoos to use for nesting though this assessment was based on the size of the entrance into an apparent hollow only. No actual evidence of any hollows being used by black cockatoos for nesting (currently or previously) was seen.

It should be noted that not all of the identified habitat trees may require clearing. This will need to be determined after final, more accurate development plans are made available.

Additional details on each observed "habitat tree" can be found in Appendix D.

Foraging evidence left by black cockatoos in the form of chewed marri fruits were found at several; locations across the site. This evidence was attributed to the forest redtailed black cockatoo or Baudin's black cockatoo. No foraging evidence directly attributable to Carnaby's black cockatoos was seen though it is likely this species also frequents the area at times.

The total extent of woodland vegetation within the study area is difficult to accurately estimate given the sparse nature of some of the paddock trees but totals about 32 ha. Almost all can be regarded to represent foraging habitat for black cockatoos due to the dominance of marri and to a lesser extent jarrah along with a few individual trees of less dominant species such as *banksia*. Most of this vegetation (~30 ha) is contained within BF site 361 and will be retained as POS.

With respect to native vertebrate fauna, 11 mammals (includes eight bat species), 100 bird, 21 reptile and nine frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise sections of the study area at times.

Of the 141 native animals that are listed as potentially occurring in the area, five are classified as endangered/vulnerable or in need of special protection under State and/or Federal law. In addition, three migratory species may also frequent the area at times.

In most cases no impact on fauna species of conservation significance is considered likely. This is primarily because their preferred habitat is absent from the site and therefore, they are not likely to be present. In cases where habitat is at least marginally suitable, impacts are also considered unlikely to be significant because of the small size of the area that will require clearing, its largely degraded state and the fact that in most cases individuals of the species in question are most likely to only be present on site infrequently. The retention of the majority of the remnant vegetation with the BF site 361 will allow individuals/populations of all the species in question, if present, to persist despite the development in the balance of the site.

Of most significance is the possible requirement to clear potential black cockatoo breeding, roosting habitat and existing foraging habitat outside of the Bush Forever area. Planning of development within these sections of the of the site should take into account the presence of black cockatoo habitat so that impacts can be minimised as much as possible.

A series of other recommendations aimed at mitigating and minimising potential impacts on fauna and fauna habitat in general are provided in Section 9. These should

be taken into consideration during planning and development where considered

reasonable and practicable.

1. INTRODUCTION

This report details the results of a fauna assessment of the proposed Cardup Business Park, South Western Highway, Cardup (Figure 1). The subject site is situated about 36 kilometres south east of the Perth central business district in south west Western Australia and is centred at approximately 33.252345°S and 116.003937°E.

The proposed development area is made of seven individual lots (Lot 1, 6, 7, 10, 21, 41 and 60) and has a total area of about 208 hectares (ha) most of which is cleared of native vegetation (Figure 2). The largest expanse of continuous vegetation (~30ha) is present in the southern section of the site and forms Bush Forever site 361.

2. DEVELOPMENT PROPOSAL

It is understood that the proponents are currently undertaking local structure planning to support a "business park" development within the subject site. The current concept plan is shown as Figure 3.

A range of investigations, including this fauna survey, have been undertaken in order to fully understand the suite of environmental values across the area. The findings of this fauna survey and other investigations will be used to inform and support the development of a Local Structure Plan, with the aim being to minimise potential environmental impacts.

It is anticipated that the information presented will be used by regulatory authorities to assess the potential impact of the proposal on fauna and fauna habitats as part of any required approval process.

3. SCOPE OF WORKS

The scope of works was to conduct a level 1 fauna survey as defined by the EPA (EPA 2004). Because some listed threatened species (i.e. several species of black cockatoo) are known to occur in the general area, the scope of the survey work was expanded to include targeted assessment of the site's significance to these species.

The fauna assessment has therefore included:



- 1. Level 1 Fauna Survey (to EPA standard).
- 2. Black Cockatoo habitat Assessment ("habitat trees" = DBH >50cm, existing and potential nest hollows, roosting habitat and foraging evidence); and
- 3. Report summarising results with management/planning recommendations and requirements under state and federal legislation

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*.

4. METHODS

4.1 POTENTIAL FAUNA INVENTORY - DESKTOP STUDY

4.1.1 Database Searches

Searches of the following databases were undertaken to aid in the compilation of a list of vertebrate fauna potentially occurring within the study area:

- DPaW's NatureMap Database Search (combined data from DPaW, Western Australian Museum, Birds Australia and consultants reports) (DPaW 2013b): and
- Protected matters search tool (Department of Sustainability, Environment, Water, Population and Communities DSEWPaC 2013).

It should be noted that these lists are based on observations from a broader area than the study site and therefore may include species that would only ever occur as vagrants in the actual study area due to a lack of suitable habitat or the presence of only marginal habitat. The databases also often included very old records and in some cases the species in question have become locally or regionally extinct.

Information from these sources should therefore be taken as indicative only and local knowledge and information needs also to be taken into consideration when determining what actual species may be present within the specific area being investigated.

4.1.2 Previous Fauna Surveys in the Area

Fauna surveys, assessments and reviews have been undertaken in nearby areas in the past, though not all are publically available and could not be referenced. The most significant of those available have been used as the primary reference material for compiling the potential fauna assemblage for the general area.



Those reports referred to included, but were not limited to:

- Harewood, G. (2005). Fauna Assessment (Level 1) Lots 22 -27, 29 & 45 South Western Highway & Lots 302 & 399 Reilly Road Whitby, November 2005. Version 1. Unpublished Report for Cardno BSD Pty Ltd.
- Harewood, G. (2010a). Black Cockatoo Habitat Survey, Lots 22 -27, 29 & 45 South Western Highway & Lots 302 & 399 Reilly Road Whitby, August 2010. Version 3. Unpublished Report for Cardno (WA) Pty Ltd.
- Harewood, G. (2010b). Targeted Chuditch Survey, Lots 22 -27, 29 & 45 South Western Highway & Lots 302 & 399 Reilly Road, Whitby, August 2010. Version 3. Unpublished Report for Cardno (WA) Pty Ltd.
- Harewood, G. (2010c). Graceful Sun-Moth Habitat Assessment, Lots 22 -27, 29 & 45 South Western Highway & Lots 302 & 399 Reilly Road Whitby, August 2010. Version 3. Unpublished Report for Cardno (WA) Pty Ltd.
- Harvey, M. S., Dell, J. How, R. A., & Waldock, J. M. (1987) Ground Fauna of Bushland Remnants on the Ridge Hill Shelf and Pinjarra Plain Landforms, Perth. Report to the Australian Heritage Commission. NEP Grant N95/49. 56 pp.

As with the databases searches some reports refer to species that would not occur in the study area due to a lack of suitable habitat (extent and/or quality) and this fact was taken into consideration when compiling the potential fauna species list for the study area. It should also be noted that the NatureMap database is likely to include some records from previous fauna surveys in the area including some of those listed above.

4.1.3 Existing Publications

The following represent the main publications used to identify and refine the potential fauna species list for the study area:

- Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Royal Australasian Ornithologists Union, Victoria.
- Bush, B., Maryan, B., Browne-Cooper, R. & Robinson, D. (2007). Reptiles and Frogs in the Bush: Southwestern Australia. UWA Press, Nedlands.
- Churchill, S. (2008). Australian Bats. Second Edition, Allen & Unwin.



- Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth Western Australia.
- Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth Western Australia.
- Menkhorst, P. and Knight, F. (2011). A Field Guide to the Mammals of Australia. Oxford University Press, Melbourne.
- Morgan, D.L., Beatty, S.J., Klunzinger, M.W, Allen, M.G. and Burnham, Q.E (2011). Field Guide to the Freshwater Fishes, Crayfishes and Mussels of South Western Australia. Published by SERCUL.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1983). Lizards of Western Australia II: Dragons and Monitors. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1990). Lizards of Western Australia III: Geckos and Pygopods. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1999). Lizards of Western Australia I: Skinks. Revised Edition, WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (2002). Snakes of Western Australia. Revised Edition, WA Museum, Perth.
- Tyler M.J. & Doughty P. (2009). Field Guide to Frogs of Western Australia, Fourth Edition, WA Museum, Perth.
- Van Dyck, S. & Strahan, R. Eds (2008). The Mammals of Australia. Third edition. Queensland Museum.
- Wilson, S. and Swan, G. (2011). A Complete Guide to Reptiles of Australia. Reed, New Holland, Sydney.

4.1.4 Fauna of Conservation Significance

The conservation significance of fauna species has been assessed using data from the following sources:

• Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Administered by the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC);



- *Wildlife Conservation Act 1950 (WC Act).* Administered by the Western Australian Department of Parks and Wildlife (DPaW) (Govt. of WA 2012);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and the
- DPaW Priority Fauna list. A non-legislative list maintained by the DPaW for management purposes (DPaW 2013a).

The *EPBC Act* also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA);
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

(Note - Species listed under JAMBA are also protected under Schedule 3 of the WC Act.)

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance (NES) under the *EPBC Act*.

The conservation status of all vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the study area has been assessed using the most recent lists published in accordance with the above-mentioned instruments and is indicated as such in the fauna listings of this report. A full listing of conservation codes are provided in Appendix A.

A number of other species not listed in official lists can also be considered of local or 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 three 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)
- Extinct in the Perth region (code Be)

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).

The presence of Bush Forever species should be taken into some consideration when determining the fauna values of an area. Bush Forever decreaser species are indicated as such within the species list held in Appendix B.

4.1.5 Invertebrates

It can be difficult to identify what may be significant invertebrate species (e.g. Short Range Endemics - SREs) as there are uncertainties in determining the rangerestrictions of many species due to lack of surveys, lack of taxonomic resolutions within target taxa and problems in identifying certain life stages. Where invertebrates are collected during surveys, a high percentage are likely to be unknown, or for known species there can be limited knowledge or information on their distribution (Harvey 2002).

For this project, the assessment for conservation significant invertebrates has been limited to those listed by the DPaW and *EPBC Act* database searches (which rely on distribution records and known habitat preferences). No assessment of the potential for SREs to be present has been made.

4.1.6 Taxonomy and Nomenclature

Taxonomy and nomenclature for fauna species used in this report is generally taken from the DPaW's WA Fauna Census Database which is assumed to follow Aplin and Smith (2001) for amphibians and reptiles, How *et al.* (2001) for mammals and Johnstone (2001) for birds.

Common names are taken from the Western Australia Museum (WAM) recognised primary common name listings when specified, though where common names are not provided they have been acquired from other publications. Sources include Wilson and Swan (2013), Van Dyck & Strahan (2008), Christidis and Boles (2008), Bush *et al.* (2007), Bush *et al.* (2002), Tyler *et al.* (2000), and Glauret (1961). Not all common names are generally accepted.



4.2 SITE SURVEYS

A daytime reconnaissance survey of the site was carried out on the 2 August, 2013. All survey work was carried out by Greg Harewood (B.Sc. Zoology).

4.2.1 Fauna Habitat Assessment

The vegetation communities identified during the botanical survey of the site carried out by Cardno in 2008 (Cardno 2009) have been used as the basis for a classification of areas into broad fauna habitats types.

The main aim of the habitat assessment was to determine if it was likely that any species of conservation significance would be utilising the areas that maybe impacted on as a consequence of development at the site. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the field survey the habitats within the study area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilising the area and its significance to them.

4.2.2 Opportunistic Fauna Observations

Opportunistic observations of fauna species were made during all field survey work which involved a series of transects across the site during the day while searching microhabitats such as logs, rocks, leaf litter and observations of bird species with binoculars. Secondary evidence of a species presence such as tracks, scats, skeletal remains, foraging evidence or calls were also noted if observed/heard.

4.2.3 Black Cockatoo Habitat Assessment

The black cockatoo habitat assessment included a:

Habitat tree survey: This involved the identification of all suitable trees species within the study area that have a Diameter at Breast Height (DBH) of over 50cm (irrespective of the presence/absence of suitable hollows – DSEWPaC (2012) 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 with hollows were marked with "H" using spray paint.

Target tree species included 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. Areas not targeted for development (i.e. the bulk of Bush Forever Site 361) were not assessed for habitat trees.

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".

Identified hollows 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).

5. 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 also be recognised that site conditions can change with time.

Some fauna species are reported as potentially occurring within the study area based on there being suitable habitat (quality and extent) within the study area or immediately adjacent. With respect to opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

• seasonal inactivity during the field survey;



- species present within micro habitats not surveyed;
- cryptic species able to avoid detection; and
- transient wide-ranging species not present during the survey period.

Lack of observational data on some species should therefore not necessarily be taken as an indication that a species is absent from the site.

The habitat requirements and ecology of many of the species known to occur in the wider area are often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitat or microhabitat within the study area. As a consequence of this limitation the potential fauna list produced is most likely an overestimation of those species that actually utilise the study area for some purpose. Some species may be present in the general area but may only use the study area itself on rare occasions or as vagrants/transients.

In recognition of survey limitations, a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the study area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the Author, has been assumed to potentially occur in the study area.

During the black cockatoo habitat survey trees with hollows were searched for. 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 observations was recorded using a handheld GPS. The accuracy of the GPS cannot be guaranteed above a level of about 5 to 10 metres, though it should be noted that in some circumstance the accuracy can be worse or better than this.

6. **RESULTS**

6.1 POTENTIAL FAUNA INVENTORY - DESKTOP STUDY

A list of fauna species considered most likely to occur in the study area has compiled from information obtained during the desktop study and is presented in Appendix B. This listing was refined after information gathered during the site reconnaissance survey was assessed. The results of some previous fauna surveys carried out in the general area are summarised in this species listing as are the



DPaW NatureMap database search results. The raw database search results from NatureMap (DPaW 2013b) and the Protected Matters Search Tool (DSEWPaC 2013) are contained within Appendix C.

The list of potential fauna takes into consideration that firstly the species in question is not known to be locally extinct and secondly that suitable habitat for each species, as identified during the habitat assessment, is present within the study area, though compiling an accurate list has limitations (see Section 5 above) and therefore as discussed the listing is likity to be an overestimation of the fauna species actually present.

6.2 SITE SURVEYS

6.2.1 Fauna Habitat Assessment

The study area is situated on the extreme eastern margin of the central part of the Swan Coastal Plain. The Swan Coastal Plain Bioregion (SWA) was classified as part of the Interim Biogeographical Regionalisation for Australia and is in broad terms described as a:

"Low lying coastal plain mainly covered with Woodlands. It is dominated by Banksia or Tuart on sandy soils, *Allocasuarina 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 *A. obesa* – Marri Woodlands and *Melaleuca* shrublands, are extensive only in the south." (Thackway and Cresswell, 1996; IBRA, 2000).

The site lies at the foot of the Darling Scarp over a section of the Yoganup Formation and associated colluvium and consist largely of low slopes and foot slopes (up to 5-10% grade) with well drained moderately deep to deep, gravelly acidic yellow duplex soils with variable laterite content. A very subtle, indistinct, incised stream channel running through the centre of the study area is mapped as having gentle slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths (Agmaps 2003).

Over 80% of the study site has been cleared of native vegetation. Mapping by Heddle *et al.* (1980) shows that prior to disturbance the majority of the area would have been covered by vegetation of the Forrestfield Complex which ranges from an open forest of *Corymbia calophylla* (Marri) – *Eucalyptus wandoo* (Wandoo) (actually Salmon White Gum *Eucalyptus lane-poolei*) and *Eucalyptus marginata* (Jarrah) to an open forest of *Eucalyptus marginata* (Jarrah) -*Corymbia calophylla* (Marri) – *Allocasuarina fraseriana* (Sheoak) and *Banksia* sp. Lower lying areas in the area would have been typified by fringing woodlands of *Eucalyptus rudis* (Flooded Gum).



Small sections of the study site, located on fluviatile deposits, would have been dominated by vegetation of the Guildford Complex which consists of a mixture of open to tall forest of *Corymbia calophylla* (Marri) - *Eucalyptus wandoo* (Wandoo) (actually Salmon White Gum Eucalyptus lane-poolei) - *Eucalyptus marginata* (Jarrah) and woodlands of *Eucalyptus wandoo* (Wandoo) (actually Salmon White Gum Eucalyptus wandoo (Wandoo) (actually Salmon White Gum Eucalyptus wandoo (Wandoo) (actually Salmon White Gum Eucalyptus wandoo (Wandoo) (actually Salmon White Gum Eucalyptus lane-poolei). Minor components would have included *Eucalyptus rudis* (Flooded Gum) and *Melaleuca rhaphiophylla* (Swamp Paperbark) (Heddle *et al.* 1980).

Descriptions of the broadly defined fauna habitats, mainly based on the remaining vegetation units onsite as mapped by Cardno (2009) are given below, with the extent of each identified unit being shown in Figure 4. Plates 1 to 5 illustrate the nature of the vegetation units/habitats present inside the boundary of the study area.

- Marri (*Corymbia calophylla*) and Salmon White Gum (*Eucalyptus lane-poolei*) open woodland with scattered *Banksia attenuata* and *Banksia menzeisii* over *Kingia australis* over *Hakea spathulata, Banksia armata* and *Lepidosperma pubisquameum* on sandy soils (Plate 1). This area makes up all of Bush Forever Site 361 (Norman Road Bushland Cardup);
- Degraded dampland with scattered *Casuarina obesa* over scattered *Juncus pallidus* over **Pennisetum clandestinum* (Plate 2). The dampland flows as a small, indistinct rivulet in the wetter months of the year and drains out of the study area at a point along the western boundary near its centre;
- Cleared paddocks with scattered native species Marri (*C. calophylla*) and Jarrah (*E. marginata*) over paddock grasses and broadleaf weeds (Plate 3);
- Cleared paddocks with planted non-endemic *Eucalyptus* species along property boundaries and around residential dwellings (Plate 4); and
- Man-made dams Several **s**mall man-made dams are present in various sections of the study area (Plate 5).

Overall fauna habitat values at the site have been severely compromised by total or partial clearing of native vegetation and ongoing livestock grazing. Most areas lack any natural attributes and are now only utilised by generally common and widespread fauna species with non-specific requirements that allow them to persist in highly disturbed habitats. The Bush Forever area in the southern section of the site has the most value as fauna habitat though the lack of native groundcover/shrubs and microhabitats such as hollow logs, presumably a



consequence of livestock grazing, logging and frequent fires has also seen the biodiversity values of this section of the site diminish from its original natural state.

Nonetheless the Bush Forever area has significant value to some specific fauna species such as all three species of black cockatoo as it represents foraging habitat and potential breeding and roosting habitat.

6.2.2 Opportunistic Fauna Observations

Opportunistic fauna observations are listed in Appendix B. A total of 39 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the single day time survey. Six introduced species were also seen.

Evidence of two listed threatened species was observed (the forest red-tailed black cockatoo – individuals and foraging evidence (chewed marri fruits) and Baudin's Black Cockatoo - foraging evidence (chewed marri fruits). No evidence of any migratory or DPaW priority fauna species using the area was found.

6.2.3 Black Cockatoo Habitat Assessment

The habitat tree assessment identified eighty eight (88) specimens within the areas examined (excluding the bulk of BF site 361) that fit DSEWPaC's (2012) criteria for black cockatoo breeding habitat (i.e. suitable tree species with a diameter at breast height (DBH) of >50cms) (Figure 5). Most of the trees were marri (*C. calophylla*) (82 specimens), while the balance were comprised of jarrah (*E. marginata* (6 specimens) and one possible non-endemic unidentified species.

Fifteen (15) of the 88 trees were observed to contain hollows of some type with two (2) assessed at the time to possibly have large enough hollows for black cockatoos to use for nesting though this assessment was based on the size of the entrance into an apparent hollow only. No actual evidence of any hollows being used by black cockatoos for nesting (currently or previously) was seen.

It should be noted that not all of the identified habitat trees may require clearing. This will need to be determined after final, more accurate development plans are made available.

Additional details on each observed "habitat tree" can be found in Appendix D.

Foraging evidence left by black cockatoos in the form of chewed marri fruits were found at several; locations across the site. This evidence was attributed to the forest red-tailed black cockatoo or Baudin's black cockatoo. Several forest redtailed black cockatoo individuals were also observed during the survey period. No



foraging evidence directly attributable to Carnaby's black cockatoos was seen though it is likely this species also frequents the area at times.

The total extent of woodland vegetation within the study area is difficult to accurately estimate given the sparse nature of some of the paddock trees but totals about 32 ha. Almost all can be regarded to represent foraging habitat for black cockatoos due to the dominance of marri and to a lesser extent jarrah along with a few individual trees of less dominant species such as *banksia*. Most of this vegetation (~30 ha) is contained within BF site 361 and will be retained as POS.

No existing roosting trees (trees used at night by black cockatoos to rest) were positively identified during the survey. Given the numbers of red-tailed black cockatoos observed during the day survey period roost sites must exist in the near vicinity (not necessarily on site) but at this stage there location has not been confirmed.

6.3 FAUNA INVENTORY – SUMMARY

6.3.1 Vertebrate Fauna

Table 1 summarises the number of vertebrate fauna species potentially occurring within or utilising at times the study area, based on results from the desktop study and observations made during the field assessment. A complete list of vertebrate fauna possibly inhabiting or frequenting the study area is located in Appendix B.

Not all species listed as potentially occurring within the study area in existing databases and publications (i.e. *EPBC Act* Threatened Fauna and Migratory species lists, DPaW's NatureMap database, various reports and publications) are shown in the expected listing in Appendix B. Some species have been excluded from this list based largely on the lack of suitable habitat at the study site and in the general area or known local extinction even if suitable habitat is present.

Table 1: Summary of Potential Vertebrate Fauna Species (as listed in Appendix B)

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species	Number of species observed - field survey 2013
Fish	1 ¹	0	0	0	0
Amphibians	9	0	0	0	4



Reptiles	21	0	0	0	1
Birds	106 ⁶	4	3	0	35 ²
Non-Volant Mammals	12 ⁹	1	0	0	5 ⁴
Volant Mammals (Bats)	8	0	0	0	0
Total	157 ¹⁶	5	3	0	45 ⁶

Superscript = number of introduced species included in total.

Despite the omission of some species it should be noted that the list provided is still very likely an over estimation 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. At any one time only a small proportion of the listed potential species would likely to be present.

6.3.2 Vertebrate Fauna of Conservation Significance

A review of the *EPBC Act* threatened fauna list, DPaW's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified at least 30 specially protected, priority or migratory vertebrate fauna species as potentially occurring in the general vicinity of the study area. Of these species, most that have no potential whatsoever to utilise the study area for any purpose have been omitted from the potential list for the site (Appendix B), principally due to lack of suitable habitat on-site (including extent and/or quality) or known local extinction.

In summary, two vertebrate fauna species of conservation significance were positively identified as utilising the study area for some purpose during the survey period, these being:

- Calyptorhynchus banksii naso Forest Red-tailed Black Cockatoo S1 (WC Act), Vulnerable (EPBC Act)
 Several individuals observed/heard and foraging evidence attributed to this species was also found during the day survey (chewed marri fruits). The majority of the remnant trees on site represent existing or potential foraging habitat for this species. Larger trees (>50cm DBH) can be considered potential breeding habitat. May also occasionally roost on site.
- Calyptorhynchus baudinii Baudin's Black Cockatoo S1 (WC Act), Vulnerable (EPBC Act)
 Foraging evidence attributed to this species observed at several locations during the field reconnaissance survey. Most remnant vegetation represents



foraging habitat. Larger trees (>50cm DBH) can be considered potential breeding habitat. May also occasionally roost on site.

Based on the habitats present and current documented distributions it is considered possible that thirteen additional species may use the study site for some purpose at times, though, as no evidence of any using the study site at the time of the field survey was found, the status of some in the area remains uncertain.

These species are:

- Ardea alba Great Egret S3 (WC Act), Migratory (EPBC Act) May on infrequent occasions utilise the dams and wetter paddocks/low lying areas within the study area during wetter months of the year, in low numbers. Would not breed on site.
- Ardea ibis Cattle Egret S3 (WC Act), Migratory (EPBC Act) May on infrequent occasions utilise the dams and wetter paddocks/low lying areas within the study area during wetter months of the year, in low numbers. Would not breed on site.
- *Falco peregrinus* Peregrine Falcon S4 (*WC Act*) Uncommon but study site may form part of larger home range. No potential nest sites observed.
- Calyptorhynchus latirostris Carnaby's Black Cockatoo S1 (WC Act), Endangered (EPBC Act)
 Known to frequent the general area. Most remnant vegetation represents foraging habitat. Larger trees (>50cm DBH) can be considered potential breeding habitat. May also occasionally roost on site.
- Merops ornatus Rainbow Bee-eater S3 (WC Act), Migratory (EPBC Act) Rainbow bee-eaters are common seasonal visitors to south west and during summer months a small number of individuals of this species may possibly forage and roost onsite. Sandy ground conditions in some areas may be suitable for construction of breeding burrows.
- *Phascogale tapoatafa ssp* Southern Brush-tailed Phascogale S1 (*WC Act*) This species has not been captured during nearby surveys in the past and there are no DPaW records in immediate vicinity. This would suggest it is absent but potential presence cannot be totally discounted as it can be hard to detect. Most of this species potential habitat onsite is being retained within Bush Forever site 361.

Note: Habitat for some of these species on-site, while considered possibly suitable, may be marginal in extent/quality and species listed may only visit the area for short periods, or as rare/uncommon vagrants/transients.



A number of other species of conservation significance, while possibly present in the wider area (e.g. forested areas of the Darling Range), are not listed as potential species due to known localised extinction (and no subsequent recruitment from adjoining areas) and/or lack of suitable habitat and/or the presence of feral predators. Details on conservation significant species and reasons for the omission of some from the potential listing are provided in Appendix E and Table 2.

Thirty two bird species that potentially frequent or occur in the study area are noted as Bush Forever Decreaser Species in the Perth Metropolitan Region (seven were sighted/identified as having used the study area during the survey). 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).

6.3.3 Invertebrate Fauna

Three species of conservation significant invertebrate species appeared in the DPaW or *EPBC Act* database searches (DPaW 2013b, DSEWPaC 2013), these being the shield-backed trapdoor spider (*Idiosoma nigrum*), the bedfordale trapdoor spider (*Arbanitis inornatus*) and Carter's freshwater mussel (*Westralunio carteri*).

None of these species is considered likely to persist within the study area due to a total absence of suitable habitat and/or because the site is outside of their currently documented range. Additional information on both species can be found in Appendix E.

7. FAUNA VALUES

7.1 CONSERVATION SIGNIFICANCE OF THE STUDY AREA

The conservation significance of the study area has been determined by applying site specific criteria such as:

- Fauna species and/or habitat present that is poorly represented in the general study area;
- Fauna habitat within the general study area supporting species of conservation or other significance;
- Fauna habitat in better condition than other similar locations in general study area.



Natural areas within the south west of Western Australia have been significantly altered since European settlement in the 1830's and a variety of environmental factors, in particular habitat fragmentation and fire, will continue to threaten many species of fauna with local extinction. As the local development of land progresses the significance of any remnant vegetation increases.

The regional and local conservation significance of the larger areas of remnant vegetation in the south of the study site has already been recognised in the past and the area given Bush Forever status. The value of the Bush Forever site has been recognised during the planning process and it is planned to retain almost all of this area as POS with only a few trees along the some boundaries likely to require removal.

The majority of the rest of the study site is cleared and as a consequence the diversity of fauna species present prior to disturbance has been reduced dramatically. Habitat degradation as a result of clearing, altered fire regimes and the presence of introduced predators is also likely to have had a significant effect on species diversity in the smaller bush remnants that do remain. Because of these facts these areas have very little conservation significance to fauna in general.

7.2 VALUE OF THE STUDY AREA AS AN ECOLOGICAL LINKAGE/WILDLIFE CORRIDOR

Linkage with adjacent bushland areas is a natural attribute of high priority in the assessment of any sites significance. Within Bush Forever Volume 1 document (Figure 6 - Government of Western Australia 2000a), the Whitby area is specifically identified as part of several Greenway corridors between adjacent areas of remnant bush land (Greenways 77 and 106 – Tingay, Alan & Associates 1998).

Greenway corridors and other links between areas of ecological significance help maintain the diversity and vigour of ecological systems and also aid in the integration of natural areas within broader urban and industrial landscapes. Where possible, greenway concepts should be incorporated into future planning proposals as part of the development of best practice planning and design solutions (Government of Western Australia 2000a). The retention of most of BF site 361 will maintain the sites existing contribution to ecological linkages in the local area.



8. SUMMARY OF POTENTIAL IMPACTS

The most likely potential impacts of the proposed development within the study site are:

- The loss of fauna habitat, some of which may be used by fauna of conservation significance;
- Fragmentation of vegetation/fauna habitat which may restrict the movement of some fauna species; and
- Death or injury of fauna during clearing and construction.

Given that almost all of Bush Forever Site 361 is being retained, impacts on fauna in general, as a consequence of development on the balance of the site, are likely to be very minimal. The Bush Forever Site contains the best quality fauna habitat (condition and extent) onsite and a substantial proportion of the less common fauna species listed as potentially occurring within the study site could only persist in this area.

A summary of possible impact on specific species of conservation significance previously recorded in the general area is provided in Table 2 below. Additional information on specific fauna species is provided in Appendix E.

Common Name	Genus & Species	Conservation Status (See Appendix A for codes)	Habitat Present	Likelihood of Occurrence	Possible Impacts
Shield-backed Trapdoor Spider	ldiosoma nigrum	S1 VU	No	Unlikely	No impact.
Bedfordale Trapdoor Spider	Arbanitis inornatus	P1	No	Unlikely	No impact.
Carter's Freshwater Mussel	Westralunio carteri	P4	No	Unlikely	No impact.
Darling Range Heath Ctenotus	Ctenotus delli	P4	No	Unlikely	No impact.
Southern Death Adder	Acanthophis antarticus	P3	No	Unlikely	No impact.
Southern Carpet Python	Morelia spilota imbricata	S4	No	Unlikely	No impact.
Australian Bustard	Ardeotis australis	P4	No	Unlikely - species locally extinct.	No impact.
Malleefowl	Leipoa ocellata	S1 VU Mig	No	Unlikely - species locally extinct.	No Impact.

Table 2: Likelihood of Occurrence and Possible Impacts – Fauna Species of Conservation Significance (continues on following pages).



Common Name	Genus & Species	Conservation Status (See Appendix A for codes)	Habitat Present	Likelihood of Occurrence	Possible Impacts
Great Egret	Ardea alba	S3 Mig	Yes	Poss ble	Loss of marginal degraded/manmade non- breeding habitats only. No significant impact likely.
Cattle Egret	Ardea ibis	S3 Mig	Yes	Poss ble	Loss of marginal degraded/manmade non- breeding habitats only. No significant impact likely.
Australasian Bittern	Botaurus poiciloptilus	S1 EN	No	Unlikely	No impact.
Little Bittern	Ixobrychus minutus	P4	No	Unlikely	No impact.
Black Bittern	Ixobrychus flavicollis	P3	No	Unlikely	No impact.
Painted Snipe	Rostratula benghalensis	S1 S3 Mig EN	No	Unlikely	No impact.
White-bellied Sea- Eagle	Haliaeetus Ieucogaster	S3 Mig	No	Unlikely	No impact.
Osprey	Pandion haliaetus	Mig	No	Unlikely	No impact.
Peregrine Falcon	Falco peregrinus	S4	Yes	Poss ble but only rarely.	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Migratory shorebirds	Various	S3 Mig	No	Unlikely	No impact.
Carnaby`s Black Cockatoo	Calyptorhynchus latirostris	S1 EN	Yes	Poss ble	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Baudin`s Black Cockatoo	Calyptorhynchus baudinii	S1 VU	Yes	Known to occur.	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Forest Red-tailed Black Cockatoo	Calyptorhynchus banksii naso	S1 VU	Yes	Known to occur.	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Barking Owl (SW population)	Ninox connivens connivens	P2	No	Unlikely	No impact.
Masked Owl (SW population)	Tyto n. novaehollandiae	P3	Yes/Marginal	Poss ble but only rarely.	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Fork-tailed Swift	Apus pacificus	S3 Mig	Yes	Unlikely, Flyover only.	No impact.
Rainbow Bee-eater	Merops ornatus	S3 Mig	Yes	Poss ble	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Chuditch	Dasyurus geoffroii	S1 VU	No	Unlikely	No impact.
Numbat	Myrmecobius fasciatus	S1 VU	No	Unlikely	No impact.



Common Name	Genus & Species	Conservation Status (See Appendix A for codes)	Habitat Present	Likelihood of Occurrence	Possible Impacts
Southern Brush- tailed Phascogale	Phascogale tapoatafa ssp	S1	Yes	Poss ble	Loss/modification of only small areas of natural habitat. No significant impact I kely.
Southern Brown Bandicoot	lsoodon obesulus fusciventer	P5	No/Very Marginal	Unlikely	No Impact.
Western Ringtail Possum	Pseudocheirus occidentalis	S1 VU	No	Unlikely - species locally extinct.	No impact.
Western Brush Wallaby	Macropus irma	P4	No	Unlikely	No impact.
Quokka	Setonix brachyurus	S1 VU	No	Unlikely - species locally extinct.	No impact.
Woylie	Bettongia penicillata ogibyi	S1 EN	No	Unlikely - species locally extinct.	No impact.
Western False Pipistrelle	Falsistrellus mackenziei	P4	No/Marginal	Unlikely	No impact.
Water Rat	Hydromys chrysogaster	P4	No	Unlikely	No impact.

In most cases no impact on fauna species of conservation significance is considered likely. This is primarily because their preferred habitat is absent from the site and therefore, they are not likely to be present. In cases where habitat is at least marginally suitable, impacts are also considered unlikely to be significant because of the small size of the area that will require clearing, its largely degraded state and the fact that in most cases individuals of the species in question are most likely to only be present on site infrequently. The retention of the majority of the remnant vegetation with the BF site 361 will allow individuals/populations of all the species in question, if present, to persist despite the development in the balance of the site.

9. **RECOMMENDATIONS**

The following recommendations are provided for guidance for the formulation of a fauna management plan that should aim to reduce the impact on fauna and fauna habitat as much as reasonable and practicable during proposed road works. This listing is not exhaustive and liaison with relevant regulatory authorities should be undertaken if required. It is recommended that:

- Final planning for development at the site should aim to avoid the need to clear as much of the existing vegetation as possible.
- During site works areas requiring clearing should be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained.



- Design additional project infrastructure, including access routes, vehicle and plant storage and turn around areas, borrow pits etc. so that:
 - \circ $\;$ previously disturbed areas are used where possible; and
 - o areas of sensitive vegetation are avoided.
- Disruption to surface and sub-surface hydrology should be minimised where possible and levees and drains designed to mimic natural drainage flows where disruptions will occur.
- During clearing operations a suitably experienced "fauna spotter" should be employed to inspect trees and dense shrubs and groundcover (where possible) before clearing to reduce likelihood of injury to fauna. Trees/large shrubs observed to contain potential fauna refuges (e.g. nests) should be felled in a manner that reduces the likelihood that fauna present will be injured. If feasible any fauna encountered should be relocated to suitable retained habitat nearby.
- Any proposed landscaping plantings should utilise local seed stock that includes cockatoo food plants, specifically *Eucalyptus*, *Corymbia*, *Banksia*, *Hakea*, and *Allocasuarina*. The final selection of suitable species should be carried out after liaison with appropriate experts or local land care groups to ascertain which species are most suitable for the area.
- 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. Where possible, logs are to be retained either by pushing the logs into the retained bush land, when significant disturbance to the vegetation can be avoided, or the logs cut so that the length of log outside the clearing area remains insitu.
- All staff working on site 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 clearing or normal site operations should be taken to a designated veterinary clinic or a DPaW nominated wildlife carer.
- Any significantly sized holes, pits or trenches required for services should be kept open for only as long as necessary and suitable escape ramps (45° batter) and bridging provided if the site is to be left unattended for extended periods. Holes, pits or trenches should be inspected for fauna immediately prior to filling.



10. CONCLUSION

The fauna assessment within the study area was undertaken for the purposes of categorising the fauna assemblages and identifying fauna habitats present. An assessment of the areas value as black cockatoo habitat was also carried out.

With respect to native vertebrate fauna, 11 mammals (includes eight bat species), 100 bird, 21 reptile and nine frog species have previously been recorded in the general area, some of which have the potential to occur in or utilise sections of the study area at times.

Of the 141 native animals that are listed as potentially occurring in the area, five are classified as endangered/vulnerable or in need of special protection under State and/or Federal law. In addition, three migratory species may also frequent the area at times.

In most cases no impact on fauna species of conservation significance is considered likely. This is primarily because their preferred habitat is absent from the site and therefore, they are not likely to be present. In cases where habitat is at least marginally suitable, impacts are also considered unlikely to be significant because of the small size of the area that will require clearing, its largely degraded state and the fact that in most cases individuals of the species in question are most likely to only be present on site infrequently. The retention of the majority of the remnant vegetation with the BF site 361 will allow individuals/populations of all the species in question, if present, to persist despite the development in the balance of the site.

Of most significance is the possible requirement to clear potential black cockatoo breeding, roosting habitat and existing foraging habitat outside of the Bush Forever area. Planning of development within these sections of the of the site should take into account the presence of black cockatoo habitat so that impacts can be minimised as much as possible.

A series of other recommendations aimed at mitigating and minimising potential impacts on fauna and fauna habitat in general are provided in Section 9. These should be taken into consideration during planning and development where considered reasonable and practicable.



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FIGURES













PLATES





Plate 1: Marri and Salmon White Gum open woodland with scattered *Banksia* over *Kingia australis* and very sparse shrubs (Bush Forever Site 361).



Plate 2: Degraded dampland with scattered *Casuarina obesa* over scattered *Juncus pallidus* over **Pennisetum clandestinum*.



Plate 3: Cleared paddocks with scattered native species (Marri and Jarrah) over paddock grasses and broadleaf weeds.



Plate 4: Cleared paddocks with planted non-endemic *Eucalyptus* species along property boundaries and around residential dwellings.



Plate 5: Man-made dam.

APPENDIX A

CONSERVATION CATEGORIES

EPBC Act (1999) Threatened Fauna Categories

Category	Code	Description
Extinct	E	There is no reasonable doubt that the last member of the species has died.
*Extinct in the wild	EW	A species (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
*Critically endangered	CE	A species is facing an extremely high risk of extinction in the wild in the immediate future.
*Endangered	EN	A species: (a) is not critically endangered; and (b) is facing a very high risk of extinction in the wild in the near future.
*Vulnerable	VU	A species (a) is not critically endangered or endangered; and (b) is facing a high risk of extinction in the wild in the medium-term future.
Conservation dependent	CD	A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered
*Migratory	Migratory	 (a) all migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and (c) all native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Marine	Ма	Species in the list established under s248 of the EPBC Act

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

Category	Code	Description
Schedule 1	S1	 Fauna which is rare or likely to become extinct Threatened fauna (Schedule 1) are further ranked by the DEC according to their level of threat using IUCN Red List criteria: CR: Critically Endangered - considered to be facing an extremely high risk of extinction in the wild. EN: Endangered - considered to be facing a very high risk of extinction in the wild. VU: Vulnerable - considered to be facing a high risk of extinction in the wild.
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

Western Australian Wildlife Conservation Act (1950) Threatened Fauna Categories

Western Australian DPaW Priority Fauna Categories

Category	Code	Description
Priority 1	P1	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
Priority 2	P2	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
Priority 3	P3	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
Priority 4	P4	 (a) Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Priority 5	P5	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

IUCN Red List Threatened Species Categories

Category	Code	Description
Extinct	EV	Taxa for which there is no reasonable
Extinct	EA	doubt that the last individual has died.
		Taxa which is known only to survive in
		cultivation, in captivity or and as a
Extinct in the		naturalised population well outside its
Wild	EW	past range and it has not been recorded
VVIIG		in known or expected habitat despite
		exhaustive survey over a time frame
		appropriate to its life cycle and form.
Critically	CR	Taxa facing an extremely high risk of
Endangered		extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction
		in the wild.
Vulnerable	VU	Taxa facing a high risk of extinction in the
		Taxa which has been evaluated but does
Near	NT	not qualify for CR, EN or VU now but is
Threatened		close to qualifying or likely to qualify in
		the near future.
		Taxa which has been evaluated but does
Least Concern	LC	not qualify for CR, EN, VU, or NT but is
		likely to qualify for NT in the near future.
		Taxa for which there is inadequate
		information to make a direct or indirect
Data Deficient	DD	assessment of its risk of extinction based
		on its distribution and/or population
		status.

A full list of categories and their meanings are available at:

http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categoriescriteria

APPENDIX B

FAUNA OBSERVED OR POTENTIALLY IN STUDY AREA

Fauna Observed or Poter	ntially in Region of Study Area	
Cardup Business Park, Cardup, W.A.	Approximate centroid = 33.252345°S and 116.003937°E	Compiled by Gr

Compiled by Greg Harewood - Sept 2013 Recorded (Sighted/Heard/Signs/Captured) = X

A = Harewood, G. (2013). Fauna Assessment of Cardup Business Park, South Western Highway, Cardup. Unpublished report for the Emerge Associates.

B = Harewood G. (2010) Fauna Assessment, Lots 22-27, 29 and 45 South Western Highway and Lots 302 and 399 Reilly Road, Whitby. Unpublished report for the Cardno (WA) Pty Ltd. C = Harvey, M.S. et al. (1987) Ground Fauna of Bushland Remnants on the Ridge Hill Shelf and Pinjarra Plain Landforms, Perth. Cardup Nature Reserve results.

D = Harvey, M.S. et al. (1987) Ground Fauna of Bushland Remnants on the Ridge Hill Shelf and Pinjarra Plain Landforms, Perth. Norman Road/Bush Forever Site 354 results.

E = DPaW (2013). NatureMap Database search. "By Circle" 116°00' 12" E, 32°15' 06" S – Study area (plus 10 km buffer). 26 July 2013.

Class Family Species	Common Name	Conservation Status	A	В	C	D	ш
Osteichthyes							
Poeciliidae Livebearers							
Gambusia holbrooki	Mosquito Fish	Introduced					
Amphibia							
Myobatrachidae Ground or Burrowing Frogs							
Crinia georgiana	Quacking Frog	LC	×	×	×	×	×
Crinia glauerti	Clicking Frog	rc	×	×	×		×
Crinia insignifera	Squelching Froglet	LC	×		×	×	×
Geocrinia leai	Ticking Frog	rc					×
Heleioporus eyrei	Moaning Frog	ГС			×	×	×
Limnodynastes dorsalis	Western Banjo Frog	LC				×	
Pseudophryne guentheri	Crawling Toadlet	LC	×				×

Class Family Species	Common Name	Conservation Status	A	В	C	D	ш
Hylidae Tree or Water-Holding Frogs							
Litoria adelaidensis	Slender Tree Frog	LC		×			
Litoria moorei	Motorbike Frog	LC					×
Reptilia							
Gekkonidae Geckoes							
Christinus marmoratus	Marbled Gecko						
Pygopodidae Legless Lizards							
Aprasia repens	Sandplain Worm Lizard				×	×	×
Lialis burtonis	Burton's Legless Lizard				×		×
Agamidae Dragon Lizards							
Pogona minor	Western Bearded Dragon				×	×	×
Varanidae Monitor's or Goanna's							
Varanus gouldii	Gould's Sand Monitor			×	×	×	×
Varanus rosenbergi	Heath Monitor						
Varanus tristis	Racehorse Monitor						

		Conconvation					
Ciacos Family Species	Name	Status	A	В	U	D	Ш
Scincidae Skinks							
Acritoscincus trilineatum	Southwestern Cool Skink				×		
Cryptoblepharus buchananii	Fence Skink		×	×	×	×	×
Ctenotus fallens	West Coast Ctenotus			×	×	×	×
Ctenotus labillardieri	Red-legged Skink						×
Egernia kingii	King's Skink						×
Egernia napoleonis	Salmon-bellied Skink						×
Hemiergis quadrilineata	Two-toed Mulch Skink						
Lerista elegans	West Coast Four-toed Lerista				×	×	×
Menetia greyii	Dwarf Skink				×	×	×
Morethia lineoocellata	West Coast Pale-flecked Morethi	ia					
Morethia obscura	Shrubland Pale-flecked Morethia				×		×
Tiliqua rugosa	Bobtail			×	×	×	×
Elapidae Elapid Snakes							
Notechis scutatus	Tiger Snake						×
Pseudonaja affinis	Dugite			×		×	×

Class Family Species	Common Name	Conservation Status	A	В	S	D	ш
Aves							
Phasianidae Quails, Pheasants							
Coturnix pectoralis	Stubble Quail	rc	×	×			×
Coturnix ypsilophora	Brown Quail	ГС					×
Anatidae Geese, Swans, Ducks							
Anas castanea	Chestnut Teal	rc					
Anas gracilis	Grey Teal	LC		×	×		×
Anas platyrhynchos	Mallard	Introduced					
Anas rhynchotis	Australasian Shoveler	Bh LC					×
Anas superciliosa	Pacific Black Duck	LC		×	×		×
Aythya australis	Hardhead	Bh LC					×
Biziura lobata	Musk Duck	Bh LC					×
Chenonetta jubata	Australian Wood Duck	ГС	×	×	×		×
Cygnus atratus	Black Swan	rc					×
Tadorna tadornoides	Australian Shelduck	LC	×	×	×		×

Class Family Species	Common Name	Conservation Status	A	В	U	D	ш
Podicipedidae Grebes							
Poliocephalus poliocephalus	Hoary-headed Grebe	ГС					×
Tachybaptus novaehollandiae	Australasian Grebe	ГС	×				×
Phalacrocoracidae Cormorants							
Phalacrocorax melanoleucos	Little Pied Cormorant	ГС					
Phalacrocorax sulcirostris	Little Black Cormorant	ГС					×
Ardeidae Herons, Egrets, Bitterns							
Ardea alba	Great Egret	S3 Mig CA JA					
Ardea ibis	Cattle Egret	S3 Mig CA JA					
Ardea novaehollandiae	White-faced Heron	ГС					
Ardea pacifica	White-necked Heron	ГС					×
Threskiornithidae libises, Spoonbills							
Platalea flavipes	Yellow-billed Spoonbill	ГС					×
Threskiornis molucca	Australian White Ibis	LC					×
Threskiornis spinicollis	Straw-necked Ibis	LC		×	×		×

Class Family Species	Common Name	Conservation Status	A	В	C	D	ш
Accipitridae Kites, Goshawks, Eagles, Harriers							
Accipiter cirrocephalus	Collared Sparrowhawk	Bp LC		×	×	×	×
Accipiter fasciatus	Brown Goshawk	Bp LC			×		×
Aquila audax	Wedge-tailed Eagle	Bp LC		×			×
Aquila morphnoides	Little Eagle	Bp LC			×		
Circus approximans	Swamp Harrier	LC					×
Circus assimilis	Spotted Harrier	LC					
Elanus caeruleus	Black-shouldered Kite	LC					
Haliastur sphenurus	Whistling Kite	Bp LC					×
Hamirostra isura	Square-tailed Kite	Bp LC					
Falconidae Falcons							
Falco berigora	Brown Falcon	Bp LC					×
Falco cenchroides	Australian Kestrel	ГC	×	×	×		×
Falco longipennis	Australian Hobby	LC			×		×
Falco peregrinus	Peregrine Falcon	S4 Bp LC			×		×

Class Family Species	Common Name	Conservation Status	A	В	U	D	ш
Columbidae Pigeons, Doves							
Columba livia	Domestic Pigeon	Introduced			×		×
Ocyphaps lophotes	Crested Pigeon	LC	×	×	×		×
Phaps chalcoptera	Common Bronzewing	Bh LC	×	×	×		×
Streptopelia chinensis	Spotted Turtle-Dove	Introduced					×
Streptopelia senegalensis	Laughing Turtle-Dove	Introduced			×		×

		:					
Class Family Species	Common Name	Conservation Status	A	В	O	D	ш
Psittacidae Parrots							
Cacatua roseicapilla	Galah	rc	×	×	×		×
Cacatua sanguinea	Little Corella	C		×	×		×
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	S1 VU Be VU A2c+3c+4c	×	×	×		×
Calyptorhynchus baudinii	Baudin's Black Cockatoo	S1 VU Bp VU C2a(ii)	×	×		×	×
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	S1 EN Bp EN A2bcde+3bc		×			×
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	LC					
Neophema elegans	Elegant Parrot	CC			×		×
Platycercus icterotis icterotis	Western Rosella (western ssp)	Bp LC		×	×		
Platycercus spurius	Red-capped Parrot	LC	×	×	×	×	×
Platycercus zonarius semitorquatus	Australian Ringneck Parrot	CC	×	×	×		
Polytelis anthopeplus	Regent Parrot	ГC			×		×
Trichoglossus haematodus	Rainbow Lorikeet	Introduced	×				×

Class Family Species	Common Name	Conservation Status	A	В	U	D	ш
Cuculidae Parasitic Cuckoos							
Cacomantis flabelliformis	Fan-tailed Cuckoo	ГС					×
Chrysococcyx basalis	Horsfield's Bronze Cuckoo	ГС					
Chrysococcyx lucidus	Shining Bronze Cuckoo	ГС			×		
Cuculus pallidus	Pallid Cuckoo	ГС	×		×		
Strigidae Hawk Owls							
Ninox novaeseelandiae	Boobook Ow	ГС					×
Tytonidae Bam Owls							
Tyto alba	Barn Owl	ГС					×
Podargidae Frogmouths							
Podargus strigoides	Tawny Frogmouth	LC					×
Halcyonidae Tree Kingfishers							
Dacelo novaeguineae	Laughing Kookaburra	Introduced	×	×	×	×	×
Todiramphus sanctus	Sacred Kingfisher	ГС		×	×	×	×
Meropidae Bee-eaters							
Merops ornatus	Rainbow Bee-eater	S3 Mig JA LC		×	×	×	×
WC Act Status - S1 to S4, EPBC Act Status -	EN = Endangered, VU = Vulnerable, E	EX = Extinct, DEC Priority Status -	P1 to P5, Int. A	amts - CA = C/	AMBA. JA = JAI	MBA RK = ROK	AMBA Bush

Least Concern - see Appendix Forever Decreaser Species - Bn = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions LC = A and http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria for others.

Class Family Species	Common Name	Conservation Status	A	В	U	۵	ш
Maluridae Fairy Wrens, GrassWrens							
Malurus splendens	Splendid Fairy-wren	Bh LC		×	×	×	×
Acanthizidae Thornbills, Geryones, Fieldwrens & Whitefaces							
Acanthiza apicalis	Broad-tailed Thornbill	Bh LC	×	×			×
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	Bh LC	×	×	×	×	×
Acanthiza inornata	Western Thornbill	Bh LC		×	×	×	×
Gerygone fusca	Western Gerygone	LC	×	×	×	×	×
Sericornis frontalis	White-browed Scrubwren	Bh LC					×
Smicrornis brevirostris	Weebill	Bh LC	×	×	×	×	×
Pardalotidae Pardalotes							
Pardalotus punctatus	Spotted Pardalote	ГС	×				×
Pardalotus striatus	Striated Pardalote	LC	×	×	×	×	×

Class Family	Common Name	Conservation Status					
Species		Olaluo	A	в	ပ	۵	ш
Meliphagidae Honeyeaters, Chats							
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	LC					
Acanthorhynchus superciliosus	Western Spinebill	LC		×	×	×	×
Anthochaera carunculata	Red Wattlebird	C	×	×	×	×	×
Anthochaera lunulata	Western Little Wattlebird	Bp LC			×		×
Epthianura albifrons	White-fronted Chat	C					×
Lichenostomus virescens	Singing Honeyeater	C	×				
Lichmera indistincta	Brown Honeyeater	LC	×	×	×	×	×
Manorina flavigula	Yellow-throated Miner	LC					×
Phylidonyris nigra	White-cheeked Honeyeater	Bp LC					
Phylidonyris novaehollandiae	New Holland Honeyeater	Bp LC		×			×
Petroicidae Australian Robins							
Eopsaltria australis griseogularis	Western Yellow Robin	Bh LC		×			
Petroica multicolor	Scarlet Robin	Bh LC		×	×	×	×
Neosittidae Sitellas							
Daphoenositta chrysoptera	Varied Sittella	Bh LC			×		×

Class Family Species	Common Name	Conservation Status	A	В	U	٥	ш
Pachycephalidae Crested Shrike-tit, Crested Bellbird, Shrike Thrush	ies, Whistlers						
Colluricincla harmonica	Grey Shrike-thrush	Bh LC			×		×
Pachycephala pectoralis	Golden Whistler	Bh LC	×				×
Pachycephala rufiventris	Rufous Whistler	ГС		×	×	×	×
Dicruridae Monarchs, Magpie Lark, Flycatchers, Fantails, Dro	oɓuc						
Grallina cyanoleuca	Magpie-lark	ГС	×	×	×		×
Rhipidura fuliginosa	Grey Fantail	LC	×	×	×		×
Rhipidura leucophrys	Willie Wagtail	ГС	×	×	×	×	×
Campephagidae Cuckoo-shrikes, Trillers							
Coracina novaehollandiae	Black-faced Cuckoo-shrike	ГС	×	×	×	×	×
Lalage tricolor	White-winged Triller	ГС			×		
Artamidae Woodswallows, Butcherbirds, Currawongs							
Artamus cinereus	Black-faced Woodswallow	Bp LC					×
Artamus cyanopterus	Dusky Woodswallow	Bp LC		×	×		×

Class Family Species	Common Name	Conservation Status	A	В	C	Δ	ш
Cracticidae Currawongs, Magpies & Butcherbirds							
Cracticus tibicen	Australian Magpie	CC	×	×	×	×	×
Cracticus torquatus	Grey Butcherbird	C		×	×	×	×
Corvidae Ravens, Crows							
Corvus coronoides	Australian Raven	C	×	×	×	×	×
Motacillidae Old World Pipits, Wagtails							
Anthus australis	Australian Pipit	ГС	×	×	×		×
Dicaeidae Flowerpeckers							
Dicaeum hirundinaceum	Mistletoebird	CC			×		×
Hirundinidae Swallows, Mar ins							
Hirundo ariel	Fairy Martin	CC					×
Hirundo neoxena	Welcome Swallow	C	×	×			×
Hirundo nigricans	Tree Martin	LC	×	×	×		
Sylviidae Old Worthers							
Cincloramphus cruralis	Brown Songlark	C					
Cincloramphus mathewsi	Rufous Songlark	ГС			×		
WC Act Status - S1 to S4, EPBC Act Status	- EN = Endangered, VU = Vulnerat	ble, EX = Extinct, DEC Priority Status -	P1 to P5, Int. /	Agmts - $CA = C$	AMBA, JA = JA	MBA, RK = ROK	AMBA, Bush

WC Act Status - S1 to S4, EPBC Act Status - المنابعة ال منابعة المنابعة ال منابعة المنابعة المنابع المنابعة المنابعة المنابعة المنابعة المنابعة المنابعة المنابعة الم

Class Family Species	Common Name	Conservation Status	A	В	U	D	ш
Zosteropidae White-eyes							
Zosterops lateralis	Grey-breasted White-eye	LC	×	×	×	×	×
Mammalia							
Dasyuridae Camivorous Marsupials							
Phascogale tapoatafa ssp	Southern Brush-tailed Phascogal	le S1 VU NT					×
Phalangeridae Brushtail Possums, Cuscuses							
Trichosurus vulpecula	Common Brushtail Possum	LC		×			×
Macropodidae Kangaroos, Wallabies							
Macropus fuliginosus	Western Grey Kangaroo	LC	×	×		×	×
Molossidae Freetail Bats							
Mormopterus planiceps	Southern Freetail-bat	ГС					×
Tadarida australis	White-striped Freetail-bat	ГС					×

,							
Class Family Species	Common Name	Conservation Status	A	В	C	D	Ш
Vespertilionidae Ordinary Bats							
Chalinolobus gouldii	Gould's Wattled Bat	LC					×
Chalinolobus morio	Chocolate Wattled Bat	LC					×
Nyctophilus geoffroyi	Lesser Long-eared Bat	LC					×
Nyctophilus gouldi	Gould's Long-eared Bat	LC					×
Nyctophilus timoriensis	Greater Long-eared Bat	LC					
Vespadelus regulus	Southern Forest Bat	LC					×
Muridae Rats, Mice							
Mus musculus	House Mouse	Introduced			×	×	×
Rattus rattus	Black Rat	Introduced		×			×
Canidae Dogs, Foxes							
Canis lupus familiaris	Dog	Introduced					
Vulpes vulpes	Red Fox	Introduced		×	×		×
Felidae Cats							
Felis catus	Cat	Introduced		×			×

Class Family Species	Common Name	Conservation Status	A	В	o	D	ш
Equidae Horses							
Equus caballus	Horse	Introduced	×				
Bovidae Homed Ruminants							
Bos taurus	European Cattle	Introduced	×				
Ovis aries	Domestic Sheep	Introduced	×				
Leporidae Rabbits, Hares							
Oryctolagus cuniculus	Rabbit	Introduced	×	×	×	×	×

APPENDIX C

DPaW & EPBC DATABASE SEARCH RESULTS

NatureMap - Invertebrates - Cardup

Created By Greg Harewood on 26/07/2013

Kingdom Animalia Current Names Only Yes Core Datasets Only Yes Species Group Invertebrates Method 'By Circle' Centre 116°00' 12" E,32°15' 06" S Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	-11749	Akamptogonus novarae			
2.	-12860	Amblyomma triguttatum			
3.	-12397	Aname mainae			
4.	-11485	Aname tepperi			
5.	-12470	Antichiropus variabilis			
6.	-11833	Araneus cyphoxis			
7.	-11346	Araneus senicaudatus			
8.	33903	Arbanitis inornatus (trapdoor spider)		P1	
9.	-12919	Artoria linnaei			
10.	-12035	Austracantha minax			
11.	-12850	Austrochthonius muchmorei			
12.	-11711	Backobourkia heroine			
13.	-11582	Badumna insignis			
14.	-13124	Ballarra longipalpus			
15.	-13111	Cercophonius sulcatus			
16.	-12400	Cethegus fugax			
17.	-12404	Cormocephalus aurantiipes			
18.	-12062	Cormocephalus hartmeyeri			
19.	-11783	Cyclosa trilobata			
20.	-11559	Demadiana cerula			
21.	-11733	Dingosa serrata			
22.	-12111	Dinocambala ingens			
23.	-12492	Eucyrtops lation			
24.	-11823	Eukoenenia mirabilis			Y
25.	-12402	Euopios inornatus			
26.	-13094	Holconia westralia			
27.	-12487	Idiosoma sigiilatum			
28.	-12392	Isopeda leisnmanni			
29.	-12390	Nunciello appora			
21	12000				
32	-12034				
33	-12034	Ozarchaea westraliensis			
34	-12286	Paralampona marangaroo			
35.	-12479	Pediana occidentalis			
36.	-12407	Raveniella cirrata			
37.	-11940	Raveniella peckorum			
38.	-11987	Scolopendra laeta			
39.	-12388	Stylopauropoides wungongensis			Y
40.	-12592	Supunna funerea			
41.	-12453	Synothele durokoppin			
42.	-11938	Synothele michaelseni			
43.	-11729	Tasmanicosa leuckartii			
44.	-13078	Urodacus novaehollandiae			
45.	-13093	Urodacus woodwardii			
46.	-12011	Venator immansueta			
47.	34113	Westralunio carteri (Carter s Freshwater Mussel)		P4	

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Conservation Codes T - Rare or likely to become extinct X - Presumed extinct IA - Protected under international agreement

NatureMap is a collaborative project of the Department of Environment and Conservation, Western Australia, and the Western Australian Museum.



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NatureMap - Frogs - Cardup

Created By Greg Harewood on 26/07/2013

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Species Group	Amphibians
Method	'By Circle'
Centre	116°00' 12" E,32°15' 06" S
Buffer	10km
Core Datasets Only Species Group Method Centre Buffer	Yes Amphibians 'By Circle' 116°00' 12" E,32°15' 06" S 10km

I	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	25398	Crinia georgiana (Quacking Frog)			
2.	25399	Crinia glauerti (Clicking Frog)			
3.	25400	Crinia insignifera (Squelching Froglet)			
4.	25404	Geocrinia leai (Ticking Frog)			
5.	25410	Heleioporus eyrei (Moaning Frog)			
6.	25412	Heleioporus psammophilus (Sand Frog)			
7.	25388	Litoria moorei (Motorbike Frog)			
8.	25426	Neobatrachus pelobatoides (Humming Frog)			
9.	25433	Pseudophryne guentheri (Crawling Toadlet)			

Conservation Codes T - Rare or likely to become extinct X - Presume extinct IA - Protected under international agreement S - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 2 4 - Priority 4 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap is a collaborative project of the Department of Environment and Conservation, Western Australia, and the Western Australian Museum.




NatureMap - Reptiles - Cardup

Created By Greg Harewood on 26/07/2013

Kingdom Animalia Current Names Only Yes Core Datasets Only Yes Species Group Reptiles Method 'By Circle' Centre 116°00' 12" E,32°15' 06" S Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	25242	Acanthophis antarcticus (Southern Death Adder)		P3	
2.	42368	Acritoscincus trilineatus			
3.	24990	Aprasia pulchella			
4.	24991	Aprasia repens			
5.	25337	Chelodina oblonga (Oblong Turtle)			
6.	30893	Cryptoblepharus buchananii			
7.	24883	Ctenophorus ornatus (Ornate Crevice-Dragon)			
8.	25027	Ctenotus australis			
9.	25035	Ctenotus delli (Darling Range Heath Ctenotus, skink)		P4	
10.	25039	Ctenotus fallens			
11.	25047	Ctenotus impar			
12.	25049	Ctenotus labillardieri			
13.	25766	Delma fraseri (Fraser s Legless Lizard)			
14.	24939	Diplodactylus polyophthalmus			
15.	25096	Egernia kingii (King s Skink)			
16.	25100	Egernia napoleonis			
17.	24959	Gehyra variegata			
18.	25115	Hemiergis initialis subsp. initialis			
19.	25131	Lerista distinguenda			
20.	25133	Lerista elegans			
21.	25005	Lialis burtonis			
22.	25184	Menetia greyii			
23.	25240	Morelia spilota subsp. imbricata (Carpet Python)		S	
24.	25192	Morethia obscura			
25.	25252	Notechis scutatus (Tiger Snake)			
26.	25253	Parasuta gouldii			
27.	25255	Parasuta nigriceps			
28.	24907	Pogona minor subsp. minor (Dwarf Bearded Dragon)			
29.	25259	Pseudonaja affinis subsp. affinis (Dugite)			
30.	42416	Pseudonaja mengdeni (Western Brown Snake)			
31.	25008	Pygopus lepidopodus (Common Scaly Foot)			
32.	25271	Ramphotyphlops australis			
33.	25273	Ramphotyphlops bituberculatus			
34.	25285	Ramphotyphlops pinguis			
35.	25288	Ramphotyphlops waitii			
36.	25266	Simoselaps bertholdi (Jan s Banded Snake)			
37.	25203	Tiliqua occipitalis (Western Bluetongue)			
38.	25519	Tiliqua rugosa			
39.	25218	Varanus gouldii (Bungarra or Sand Monitor)			

Conservation Codes T - Rare or likely to become extinct X - Presume dextinct IA - Protected under international agreement S - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 2 4 - Priority 4 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

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NatureMap - Birds - Cardup

Created By Greg Harewood on 26/07/2013

Kingdom Animalia Current Names Only Yes Core Datasets Only Yes Species Group Birds Method 'By Circle' Centre 116°00' 12" E,32°15' 06" S Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Quer Area
1.	24260	Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)			
2.	24261	Acanthiza chrysorrhoa (Yellow-rumped Thornbill)			
3.	24262	Acanthiza inornata (Western Thornbill)			
4.	24560	Acanthorhynchus superciliosus (Western Spinebill)			
5.	25535	Accipiter cirrocephalus (Collared Sparrowhawk)			
6.	25536	Accipiter fasciatus (Brown Goshawk)			
7.	24282	Accipiter fasciatus subsp. fasciatus (Brown Goshawk)			
8.	24312	Anas gracilis (Grey Teal)			
9.	24315	Anas rhynchotis (Australasian Shoveler)			
10.	24316	Anas superciliosa (Pacific Black Duck)			
11.	24561	Anthochaera carunculata (Red Wattlebird)			
12.	24562	Anthochaera lunulata (Western Little Wattlebird)			
13.	24599	Anthus australis subsp. australis (Australian Pipit)			
14.	24285	Aquila audax (Wedge-tailed Eagle)			
15.	24341	Ardea pacifica (White-necked Heron)			
16.	24610	Ardeotis australis (Australian Bustard)		P4	
17	25566	Artamus cinereus (Black-faced Woodswallow)		14	
18	2/353	Artamus cyaponterus (Dusky Woodswallow)			
10.	24000	Artamas cyanopierus (Dasky woodswallow)			
19.	24310	Ayunya ausurans (Haruneau)			
20.	24319	Biziura Iobala (Musk Duck)			
21.	257 15				
22.	25716	Cacatua sanguinea (Little Corella)			
23.	24729	Cacatua tenuirostris (Eastern Long-billed Corella)	Y		
24.	25598	Cacomantis flabelliformis (Fan-tailed Cuckoo)			
25.	42307	Cacomantis pallidus (Pallid Cuckoo)			
26.	24788	Calidris ruficollis (Red-necked Stint)		IA	
27.	25717	Calyptorhynchus banksii (Red-tailed Black-Cockatoo)			
28.	24731	Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)		Т	
29.	24733	Calyptorhynchus baudinii (Baudin s Cockatoo (long-billed black-cockatoo), Baudin s Cockatoo)		Т	
30.	24734	Calyptorhynchus latirostris (Carnaby s Cockatoo (short-billed black-cockatoo),		т	
		Carnaby s Cockatoo)		I	
31.	24377	Charadrius ruficapillus (Red-capped Plover)			
32.	24321	Chenonetta jubata (Australian Wood Duck, Wood Duck)			
33.	24288	Circus approximans (Swamp Harrier)			
34.	24396	Climacteris rufa (Rufous Treecreeper)			
35.	25675	Colluricincla harmonica (Grey Shrike-thrush)			
36.	24613	Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)			
37.	24399	Columba livia (Domestic Pigeon)	Y		
38.	25568	Coracina novaehollandiae (Black-faced Cuckoo-shrike)			
39.	24362	Coracina novaehollandiae subsp. novaehollandiae (Black-faced Cuckoo-shrike)			
40.	25592	Corvus coronoides (Australian Raven)			
41.	24417	Corvus coronoides subsp. perplexus (Australian Raven)			
42.	24419	Corvus splendens (House Crow)			
43.	24671	Coturnix pectoralis (Stubble Quail)			
44	25701	Coturnix vosilonhora (Brown Quail)			
45	25505	Cracticus tibicen (Australian Magnie)			
46	20090	Cracticus torculatus (Crev Butcherbird)			
40.	20090	Curanus stratus (Disek Swan)			
47.	24322	Oyynus analus (Diduk Swali)	V		
48.	30901		Ŷ		
49	25673	Dapnoenositta chrysoptera (Varied Sittella)			

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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
50.	25607	Dicaeum hirundinaceum (Mistletoebird)			
51.	24470	Dromaius novaehollandiae (Emu)			
52.	24651	Eopsaltria australis subsp. griseogularis (Western Yellow Robin)			
53.	24652	Eopsaltria georgiana (White-breasted Robin)			
55.	24007	Epinianura albirrons (white-fronted Chat)			
56	25622	Falco penglora (Brown Falcon)			
57	25623	Falco longipennis (Australian Hobby)			
58.	25624	Falco peregrinus (Peregrine Falcon)		S	
59.	24476	Falco subniger (Black Falcon)		0	
60.	25727	Fulica atra (Eurasian Coot)			
61.	24765	Gallirallus philippensis subsp. mellori (Buff-banded Rail)			
62.	25530	Gerygone fusca (Western Gerygone)			
63.	24443	Grallina cyanoleuca (Magpie-lark)			
64.	24295	Haliastur sphenurus (Whistling Kite)			
65.	24489	Hirundo ariel (Fairy Martin)			
66.	24491	Hirundo neoxena (Welcome Swallow)			
67.	24557	Leipoa ocellata (Malleefowl)		Т	
68.	25661	Lichmera indistincta (Brown Honeyeater)			
69.	25650	Malurus elegans (Red-winged Fairy-wren)			
70.	24551	Malurus pulcherrimus (Blue-breasted Fairy-wren)			
71.	25654	Malurus splendens (Splendid Fairy-wren)			
72.	24552	Malurus splendens subsp. splendens (Splendid Fairy-wren)			
73.	24583	Manorina flavigula (Yellow-throated Miner)			
74.	24586	Melithreptus brevirostris subsp. leucogenys (Brown-headed Honeyeater)			
75.	24587	Melithreptus chloropsis (Western White-naped Honeyeater)			
76.	24598	Merops ornatus (Rainbow Bee-eater)		IA	
77.	25693	Microeca fascinans (Jacky Winter)			
78.	25610	Myiagra inquieta (Restless Flycatcher)			
79.	24738	Neophema elegans (Elegant Parrot)			
80.	25748	Ninox novaeseelandiae (Boobook Owi)			
81.	24820	Ninox novaeseelandiae subsp. boobook (Boobook Owi)			
02.	20004	Opurphana Janhataa (Craated Diraan)			
03.	24407	Dcyphaps lopholes (Crested Figeon)			
95	25690	Pachycephala pectoralis (Bolden Whistler)			
86	25681	Pardalotus nunctatus (Snotted Pardalote)			
87	24625	Pardalotus punctatus subsp. punctatus (Spotted Pardalote)			
88	24626	Pardalotus punctatus subsp. xanthopyde (Yellow-rumped Pardalote)			
89.	25682	Pardalotus striatus (Striated Pardalote)			
90.	24630	Pardalotus striatus subsp. westraliensis (Striated Pardalote)			
91.	24674	Pavo cristatus (Common Peafowl, Indian Peafowl)	Y		
92.	24648	Pelecanus conspicillatus (Australian Pelican)			
93.	24659	Petroica goodenovii (Red-capped Robin)			
94.	24660	Petroica multicolor subsp. campbelli (Scarlet Robin)			
95.	25697	Phalacrocorax carbo (Great Cormorant)			
96.	24667	Phalacrocorax sulcirostris (Little Black Cormorant)			
97.	24409	Phaps chalcoptera (Common Bronzewing)			
98.	25587	Phaps elegans (Brush Bronzewing)			
99.	24596	Phylidonyris novaehollandiae (New Holland Honeyeater)			
100.	24841	Platalea flavipes (Yellow-billed Spoonbill)			
101.	25720	Platycercus icterotis (Western Rosella)			
102.	24745	Platycercus icterotis subsp. icterotis (Western Rosella)			
103.	24747	Platycercus spurius (Red-capped Parrot)			
104.	24750	Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)			
105.	25703	Podargus strigoides (Tawny Frogmouth)			
106.	25704	Podiceps cristatus (Great Crested Grebe)			
107.	24681	Poliocephalus poliocephalus (Hoary-headed Grebe)			
108.	25722	Polytelis anthopeplus (Regent Parrot)			
109.	24683	Pomatostomus superciliosus (White-browed Babbler)			
110.	25731	Porphyrio porphyrio (Purple Swamphen)			
111.	24771	Porzana tabuensis (Spotless Crake)			
112.	24776	Recurvirostra novaehollandiae (Red-necked Avocet)			
113.	24452	Rhipidura fuliginosa subsp. preissi (Grey Fantail)			
114.	25614	Rhipidura leucophrys (Willie Wagtail)			
115.	24454	Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)			
116.	25534	Sericornis trontalis (White-browed Scrubwren)			
	24279	Sericornis trontalis subsp. maculatus (White-browed Scrubwren)			
117.	c				
117. 118.	30948	Smicrornis brevirostris (Weebill)			

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OCM051.2/09/14

	N	lame ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
12	20.	25597	Strepera versicolor (Grey Currawong)			
12	21.	25589	Streptopelia chinensis (Spotted Turtle-Dove)	Y		
12	22.	25590	Streptopelia senegalensis (Laughing Turtle-Dove)	Y		
12	23.	25705	Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)			
12	24.	24331	Tadorna tadornoides (Australian Shelduck, Mountain Duck)			
12	25.	24844	Threskiornis molucca (Australian White Ibis)			
12	26.	24845	Threskiornis spinicollis (Straw-necked Ibis)			
12	27.	25549	Todiramphus sanctus (Sacred Kingfisher)			
12	28.	25723	Trichoglossus haematodus (Rainbow Lorikeet)			
12	29.	24851	Turnix velox (Little Button-quail)			
13	30.	24852	Tyto alba subsp. delicatula (Barn Owl)			
13	31.	24386	Vanellus tricolor (Banded Lapwing)			
13	32.	25765	Zosterops lateralis (Grey-breasted White-eye, Silvereye)			
13	33.	24856	Zosterops lateralis subsp. gouldi (Grey-breasted White-eye)			

Conservation Codes ne extinct

I - Rale of likely to become extinct
X - Presumed extinct
A - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Prioritý 2
3 - Prioritý 3
4 - Prioritý 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search arise included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.





NatureMap - Mammals - Cardup

Created By Greg Harewood on 26/07/2013

Kingdom Animalia Current Names Only Yes Core Datasets Only Yes Species Group Mammals Method 'By Circle' Centre 116°00' 12" E,32°15' 06" S Buffer 10km

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	25449	Antechinus flavipes (Yellow-footed Antechinus)			
2.	24088	Antechinus flavipes subsp. leucogaster (Yellow-footed Antechinus, Mardo)			
3.	24161	Bettongia lesueur subsp. graii (Boodie, Burrowing Bettong)			
4.	24160	Bettongia lesueur subsp. lesueur (Shark Bay Boodie, Burrowing Bettong)		Т	
5.	24162	Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)		Т	
6.	30883	Canis lupus subsp. familiaris (Dog)	Y		
7.	24086	Cercartetus concinnus (Western Pygmy-possum, Mundarda)			
8.	24186	Chalinolobus gouldii (Gould s Wattled Bat)			
9.	24187	Chalinolobus morio (Chocolate Wattled Bat)			
10.	24092	Dasyurus geoffroii (Chuditch, Western Quoll)		Т	
11.	24189	Falsistrellus mackenziei (Western False Pipistrelle)		P4	
12.	24041	Felis catus (Cat)	Y		
13.	24215	Hydromys chrysogaster (Water-rat)		P4	
14.	24153	Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)		P5	
15.	24132	Macropus fuliginosus (Western Grey Kangaroo)			
16.	24133	Macropus irma (Western Brush Wallaby)		P4	
17.	24184	Mormopterus planiceps (Southern Freetail-bat)			
18.	24223	Mus musculus (House Mouse)	Y		
19.	24042	Mustela putorius (European Polecat, Ferret)	Y		
20.	24146	Myrmecobius fasciatus (Numbat, Walpurti)		Т	
21.	24194	Nyctophilus geoffroyi (Lesser Long-eared Bat)			
22.	24195	Nyctophilus gouldi (Gould s Long-eared Bat)			
23.	24085	Oryctolagus cuniculus (Rabbit)	Y		
24.	24155	Perameles eremiana (Desert Bandicoot)		х	
25.	24156	Petaurus breviceps subsp. ariel (Sugar Glider)			
26.	24165	Petropseudes dahli (Rock Ringtail Possum, Wogoit)		P3	
27.	24099	Phascogale tapoatafa subsp. tapoatafa (Southern Brush-tailed Phascogale, Wambenger)		т	
28.	24163	Potorous ailbertii (Gilbert s Potoroo)		т	
29.	24164	Potorous platvops (Broad-faced Potoroo)		X	
30.	24166	Pseudocheirus occidentalis (Western Ringtail Possum)		т	
31.	24245	Rattus rattus (Black Rat)	Y		
32.	24145	Setonix brachyurus (Quokka)		т	
33.	24108	Sminthopsis crassicaudata (Fat-tailed Dunnart)			
34.	24111	Sminthopsis gilberti (Gilbert s Dunnart)			
35.	24259	Sus scrofa (Pig)	Y		
36.	24185	Tadarida australis (White-striped Freetail-bat)			
37.	24167	Tarsipes rostratus (Honey Possum, Noolbenger)			
38.	25521	Trichosurus vulpecula (Common Brushtail Possum)			
39.	24157	Trichosurus vulpecula subsp. arnhemensis (Northern Brushtail Possum)			
40.	24158	Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)			
41.	24206	Vespadelus regulus (Southern Forest Bat)			
42.	24040	Vulpes vulpes (Red Fox)	Y		
43.	24159	Wyulda squamicaudata (Scaly-tailed Possum)		P3	

Conservation Codes T - Rare or likely to become extinct X - Presume extinct IA - Protected under international agreement S - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 4 4 - Priority 4 5 - Priority 5

NatureMap is a collaborative project of the Department of Environment and Conservation, Western Australia, and the Western Australian Museum.





EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about <u>Environment Assessments</u> and the EPBC Act including significance guidelines, forms and application process details.

Report created: 26/07/13 18:25:48

Summary Details <u>Matters of NES</u> <u>Other Matters Protected by the EPBC Act</u> <u>Extra Information</u> <u>Caveat</u> <u>Acknowledgements</u>



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates Buffer: 0.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the <u>Administrative Guidelines on Significance</u>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	20
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As <u>heritage values</u> of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A <u>permit</u> may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated. OCM051.2/09/14

Place on the RNE:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	31
Nationally Important Wetlands:	None
<u>Key Ecological Features (Marine)</u>	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR)	[Resource Information]
Name	Proximity
Peel-yalgorup system	Upstream from Ramsar

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
<u>Calyptorhynchus baudinii</u>		
Baudin's Black-Cockatoo, Long-billed Black- Cockatoo [769]	Vulnerable	Roosting known to occur within area
Calyptorhynchus latirostris		
Carnaby's Black-Cockatoo, Short-billed Black- Cockatoo [59523]	Endangered	Breeding likely to occur within area
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum [25911]	Vulnerable	Species or species habitat may occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat may occur within area
Other		
Idiosoma nigrum		
Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Plants		OCM051.2/09/14
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty	Endangered	Species or species
Spider-orchia [7309]		nabitat likely to occur within area
Centrolepis caespitosa		within area
[6393]	Endangered	Species or species
	0	habitat likely to occur
		within area
Darwinia foetida	Critically Endongered	
Muchea Bell [83190]	Critically Endangered	Species of species
		area
<u>Diuris micrantha</u>		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species
		habitat likely to occur
		within area
Purdie's Donkey-orchid [12050]	Endangered	Species or species
Fuldie's Donkey-orchia [12930]	Lindaligered	habitat likely to occur
		within area
Drakaea elastica		
Glossy-leafed Hammer-orchid, Praying Virgin	Endangered	Species or species
[16753]		habitat likely to occur
Drakaea micrantha		within area
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species
		habitat may occur within
		area
Eucalyptus balanites		
Cadda Road Mallee, Cadda Mallee [24264]	Endangered	Species or species
		nabitat likely to occur
Synaphea sp. Fairbridge Farm (D.Papenfus 696)		within area
Selena's Synaphea [82881]	Critically Endangered	Species or species
	- , <u>,</u>	habitat likely to occur
		within area
Southern Tetraria [10137]	vuinerable	Species or species
		within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species
		habitat may occur within
		area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on t	he EPBC Act - Threatened	Species list.
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species
		habitat likely to occur
Migratory Terrestrial Species		within area
Haliaeetus leucodaster		
White-bellied Sea-Eagle [943]		Species or species
		habitat likely to occur
		within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species
		nabitat may occur within
Merops ornatus		area
Rainbow Bee-eater [670]		Species or species
		habitat may occur within
		area
Migratory Wetlands Species		
Ardea alba		
Great Eyret, White Eyret [39341]		habitat likely to occur

Name	Threatened	Type of Presence
Ardea ibis		within area OCM051.2/09/14
Cattle Egret [59542]		Species or species habitat may occur within area
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name	e on the EPBC Act - Threa	tened Species list.
Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<u>Ardea ibis</u>		
Cattle Egret [59542]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<u>Merops ornatus</u>		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area
<u>Rostratula benghalensis (sensu lato)</u>		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species

OCM051.2/09/14 [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status Type of Pr	resence
Birds	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Carduelis carduelis		
European Goldfinch [403]	Species o	r species
	habitat like	ely to occur
Columba livia	within area	а
Rock Pigeon, Rock Dove, Domestic Pigeon [803]	Species o	r species
	habitat like	ely to occur
Passer domesticus		u
House Sparrow [405]	Species o	r species
	habitat like	ely to occur
Passer montanus	within area	а
Furasian Tree Sparrow [406]	Species o	r species
	habitat like	ely to occur
	within area	ล้
<u>Streptopelia chinensis</u>		
Spotted Turtle-Dove [780]	Species o	r species
	within area	a
Streptopelia senegalensis		_
Laughing Turtle-dove, Laughing Dove [781]	Species o	r species
	habitat like	ely to occur
Sturnus vulgaris	within area	а
Common Starling [389]	Species o	r species
	habitat like	ely to occur
	within area	a
Mammals		
Canis lupus familiaris	Species	ranasiaa
Canis lupus familiaris Domestic Dog [82654]	Species o babitat like	r species
<u>Canis lupus familiaris</u> Domestic Dog [82654]	Species o habitat like within area	r species ely to occur a
Canis lupus familiaris Domestic Dog [82654]	Species o habitat like within area	r species ely to occur a
Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2]	Species o habitat like within area Species o	r species ely to occur a r species
Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2]	Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus	Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a
Mammais Canis lupus_familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19]	Species o habitat like within area Species o habitat like within area Species o	r species ely to occur a r species ely to occur a r species
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19]	Species o habitat like within area Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur a r species ely to occur
Mammais Canis lupus_familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19]	Species o habitat like within area Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a r species ely to occur a
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Balm Squirrel, Five stringed Balm Squirrel	Species o habitat like within area Species o habitat like within area Species o habitat like within area Species o	r species ely to occur a r species ely to occur a r species ely to occur a
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]	Species o habitat like within area Species o habitat like within area Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur
Mammais Canis lupus_familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]	Species o habitat like within area Species o habitat like within area Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur a
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus	Species o habitat like within area Species o habitat like within area Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur a
Mammais Canis lupus_familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120]	Species o habitat like within area Species o habitat like within area Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur a
Mammais Canis lupus_familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120]	Species o habitat like within area Species o habitat like within area Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur a r species ely to occur
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Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128]	Species o habitat like within area Species o	r species ely to occur a r species ely to occur
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128]	Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128]	Species o habitat like within area Species o habitat like within area	r species ely to occur a r species ely to occur a
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128] Rattus rattus Black Rat, Shin Rat [84]	Species o habitat like within area Species o	r species ely to occur a r species ely to occur a
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128] Rattus rattus Black Rat, Ship Rat [84]	Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128] Rattus rattus Black Rat, Ship Rat [84]	Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur
Mammais Canis lupus familiaris Domestic Dog [82654] Capra hircus Goat [2] Felis catus Cat, House Cat, Domestic Cat [19] Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] Mus musculus House Mouse [120] Oryctolagus cuniculus Rabbit, European Rabbit [128] Rattus rattus Black Rat, Ship Rat [84]	Species o habitat like within area Species o habitat like	r species ely to occur a r species ely to occur

Name

<u>Sus scrofa</u> Pig [6]

Vulpes vulpes Red Fox, Fox [18]

Plants

Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]

Brachiaria mutica

Para Grass [5879]

Cenchrus ciliaris

Buffel-grass, Black Buffel-grass [20213]

<u>Chrysanthemoides monilifera</u> Bitou Bush, Boneseed [18983]

Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]

Genista monspessulana

Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126] <u>Genista sp. X Genista monspessulana</u> Broom [67538]

Lantana camara

Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum African Boxthorn, Boxthorn [19235]

<u>Olea europaea</u> Olive, Common Olive [9160]

Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]

Rubus fruticosus aggregate Blackberry, European Blackberry [68406]

Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]

Salvinia molesta

Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]

Solanum elaeagnifolium

Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323] Status

Type of Presence

within area OCM051.2/09/14

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat may occur within area

Species or species habitat may occur within area

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Species or species habitat likely to occur within area

Coordinates

-32.25158 116.00368

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distr butions are less well known, existing vegetation maps and point location data are used to produce indicative distr bution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distr bution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

APPENDIX D

HABITAT TREE DETAILS

	Comments			th of hollows unknown	th of hollows unknown		th of hollows unknown	th of hollows unknown						th of hollows unknown	th of hollows unknown		th of hollows unknown			th of hollows unknown	also di anno	snallow	th of hollows unknown	th of hollows unknown	th of hollows unknown						th of hollows unknown					th of hollows unknown				th of hollows unknown						
	Potential Cockatoo Nest Hollow	0	0	o Depi	o Dept	0	o Dept	es Dept	0	0	0			es Dept	0 Dept	0	es Dept	0	0	o Dept	0	00	Dent	o Depi	o Dept	0	0	0	0	0 0	o Dept	0	0	0		Dent		0	0	0 Dept	0	0	0	0 1		0 0
	Chew Marks	No Signs N	No Signs N	No Signs N	No Signs N	No Signs N	No Signs N	No Signs Y	No Signs N	No Signs N	No Signs	NO SIGNS NO SIGNE	No Signs	No Signs Y	No Signs N	No Signs N	No Signs Y	No Signs N	No Signs N	No Signs N	No Signs	NO SIGNS	No Signs No Signs	No Signs	No Signs N	No Signs N	No Signs N	No Signs N	No Signs	No Signs No	No Signs N	No Signs N	No Signs N	No Signs	NO Signs	No Signs	No Signs N	No Signs N	No Signs N	No Signs N	No Signs N	No Signs N	No Signs	No Signs IN	NO SIGIIS NO SIGIIS	No Signs
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	Hollow Size 5 (cm)			5-12																			5-12	5-12							5-12															
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	Hollow Type 3			Branch				Spout Trunk															Branch -	Spout Branch	Branch						Branch															
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	Tree Species	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Jarran	Jarran Tuknown Fuc	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Dead Jarrah	larrah	Marri	Marri	Marri	Marri	larrah	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri	Marri
	ZE	6432197	6432224	6432055	6431671	6431628	64316171	6431610	6431608	6431081	6431012	6430897	6431117	6431121	6431179	6431109	6431144	6431199	6431156	6431105	6431047	0431043	64311861	6431696	6430427	6430419	6430412	6430650	6430668	6430673	6430702	6430706	6430750	6430753	6430744	6430712	6430741 J	64306871	6430688	64307131	6430716	6430717	6430712	6430673	6430630	6430639
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bitat Treu	Zone	50H	50H	50H	50H	50H	50H	50H	50H	50H	50H	HOS	20H	50H	50H	SOH	50H	20H	50H	50H	50H	HUC	HUS	50H	50H	50H	50H	50H	50H	HOS	50H	50H	50H	50H	HUS	FOH	50H	50H	50H	SOH	50H	50H	20H	50H	HUS	50H
Cardup Hat Datum - GE	Waypoint Number	wpt001	wpt002	wpt003	wpt004	wpt005	wpt006	wpt007	wpt008	wpt009	wpt010	wpt012	wpt013	wpt014	wpt015	wpt016	wpt017	wpt018	wpt019	wpt020	wpt021	ZZUT4W	wptU23 wnt024	wpt025	wpt026	wpt027	wpt028	wpt029	wpt030	wpt032	wpt033	wpt034	wpt035	wpt036	wht038	wnt039	wpt040	wpt041	wpt042	wpt043	wpt044	wpt045	wpt046	wpt047	wpt040	wpt050

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Tree Height (m)	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20
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шE	406266	406262	406281	406302	406310	406342	406347	406345	406345	406337	406363	406353	406353	406341	406313	406305	406302	406293	406292	406293	406288	406285	406282	406286	406289	406278	406233	406208	406190	406199	406214	406195	406186	406220	406238	406193	406184	406154
Zone	50H																																					
Waypoint Number	wpt051	wpt052	wpt053	wpt054	wpt055	wpt056	wpt057	wpt058	wpt059	wpt060	wpt061	wpt062	wpt063	wpt064	wpt065	wpt066	wpt067	wpt068	wpt069	wpt070	wpt071	wpt072	wpt073	wpt074	wpt075	wpt076	wpt077	wpt078	wpt079	wpt080	wpt081	wpt082	wpt083	wpt084	wpt085	wpt086	wpt087	wpt088

OCM051.2/09/14 CARDUP BUSINESS PARK – SOUTH WESTERN HWY - CARDUP - FAUNA ASSESSMENT – AUGUST '13 – V1

APPENDIX E

SIGNIFICANT SPECIES PROFILES

Shield-backed Trapdoor Spider Idiosoma nigrum

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. The species is known from three locations. One location consists of a number of severely fragmented populations in the central and northern wheatbelt (Main *et al.*, 2000). The second and third locations are at Jack Hills and Weld Range, two isolated populations approximately 200km further north, in more arid areas (Main, pers. comm., 2009). The species' area of occupancy is estimated to be 1700km² and its extent of occurrence is approximately 21 500 km² (Main, unpublished data).

<u>Habitat</u>: Burrows in heavy clay soils in areas of open *Eucalyptus loxophleba, E. salmonophloia* and *E. capillosa* woodland, where *Acacia acuminata* forms a sparse understorey. Forages within ground litter surrounding burrows (TSSC 2011).

<u>Likely presence in study area</u>: Habitat within the study area appears unsuitable and the area is outside of this species documented range. This species is therefore considered to be very unlikely to occur.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Bedfordale Trapdoor Spider Arbanitis inornatus

<u>Status and Distribution</u>: Listed as Priority 1 by the DPaW. Distribution is not documented.

<u>Habitat</u>: Habitat requirements poorly documented. Appears to require woodlands or forests in very good condition to persist.

<u>Likely presence in study area</u>: Given the highly degraded nature of most of the study area it is very unlikely that a population of this species persists on site.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat is considered likely to occur.

Carter's Freshwater Mussel Westralunio carteri

<u>Status and Distribution</u>: Listed as Priority 4 by DPaW and as Vulnerable by the ICUN. Carter's freshwater mussel is the only freshwater mussel species endemic to south-western WA, ranging from the Moore River south to the Frankland River (Morgan *et al.* 2011).

<u>Habitat</u>: Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots. Salinity tolerance quite low (Morgan *et al.* 2011).

<u>Likely presence in study area</u>: No suitable habitat for this species occurs within the study area.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Darling Range Heath Ctenotus Ctenotus delli

<u>Status and Distribution</u>: Listed as Priority 4 by DPaW. Main distribution is in the Darling Range from the Darlington/Mundaring area to near Collie (Storr *et al.* 1999).

<u>Habitat</u>: Humid zone, mainly laterite and clays (Storr *et al.* 1999) supporting jarrah/marri woodland with a shrub dominated understorey, sheltering in dense vegetation, inside grass trees and beneath rocks, sometimes in burrows (Nevill 2005). Occasionally found on granite outcrops (Bush 2002).

<u>Likely presence in study area</u>: The study area is just outside this species main documented range and habitat onset appears to be unsuitable. This species is therefore considered to be very unlikely to occur.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Southern Carpet Python Morelia spilota imbricata

<u>Status and Distribution</u>: The south western population is classified Schedule 4 under the *WC Act*. This subspecies has wide distribution within the south west but is uncommon. Occurs north to Geraldton and Yalgoo and east to Pinjin, Kalgoorlie, Fraser Range and Eyre (Storr *et al.* 2002).

<u>Habitat</u>: This species has been recorded from semi-arid coastal and inland habitats, Banksia woodland, Eucalypt woodlands, and grasslands. Most often found utilising hollow logs in addition the burrows of other animals for shelter. Often arboreal and will use tree hollows for refuge.

<u>Likely presence in study area</u>: Habitat within the study area appears too degraded for this species to utilise and there are no DPaW database records in the near vicinity. Near Perth, this species is more often found in areas of substantial undisturbed bushland such as catchment areas and rocky outcrops of the Darling Range (Bush *et al.* 2002). This species is therefore considered to be very unlikely to occur.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Southern Death Adder Acanthophis antarcticus

<u>Status and Distribution</u>: The Southern Death Adder is classified as Priority 3 by DPaW. Now locally confined to the Darling Range between Mt Helena and Jarrahdale (Bush *et al.* 2002).

<u>Habitat</u>: In the Darling Range this species is typically found within Jarrah woodlands adjacent to granite outcrops and along densely vegetated creeks (Bush *et al* 1995).

<u>Likely presence in study area</u>: No recent records on the coastal plain where it is considered locally extinct and habitat within the study area is too degraded to support individuals of this species. Not listed as a potential species.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Malleefowl Leipoa ocellata

<u>Status and Distribution</u>: This species is listed as Schedule 1 under the *WC Act* and as Vulnerable and Migratory under the *EPBC Act*. Originally common, but now generally rare to uncommon and patchily distributed.

Current distribution mainly southern arid and semi-arid zones, north to Shark Bay, Jingemarra, Colga Downs and Yeelirrie, east to Earnest Giles Range, Yeo Lake, lower Ponton Creek and to Eucla and west and south to Cockleshell Gully, the Wongan Hills, Stirling Range, Beaufort Inlet, Hatters Hill, Mt Ragged and Point Malcolm (Johnstone and Storr 1998).

<u>Habitat</u>: Mainly scrubs and thickets of mallee *Eucalyptus* spp., boree *Melaleuca lanceolata* and bowgada *Acacia linophylla*, also dense litter forming shrublands.

<u>Likely presence in study area</u>: This species is regionally extinct and would never, under normal circumstances occur anywhere on the Swan Coastal Plain/Darling Range.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Great Egret Ardea alba

<u>Status and Distribution</u>: This species of egret is listed as migratory under the *EPBC Act* 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 2004).

<u>Habitat</u>: Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs (Morcombe 2004).

<u>Likely presence in study area</u>: May on infrequent occasions utilise the dams and wetter paddocks/low lying areas within the study area during wetter months of the year, in low numbers. Would not breed on site.

<u>Potential impact of development</u>: Loss of marginal degraded/manmade nonbreeding habitats only and therefore no significant impact on this species can be considered likely.

Cattle Egret Ardea ibis

<u>Status and Distribution</u>: This species of egret is listed as migratory under the *EPBC Act* 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 2004).

<u>Habitat</u>: Moist pastures with tall grasses, shallow open wetlands and margins, mudflats (Morcombe 2004). As its name suggests, most often seen in association with cattle.

<u>Likely presence in study area</u>: May on infrequent occasions utilise the dams and wetter paddocks/low lying areas within the study area during wetter months of the year, in low numbers. Would not breed on site.

<u>Potential impact of development</u>: Loss of marginal degraded/manmade nonbreeding habitats only and therefore no significant impact on this species can be considered likely.

Australasian Bittern Botaurus poiciloptilus

<u>Status and Distribution</u>: Classified as Schedule 1 under the *WC Act* and as Endangered under the *EPBC Act*. The species is uncommon to rare (Morcombe 2004), but locally common in wetter parts of south west (Johnstone and Storr 1998). Occurs north to Moora and east to Mt Arid (Johnstone and Storr 1998).

<u>Habitat</u>: Freshwater wetlands, occasionally estuarine; prefers heavy vegetation (Morcombe 2003) such as beds of tall dense *Typha*, *Baumea* and sedges in freshwater swamps (Johnstone and Storr 1998).

<u>Likely presence in study area</u>: The study area contains no suitable habitat for this species to utilise.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

Black Bittern Ixobrychus flavicollis

<u>Status and Distribution</u>: Listed as Priority 3 by DEC. Occurs north to Yanchep and Northam and east to Albany (Johnstone and Storr 1998).

<u>Habitat</u>: Freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense waterside vegetation (Johnstone and Storr 1998).

<u>Likely presence in study area</u>: The study area contains no suitable habitat for this species to utilise.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

Little Bittern *lxobrychus minutus*

<u>Status and Distribution</u>: Listed as Priority 4 by DPaW. Occurs north to Moora and east to Two Peoples Bay; accidental or on migration further north and east and on Rottnest Island and central district (Condingup district) (Johnstone and Storr 1998).

<u>Habitat</u>: Dense vegetation surrounding/within freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of *Typha*, *Baumea* and tall rushes in freshwater swamps around lakes and along rivers (Johnstone and Storr 1998).

<u>Likely presence in study area</u>: The study area contains no suitable habitat for this species to utilise.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

Australian Bustard Ardeotis australis

<u>Status and Distribution</u>: This species is listed as Priority 4 by DPaW. A nomadic species that is common away from settled areas over much of Australia (Morcombe 2003).

<u>Habitat</u>: Grasslands, especially tussock grasses, like speargrass, Mitchell grass, spinifex; arid scrub with saltbush, bluebush; open dry woodland of mulga, mallee and, heath (Morcombe 2003).

<u>Likely presence in study area</u>: This species is regionally extinct and would only very rarely occur in this section of the Swan Coastal Plain.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Osprey Pandion haliaetus

<u>Status and Distribution</u>: This species is listed as Migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. Moderately common to very common in sheltered seas around the north and west coast islands south to 31°S; uncommon to common on mainland coasts, estuaries and large rivers north of tropic, rare to uncommon elsewhere (Johnstone and Storr 1998).

<u>Habitat</u>: Coasts, estuaries, bays, inlets, islands, and surrounding waters, coral atolls, reefs, lagoons, rock cliffs and stacks. Ascends larger rivers (Pizzey & Knight 2012). Construct nests on prominent headland, large trees, communication towers (Simpson & Day 2010).

<u>Likely presence in study area</u>: The study area contains no suitable habitat for this species to utilise.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

White-bellied Sea Eagle Haliaeetus leucogaster

<u>Status and Distribution</u>: This species is listed as Schedule 3 under the *WC Act* and as migratory under the *EPBC Act* 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 2004).

<u>Habitat</u>: 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 2004). White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession.

<u>Likely presence in study area</u>: The study area contains no suitable habitat for this species to utilise.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

Peregrine Falcon Falco peregrinus

<u>Status and Distribution</u>: This species is listed as Schedule 4 under the *WC Act*. 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).

<u>Habitat</u>: Diverse from rainforest to arid shrublands, from coastal heath to alpine (Morcombe 2004). 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.

<u>Likely presence in study area</u>: The species potentially utilises some sections of the study area as part of a much larger home range. No potential nest sites observed.

<u>Potential impact of development</u>: No significant impact anticipated. This species will continue to utilise the area, if it does now, despite any proposed development.

Migratory Shorebirds

A number of migratory shorebirds are listed as potentially occurring in the general area. Not all specific species are discussed in detail.

<u>Status and Distribution</u>: Migratory shorebirds are listed under the *EPBC Act* and under international agreements to which Australia is a signatory. All species are

either widespread summer migrants to Australia or residents. State and Federal conservation status varies between species.

<u>Habitat</u>: Varies between species but includes beaches and permanent/temporary wetlands varying from billabongs, swamps, lakes, floodplains, sewerage farms, saltwork ponds, estuaries, lagoons, mudflats sandbars, pastures, airfields, sports fields and lawns.

<u>Likely presence in study area</u>: The study area contains no habitat that could be considered suitable for any species of migratory shorebirds to utilise. None are listed as potential species.

<u>Potential impact of development</u>: No significant impact on migratory shorebirds will occur as the result of development within the study area.

Painted Snipe Rostratula benghalensis

<u>Status and Distribution</u>: This species is listed as Schedule 1 and 3 under the *WC Act* and as Endangered and Migratory under the *EPBC Act*. Sparsely distributed in better watered regions: Kimberley, North West and South Western divisions. Also eastern Australia and Tasmanian (Johnstone and Storr 1998).

<u>Habitat</u>: Well vegetated shallows and margins of wetlands, dams, sewerage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea tree scrub, open timber. Requires dense low cover (Morcombe 2004).

<u>Likely presence in study area</u>: There is no suitable habitat for this species within the study site.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Found in the humid and subhumid south west, mainly hilly interior, north to Gingin and east to Mt Helena, Christmas Tree Well, North Bannister, Mt Saddleback, Rock Gully and the upper King River (Johnstone and Storr 1998).

<u>Habitat</u>: Eucalypt forests, feeds on marri, jarrah, blackbutt, karri, sheoak and snottygobble. The forest red-tailed black cockatoo nests in the large hollows of marri, jarrah and karri (Johnstone and Kirkby 1999). In marri, the nest hollows of the forest red-tailed black cockatoo range from 8-14m above ground, the entrance is 12 – 41cm in diameter and the depth is one to five metres (Johnstone and Storr 1998).

Breeding commences in winter/spring. There are few records of breeding for the forest red-tailed black cockatoo (Johnstone and Storr 1998), but eggs are laid in October and November (Johnstone 1997; Johnstone and Storr 1998).

J	F	М	Α	Μ	J	J	Α	S	0	Ν	D

Period in which breeding is most likely to commence Period in which fledging/weening could extend through

Recent data however indicates that breeding in all months of the year occurs with peaks in spring and autumn–winter (Ron Johnstone pers comms). Incubation period 29 – 31 days. Young fledge at 8 to 9 weeks (Simpson and Day 2004).

<u>Likely presence in study area</u>: Several individuals observed/heard and foraging evidence attributed to this species was also found during the day survey (chewed marri fruits). Most remnant vegetation represents foraging habitat and potential breeding habitat. May also occasionally roost on site.

<u>Potential impact of development</u>: Possible requirement to clear some potential breeding and foraging habitat of this species however the vast majority of habitat suitable for this species to utilise (Bush Forever site 361) will be retained as POS. Significant impact can be considered to be unlikely.

Baudin's Black- Cockatoo Calyptorhynchus baudinii

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. 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). On the southern Swan Coastal Plain this cockatoo is in some areas resident but mainly a migrant moving from the deep south-west to the central and northern Darling Range. Between March and September most flocks move north and are concentrated in the northern parts of the Darling Range. During this period birds forage well out onto the southern Swan Coastal Plain to areas such as Harvey, Myalup, Bunbury, Capel, Dunsborough and Meelup. While generally more common in the Darling Range this species can also be common on parts of the southern Swan Coastal Plain especially in mid-August – September when flocks begin to return to their breeding quarters (Johnstone 2008).

<u>Habitat</u>: Mainly eucalypt forests where it feeds primarily on the Marri seeds, (Morcombe, 2003), Banksia, Hakeas and *Erodium* sp. Also strips bark from trees in search of beetle larvae (Johnstone and Storr 1998). This species of cockatoo nests in large tree hollows, 30–40 cm in diameter and more than 30 cm deep (Saunders 1974).





Baudin's black-cockatoo breeds in late winter and spring, from August to November or December (Gould 1972; Johnstone 1997; Saunders 1974; Saunders et al. 1985). Eggs laid in October (Johnstone and Storr 1998). Based on observations at currently

known nest sites breeding mainly occurs within the October-December period (Ron Johnstone pers comms). Incubation is 28 – 30 days. Young fledge at 8 to 9 weeks (Simpson and Day 2004).

<u>Likely presence in study area</u>: Foraging evidence attributed to this species observed at several locations during the field reconnaissance survey. Most remnant vegetation represents foraging habitat and potential breeding habitat. May also occasionally roost on site.

<u>Potential impact of development</u>: Possible requirement to clear some potential breeding and foraging habitat of this species however the vast majority of habitat suitable for this species to utilise (Bush Forever site 361) will be retained as POS. Significant impact can be considered to be unlikely.

Carnaby's Black- Cockatoo Calyptorhynchus latirostris

<u>Status and Distribution</u>: Carnaby's black cockatoo is listed as Scheduled 1 under the *WC Act* and as Endangered under the *EPBC Act*. 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).

<u>Habitat</u>: Forests, woodlands, heathlands, farms; feeds on Banksia, Hakeas and Marri. Carnaby's cockatoo has specific nesting site requirements. Nests are mostly in smoothed-barked eucalypts with the nest hollows ranging from 2.5 to 12m above the ground, an entrance from 23-30cm diameter and a depth of 0.1-2.5m (Johnstone and Storr, 1998).

Breeding occurs in winter/spring mainly in eastern forest and wheatbelt where they can find mature hollow bearing trees to nest in (Morcombe, 2003). Judging from records in the Storr-Johnstone Bird Data Bank, this species is currently expanding its breeding range westward and south into the Jarrah – Marri forest of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain including the region between Mandurah and Bunbury.

Carnaby's black cockatoo has been known to breed close to the town of Mandurah, as well as at Dawesville, Lake Clifton and Baldivis (pers. comm., Ron Johnstone, WA Museum) and there are small resident populations on the southern Swan Coastal Plain near Mandurah, Lake Clifton and near Bunbury. At each of these sites the birds forage in remnant vegetation and adjacent pine plantations (Johnstone 2008).





Carnaby's black-cockatoo lays eggs from July or August to October or November, with most clutches being laid in August and September (Saunders 1986). Birds in

inland regions may begin laying up to three weeks earlier than those in coastal areas (Saunders 1977). The female incubates the eggs over a period of 28-29 days. The young depart the nest 10–12 weeks after hatching (Saunders 1977; Smith & Saunders 1986).

<u>Likely presence in study area</u>: No evidence of this species utilising the site was observed but it is likely to be present on occasions. Most remnant vegetation represents foraging habitat and potential breeding habitat. May also occasionally roost on site.

<u>Potential impact of development</u>: Possible requirement to clear some potential breeding and foraging habitat of this species however the vast majority of habitat suitable for this species to utilise (Bush Forever site 361) will be retained as POS. Significant impact can be considered to be unlikely.

Barking Owl Ninox connivens connivens

<u>Status and Distribution</u>: Listed as Priority 2 by DPaW. Found north to Perth (formerly) and east to Northam, Katanning and nearly to Bremer Bay. Declining in south west (Johnstone and Storr 1998).

<u>Habitat</u>: Dense vegetation, especially forest and thickets of waterside vegetation such as melaleucas (Johnstone and Storr 1998). Roosts in tree hollows.

<u>Likely presence in study area</u>: The preferred habitat of this species is absent from the site.

Potential impact of development: No impact on this species or its preferred habitat will occur.

Masked Owl Tyto novaehollandae novaehollandae

<u>Status and Distribution</u>: Listed as Priority 3 by DPaW. 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).

<u>Habitat</u>: Roosts and nests in heavy forest, hunts over open woodlands and farmlands (Morcombe 2004). Probably breeding in forested deep south west with some autumn–winter wanderings northwards (Johnstone and Storr 1998).

<u>Likely presence in study area</u>: May occasionally reside in general area though status onsite uncertain. It is unlikely to be specifically attracted to the site. Not listed as a potential species as the frequency of occurrence would be extremely low. In any event, the best quality habitat for this species is being retained within Bush Forever site 361.

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

Fork-tailed Swift Apus pacificus

<u>Status and Distribution</u>: The fork-tailed swift is listed as Schedule 3 under the *WC Act* and as migratory under the *EPBC Act* and under international agreements to which Australia is a signatory. It is a summer migrant (Oct-Apr) to Australia (Morcombe 2004).

<u>Habitat</u>: Low to very high airspace over varied habitat from rainforest to semi desert (Morcombe 2004).

<u>Likely presence in study area</u>: The fork-tailed swift is potentially a very occasional summer visitor to the south west but is entirely aerial and largely independent of terrestrial habitats. It would only occur rarely and for very short periods of time and therefore has not been listed as a potential species.

Potential impact of development: No impact on this species will occur.

Rainbow Bee-eater Merops ornatus

<u>Status and Distribution</u>: This species is listed as Schedule 3 under the *WC Act* and as Migratory under the *EPBC Act* 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 2004).

<u>Habitat</u>: Open country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands (Morcombe 2004). Breeds underground in burrows where areas of suitable soft soil, firm enough to support tunnel building exist.

<u>Likely presence in study area</u>: Rainbow bee-eaters are common seasonal visitors to south west and during summer months a small number of individuals of this species may possibly forage and roost onsite. Sandy ground conditions in some areas may be suitable for construction of breeding burrows.

<u>Potential impact of development</u>: Despite the potential for breeding no significant impact on this species is anticipated as individuals' present onsite at any one time are unlikely to represent a substantial proportion of the overall population. Rainbow Bee-eaters can be expected to continue to utilise the area, as they do now, despite any future development.

Chuditch Dasyurus geoffroii

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. 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.

<u>Habitat</u>: 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^2 whilst that for females is 3-4 km^2 (Sorena and Soderquist 1995).

<u>Likely presence in study area</u>: Previous fauna surveys in nearby areas (Harewood 2010, Harvey *et al.* 1987) have failed to detect this species despite targeted trapping methods being utilised. This species is rarely recorded on any section of the coastal plain and given the marginal habitat quality onsite (e.g. lack of groundcover/hollow logs) it is only likely to temporarily utilise the area on very rare occasions at best. Retention of the Bush Forever site will provide a corridor for movement through the area if and when individuals of this species do move into the area.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat is anticipated.

Numbat Myrmecobius fasciatus

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Once occurred across much of arid and semi arid southern Australia, now restricted to a few remnant forests of Wandoo, Powderbark Wandoo or jarrah in South west WA (Menkhorst & Knight 2011). Rare, scattered. Found only at Dryandra, Perup and six other translocation sites (van Dyck & Strahan 2008).

<u>Habitat</u>: Generally dominated by eucalypts that provide hollow logs and branches for shelter and termites for food (van Dyck & Strahan 2008).

<u>Likely presence in study area</u>: Generally considered to be locally extinct. Not listed as a potential species.

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

Southern Brush-tailed Phascogale Phascogale tapoatafa ssp

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act*. Present distribution 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 (DEC information pamphlet). Records are less common from wetter forests. Can also persist in floristically degraded areas such as relatively dense and continuous, but parkland cleared woodland in farmland (G. Harewood pers. obs.).

<u>Habitat</u>: 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).

<u>Likely presence in study area</u>: This species has not been captured during nearby surveys in the past and there are no DPaW records in immediate vicinity. This would suggest it is absent but potential presence cannot be totally discounted as it can be hard to detect. Most of this species potential habitat onsite is being retained within Bush Forever site 361.

<u>Potential impact of development</u>: No impact on this species is anticipated given that most of this species potential habitat will be retained.

Southern Brown Bandicoot Isoodon obesulus fusciventer

<u>Status and Distribution</u>: Listed as Priority 5 by DPaW. 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 (DEC information pamphlet) and Nambung and Yalgorup National Parks (DPaW pers. comm.).

<u>Habitat</u>: 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 (DPaW information pamphlet ND).

<u>Likely presence in study area</u>: Known from nearby bush remnants (Harewood 2010, Harvey *et al.* 1997) but almost all of the vegetation onsite appears unsuitable for this species to utilise due to absent or very sparse groundcover. Not listed as a potential species

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

Western Ringtail Possum Pseudocheirus occidentalis

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Common in suitable habitat (de Tores 2008). The species is widespread and relatively common in vegetated remnants within the Swan Coastal Plain and along the Whicher Scarp between Bunbury and Busselton (G. Harewood pers. obs.). The highest densities of this species are recorded in Peppermint habitat near Busselton area; relatively high densities are found in Jarrah/Marri forest at Perup (de Tores 2008).

The western ringtail possum has a restricted distribution in south-western Western Australia. Most known populations (natural and translocated) 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. It has also been recorded in stands of Peppermint near the Harvey

River and in Jarrah/Marri forest near Collie; however, the long term persistence of the species in these areas is not confirmed (de Tores *et al.* 2004). The Western Ringtail was formerly more widespread: in the 1970s it was known from Casuarina woodlands in the wheatbelt near Pingelly (south-east of Perth), and it is thought to have once occurred throughout much of south-western Western Australia (but not necessarily continuously distributed) (Maxwell *et al.* 1996; de Tores 2008).

<u>Habitat</u>: 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. Coastal populations mostly inhabit Peppermint-Tuart associations with highest densities 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). 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-marri associations constitute the species refuge and foraging habitat. In areas where peppermint is absent or rare WRPs have been observed feeding predominately on young jarrah, *Nuytsia floribunda* and *Allocasuarina fraseriana* (G Harewood pers. obs.).

<u>Likely presence in study area</u>: This species is generally regarded as being extinct in this part of the coastal plain. Habitat onsite is also unsuitable and therefore the western ringtail possum can be regarded as very unlikely to occur.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Western Brush Wallaby Macropus irma

<u>Status and Distribution</u>: Listed as Priority 4 by DPaW. The Western Brush Wallaby is distributed across the south-west of Western Australia from north of Kalbarri to Cape Arid (DEC information pamphlet).

<u>Habitat</u>: The species optimum habitat is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest (DEC information pamphlet).

<u>Likely presence in study area</u>: Bushland within and near the study area is too small and fragmented to support a population of this species.

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

Woylie Bettongia penicillata ogibyi

<u>Status and Distribution</u>: Listed as Schedule 1 under the *WC Act* and as Endangered under the *EPBC Act*. Restricted to remnant habitat patches in south west WA where populations are managed by way of fox control and reintroduction programs (e.g. Avon Valley, Walyunga National Park and Paruna Sanctuary).

<u>Habitat</u>: Open forest and woodland with a low, dense, understorey of tussock grasses or woody scrub. Formerly occurred in a wider range of habitats including spinifex hummock grasslands.

<u>Likely presence in study area</u>: Generally considered to be locally extinct in this area and there is no potential habitat onsite for this species.

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

Quokka Setonix brachyurus

<u>Status and Distribution</u>: Listed as Scheduled 1 under the *WC Act* and as Vulnerable under the *EPBC Act*. Rare and restricted in south west W.A. from south of Perth to Two Peoples Bay. The distribution of the Quokka includes Rottnest and Bald Islands, and at least 25 known sites on the mainland, including Two Peoples Bay Nature Reserve, Torndirrup National Park, Mt Manypeaks National Park, Walpole-Nornalup National Park, and various swamp areas through the south-west forests from Jarrahdale to Walpole. Known population just south of Bunbury.

<u>Habitat</u>: Mainland populations of this species are currently restricted to densely vegetated coastal heaths, swamps, riverine habitats including tea-tree thickets on sandy soils along creek systems where they are less vulnerable to predation. The species is nocturnal.

<u>Likely presence in study area</u>: Generally considered to be locally extinct in this area and there is no potential habitat onsite for this species.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Western False Pipistrelle Falsistrellus mackenziei

<u>Status and Distribution</u>: Listed as Priority 4 by DPaW and as Vulnerable by the ICUN. 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 2011). Range appears to be contracting southwards, presumably due to drying climate.

<u>Habitat</u>: 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.

<u>Likely presence in study area</u>: Status in the study area difficult to determine but a lack of records suggest it is absent from the general area. Not listed as a potential species. In an event, habitat that appears suitable for this species is being retained within Bush Forever site 361.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur.

Water Rat Hydromys chrysogaster

<u>Status and Distribution</u>: Listed as Priority 4 by DPaW. 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).

<u>Habitat</u>: 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: No suitable habitat.

<u>Potential impact of development</u>: No impact on this species or its preferred habitat will occur as a consequence of development at the site occurring.

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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.

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