

Basic Fauna and Targeted Black Cockatoo Assessment

Lots 76 and 107 Wattleup Road, Hammond Park

Project No: EP20-085(02)

**Prepared for Qube Hammond Link Pty Ltd
December 2020**

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Executive Summary

Qube Hammond Link Pty Ltd engaged Emerge Associates (Emerge) to undertake a 'basic' fauna assessment and a 'targeted' black cockatoo assessment within Lots 76 and 107 Wattleup Road in Hammond Park.

As part of the assessment a desktop assessment of relevant background information was completed, and a field survey was undertaken on 18 August 2020. During the field survey an assessment was made on the fauna habitat within the site and its suitability to provide habitat for conservation significant fauna. A targeted black cockatoo survey was also undertaken to determine the presence of habitat for threatened black cockatoo species.

Outcomes of the survey include the following:

- A total of 16 native and two non-native fauna species were recorded within the site.
- Two conservation significant fauna species were recorded in the site: *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo, listed as vulnerable under the EPBC Act and in WA) and *Isoodon fusciventer* (quenda, listed as P4 in WA).
- One conservation significant fauna species, *Calyptorhynchus latirostris* (Carnaby's cockatoo, listed as endangered under the EPBC Act and in WA) is considered likely to occur in the site.
- Four conservation significant fauna species are considered to possibly occur in the site: *Lerista lineata* (Perth slider, P3), *Idiosoma sigillatum* (Swan Coastal Plain shield-backed trapdoor spider, P3), *Apus pacificus* (pacific swift, migratory) and *Falco peregrinus* (peregrine falcon, other specially protected species in WA).
- Five fauna habitats were identified within the site of which the **banksia woodland** supports the highest relative values.
- The site occurs within the modeled distribution of Carnaby's cockatoo and forest red-tailed black cockatoo and the modeled breeding range of forest red-tailed black cockatoo.
- The site does not lie within the modelled distribution of Baudin's cockatoo and therefore this species is not considered likely to occur.
- The site contains four black cockatoo habitat trees, of which none contain hollows suitable for breeding species of black cockatoo.
- No evidence of black cockatoo roosting activity was observed within the site and it is considered unlikely that roosting would occur.
- Foraging evidence attributed to forest red-tailed black cockatoo was recorded within the site.
- Potential foraging habitat for Carnaby's cockatoo and forest red-tailed black cockatoo occur within the site, with approximately 4.85 ha of foraging habitat mapped. Of this, 1.25 ha of primary foraging plants for Carnaby's cockatoo and 0.36 ha of primary foraging habitat for forest red-tailed black cockatoo occur. Secondary foraging plants for both species also occur within the mapped foraging habitat.
- The overall black cockatoo habitat quality score for the site was determined to be four (moderate) for Carnaby's cockatoo and forest red-tailed black cockatoo.
- With the exception of the aforementioned species of black cockatoo, the site is likely to be primarily utilised by common and widespread native species without specific habitat requirements.

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
DBCA	Department of Biodiversity, Conservation and Attractions
DPaW	Department of Parks and Wildlife (now DBCA)
DAWE	Department of Agriculture, Water and the Environment
WA Museum	Western Australian Museum

Table A2: Abbreviations – General terms

General terms	
EN	Endangered
EX	Extinct
VU	Vulnerable
MI	Migratory
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>

Table A4: Abbreviations – planning

Planning terms	
CoC	City of Cockburn

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Table A5: Abbreviations – units of measurement

Units of measurement	
DBH	Diameter at breast height
cm	Centimetre
ha	Hectare
km	Kilometre
m	Metre

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1 Introduction

1.1 Project background

Qube Hammond Link Pty Ltd (Qube) intends to develop Lot 76 and 107 Wattleup Road in Hammond Park for residential purposes (referred to herein as the 'site'). The site is located approximately 25 kilometres (km) south of the Perth Central Business District within the City of Cockburn (CoC) and is zoned 'urban' under the *Metropolitan Region Scheme* and 'development' under the *CoC Town Planning Scheme No. 3*.

The site is approximately 8.09 hectares (ha) in size and is bound by residential development under construction to the east, Harry Waring Marsupial Reserve to the north, undeveloped land to the west and Wattleup Road to the south. The location and extent of the site is shown in **Figure 1**.

1.2 Purpose and scope of work

Emerge Associates (Emerge) were engaged by Qube to provide environmental consultancy services to support the planning process for the site. The purpose of this assessment is to provide sufficient information on the fauna values within the site to inform this process, with particular focus on identifying habitat for threatened species of black cockatoo.

The scope of work was specifically to conduct a terrestrial vertebrate fauna assessment to the standard required of a 'basic' fauna survey and a 'targeted' black cockatoo survey in accordance with the Environmental Protection Authority's (EPA's) technical guidance (EPA 2020) and the *Environment Protection and Biodiversity Conservation Act* black cockatoo referral guidelines (DSEWPaC 2012).

As part of this scope of work, the following tasks were undertaken:

- Desktop assessment of relevant background information pertaining to the site and surrounds, including database and literature searches for fauna species.
- Field survey to identify fauna species and fauna habitats within the site, including potential habitat for species of black cockatoo.
- Compilation of a list of fauna species with potential to occur within the site as identified from the desktop assessment and opportunistically recorded as part of the field survey.
- Identification of potential habitat for conservation significant fauna species and an assessment of likelihood of occurrence.
- An assessment of the quality of black cockatoo habitat within the site.
- Mapping of fauna and black cockatoo habitat.
- Documentation of the desktop assessment, survey methodology and results into a report.

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2 Environmental Context

2.1 Climate

Climate has a strong influence on the fauna habitat and species present in a region and a site. The south west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters.

An average of 792.8 millimetres (mm) of rainfall is recorded annually from the Anketell weather station, which is the closest weather station, located approximately 7.3 km from the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Jandakot Aero weather station, which is the nearest temperature recording station approximately 9 km south-east of the site, range from 18.0° C in July to 31.6° C in February, while mean minimum temperatures range from 6.9° C in July and August to 17.2° C in February (BoM 2020).

A total of 480.1 mm of rain was recorded from May to September 2020 prior to the survey, which is approximately 80% of the mean of 598 mm for this period (BOM 2020). Although lower than the mean, this amount of rainfall was considered typical for the winter period.

2.2 Geomorphology and soils

Landform and soils influence fauna habitat and species at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area.

The Swan Coastal Plain is approximately 500 km long and 20 to 30 km wide and is roughly bound by the Indian Ocean to the west and the Darling Scarp to the east. Broadly, the Swan Coastal Plain consists of two sedimentary belts of different origin. Its eastern side has formed from the deposition of alluvial material washed down from the Darling Scarp, while its western side is comprised of three dune systems that run roughly parallel to the Indian Ocean coastline (Seddon 2004). These dune systems, referred to as Quindalup, Spearwood and Bassendean associations, represent a succession of coastal deposition that has occurred since the late Quaternary period (approximately two million years ago) (Kendrick *et al.* 1991) and, as a result, they contain soils at different stages of leaching and formation.

Examination of broad scale soil mapping places the site within the Bassendean association but near the boundary of the Spearwood association (Churchward and McArthur 1980).

Finer scale mapping by (Gozzard 2011) places the site in the Spearwood dunes which was later confirmed during the field survey. The Spearwood association typically consists of a core of limestone overlain by yellow sand which is at an intermediate stage of leaching and formation. The soil types mapped within the site are shown in **Figure 2**.

The site is not known to contain any restricted landforms or unique geological features.

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2.3 Topography

The elevation of the site ranges from 45 metres in relation to the Australian Height Datum (m AHD) on the north eastern portion of the site to 28 m AHD on the south west corner of the site (DoW 2008), as shown in **Figure 2**.

2.4 Hydrology and wetlands

Wetlands include “areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries” (Wetlands Advisory Committee 1977). Many wetlands provide important fauna habitat and support high levels of fauna biodiversity and endemism.

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017d)
- *A Directory of Important Wetlands in Australia* (DBCA 2018).

No Ramsar or listed ‘important wetlands’ are located within the site. The Ramsar listed wetland ‘Forrestdale and Thomsons Lakes’ is located approximately 1.3 km north of the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2020) shows that there are no hydrographic features within the site but some occur within the local area, as shown in **Figure 2**.

The Department of Biodiversity, Conservation and Attractions (DBCA) maintains the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2020) which uses the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period). The dataset also categorises geomorphic wetland features into specific wetland types and management categories to guide land use and conservation. Note that as this dataset was drafted at a regional scale the boundaries of mapped wetland features are often inconsistent with physical wetland boundaries.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset (DBCA 2020) indicated that no geomorphic wetlands occur within the site. Two small unnamed wetlands occur to the west of the site (conservation category and multiple use category), a series of wetlands occur to the north of the site within Bush Forever Site 392 (including conservation category Banganup Swamp). Wattleup Lake (resource enhancement category) occurs to the south-west of the site.

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2.5 Regional vegetation

Vegetation types and resulting fauna habitats strongly influence the diversity and composition of fauna taxa present within an area. Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides the Swan Coastal Plain into two floristic subregions (Environment Australia 2000). The site is contained within the 'SWA02' or Perth subregion, which is characterised as mainly containing *Banksia* low woodland on leached sands with *Melaleuca* swamps where ill-drained; and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990). This subregion is recognised as a biodiversity hotspot and contains a wide variety of endemic fauna species.

Variations in native vegetation within the site can be further classified based on regional vegetation associations. Heddle *et al.* (1980) mapping shows the site as comprising the 'Bassendean central and south complex', which is described as vegetation ranging from woodland of *Eucalyptus marginata* - *Allocasuarina fraseriana* - *Banksia* spp. to low woodland of *Melaleuca* spp. and sedgeland on the moister sites. More recent Beard *et al.* (2013) mapping shows the site comprises vegetation association 'Spearwood 6'. This association is described as 'medium woodland; tuart and jarrah' (Beard *et al.* 2013).

2.6 Historic land use

Review of historical images available from 1965 (WALIA 2016) onwards shows that Lot 107 and the southern portion of Lot 76 were completely cleared of remnant vegetation between 1965 and 1974, for grazing and agricultural (market garden and orchard) purposes. Vegetation subsequently re-establish within portions of Lot 107 from 1985. The northern portion of Lot 76 does not appear to have ever been cleared and supports native remnant vegetation.

2.7 Significant fauna

2.7.1 Threatened fauna species

Certain fauna taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, fauna taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia fauna species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). It is an offence to 'take' or 'disturb' threatened fauna without Ministerial approval.

Threatened fauna species listed under the EPBC Act and/or BC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Further information on threatened species and their categories is provided in **Appendix A**.

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2.7.1.1 Black cockatoos

Three threatened species of black cockatoo occur on the Swan Coastal Plain (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories:

- Black cockatoos nest in hollows that form in trees which are usually more than ~200 years old. 'Breeding habitat' is therefore described as 'habitat trees' which are trees of a species known to support black cockatoo breeding and which either have a suitably large enough nest hollow or have a large enough diameter at breast height (DBH) to indicate that a suitable nest hollow could develop in time (DSEWPaC 2012). A minimum DBH for a habitat trees is defined as ≥ 50 centimetres (cm) for most tree species used by black cockatoos and ≥ 30 cm for *Eucalyptus wandoo* (wandoo) and *Eucalyptus salmonophloia* (salmon gum) (DSEWPaC 2012). Breeding habitat is also generally expected to be located within 7 km of food and water resources (Saunders 1990).
- 'Roosting habitat' consists of groups or individual tall trees that are used by black cockatoos for roosting during the day or overnight. Roosts generally comprise the tallest trees in an area and can include native and non-native trees (DSEWPaC 2012). Roosts are often located within 6 km of water and food resources, with additional foraging ranges within 12 km (Shah 2006; DSEWPaC 2012; Le Roux 2017). The use of a particular roost site may vary depending on availability of food and water resources.
- Black cockatoos feed on the fruit and seeds of a range of native and non-native plants species. 'Foraging habitat' is therefore vegetation that contains plant species known to be foraged on by black cockatoos.

Each black cockatoo species has a defined breeding season, with Baudin's cockatoo breeding from August/September to February/March and Carnaby's cockatoo breeding from July/August to January/February (DSEWPaC 2012). Forest red-tailed black cockatoo breeds in October/November but may breed in March/April if there is good autumn rainfall (DSEWPaC 2012). There is also evidence that forest red-tail black cockatoos breed throughout the year, with peaks in April – June and August – October (Johnstone *et al.* 2013).

Publicly available regional datasets relating to black cockatoo distribution, records and extent of habitat types were reviewed in relation to the site and surrounding area, as summarised in **Table 1**, **Table 2** and **Table 3** and shown in **Figure 3**.

Detailed information on each dataset considered as part of the desktop review is provided in **Appendix A**.

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Table 1: Summary of black cockatoo background review

Category		Site context	Source
Species distribution		<ul style="list-style-type: none"> Site is located outside of the extent of the modelled distribution and predicted breeding range of Baudin's cockatoo. Site is within the modelled distribution of Carnaby's cockatoo, but not within its predicted breeding range. Site is within the modelled distribution for forest red-tailed black cockatoo and within its known breeding range. 	(DoEE 2016a, c, b)
Breeding sites		<ul style="list-style-type: none"> No nesting records occur within the site. 2 confirmed forest red-tailed black cockatoo nesting locations occur within 12 km of the site. These are two artificial hollows, where breeding was last recorded in 2013. 	BirdLife Australia database search (2020)
Carnaby's cockatoo breeding areas (12 km radius surrounding breeding sites)		<ul style="list-style-type: none"> No confirmed breeding areas intersect the site. No possible breeding areas intersect the site. 	(Glossop <i>et al.</i> 2011)
Important bird areas for Carnaby's cockatoo		<ul style="list-style-type: none"> None within the site. None within 12 km of the site. 	DPaW (2013)
Roost site		<ul style="list-style-type: none"> None within the site. 33 roost sites within 12 km of the site (see Table 2 and Table 3): <ul style="list-style-type: none"> 19 associated with white-tailed[^] black cockatoos. 6 associated with forest red-tailed black cockatoos. 8 associated with white[^] and red-tailed black cockatoos. 	BirdLife Australia database search (2020)
Foraging habitat	White-tailed black cockatoo [^]	<ul style="list-style-type: none"> Potential native foraging habitat mapped within the northern portion of the site. Extensive areas of potential native foraging habitat mapped within the wider local area of the site, particularly within Bush Forever Site 392 to the north of the site. 	(Emerge Associates 2020a)
	White-tailed black cockatoo [^]	<ul style="list-style-type: none"> No pine plantations mapped within the site or within 12 km. 	Forest Products Commission (2017)
	Forest red-tailed black cockatoo	<ul style="list-style-type: none"> Potential native foraging habitat mapped within the northern and eastern portions of the site. Extensive areas of potential native foraging habitat mapped within the wider local area of the site, particularly within Bush Forever Site 392 to the north of the site. 	(Emerge Associates 2020b)

[^]Carnaby's and/or Baudin's cockatoo

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Table 2: Number of white-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020)

Roost ID	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ARMFORR001	NS	NS	NS	0	0	18	0	0	NS	0
ARMHARR001	NS	0	0	NS	0	1	3	0	0	0
COCBANR001	NS	NS	NS	NS	NS	45	NS	0	20	0
COCBANR002	NS	NS	NS	NS	53	NS	0	0	0	0
COCBANR003	NS	NS	NS	NS	NS	NS	NS	6	16	0
COCCOOR005	NS	NS	NS	NS	NS	NS	NS	38	0	0
COCHAMR001	0	169	215	0	168	68	101	0	0	0
COCHAMR002	NS	NS	NS	NS	NS	263	194	0	369	506
COCMUNR003	NS	NS	NS	NS	NS	NS	0	0	0	3
COCSPER001	0	2	NS	323	NS	0	0	40	0	NS
COCSPER002	NS	5	0	NS	NS	0	24	0	NS	NS
KWICASR001	2	NS	NS	0	19	NS	NS	0	59	0
KWIWANR001	63	0	0	1	0	0	0	0	0	NS
KWIWANR002	NS	NS	NS	0	0	0	0	5	0	0
KWIWANR004	NS	NS	NS	NS	NS	NS	NS	73	0	0
KWIWELR001	NS	NS	15	50	0	62	0	0	4	40
KWIWELR002	NS	NS	NS	NS	NS	NS	NS	NS	4	133
MELKARR002	0	0	0	NS	0	55	0	0	0	0
MELLEER001	0	0	12	0	70	0	0	0	15	2

NS = not surveyed

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Table 3: Number of forest red-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020)

Roost ID	Year					
	2014	2015	2016	2017	2018	2019
COCBANR001	NS	0	NS	6	17	0
COCBANR002	3	NS	32	24	109	15
COCCOCR001	NS	NS	NS	NS	15	102
COCCOOR001	NS	13	0	0	8	0
COCCOOR003	NS	NS	57	6	71	33
COCMUNR001	92	NS	73	0	365	259
COCMUNR003	NS	NS	38	0	108	0
COCSPER003	NS	NS	NS	35	12	0
KWICASR001	0	NS	NS	75	16	0
KWIWELR001	0	0	9	0	0	0
KWIWELR003	NS	NS	NS	NS	14	0
MELLEER001	0	0	11	25	5	0
MELMURR001	199	33	125	209	441	214
SEROAKR002	NS	NS	NS	4	15	0

NS = not surveyed

2.7.2 Priority fauna species

Fauna species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA *Priority Fauna List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes. Further information on priority species and their categories is provided in **Appendix A**.

2.7.3 Migratory fauna species

Migratory fauna species that migrate to Australia and its external territories or pass through or over Australian waters during their annual migrations are protected under Commonwealth and State legislation. At a Commonwealth level, migratory fauna taxa may be listed as 'migratory' under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval. Further information on migratory species is provided in **Appendix A**.

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2.7.4 Specially protected fauna species

In Western Australia, fauna species that are of special conservation interest, including migratory species, cetaceans, species subject to international agreement or species otherwise in need of special protection may be listed as 'specially protected' under the BC Act. Further information on specially protected species and their categories is provided in **Appendix A**.

2.7.5 Pest fauna species

The term 'pest fauna' can refer to any animal that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Pest fauna species are generally not native, but some Australian or Western Australian fauna may also be considered pests.

A particularly invasive or detrimental pest species may be listed as a 'declared pest' pursuant to Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. Further information on categories of declared pests is provided in **Appendix A**.

2.8 Bush Forever

The Government of Western Australia's *Bush Forever* policy is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of *Bush Forever* is to protect comprehensive representations of all original ecological communities by targeting a minimum of 10% of each vegetation complex for protection (Government of WA 2000). *Bush Forever* sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

No *Bush Forever* sites occur within the site. Bush Forever Site 392 (Harry Waring Marsupial Reserve) is located directly north of the site. This reserve is managed by DBCA and covers an area of over 250 ha. The reserve protects conservation significant marsupials such as the quenda and is surrounded by a 'feral animal proof' perimeter fence. The location of Bush Forever Site 392 associated is shown in **Figure 4**.

2.9 Environmentally sensitive areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding values such as significant wetlands, threatened flora, threatened communities and *Bush Forever* sites. Within an ESA none of the exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* apply.

No ESAs are located within the site. One ESA occurs directly adjacent to the north and west of the site, associated with Bush Forever Site 392 (Harry Waring Marsupial Reserve) and three nearby wetlands including Wattleup Lake. The location of these ESAs is shown in **Figure 4**.

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2.10 DBCA managed or legislated lands

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2017a) and *Lands of Interest* (DBCA 2017b) datasets. The *Legislated Lands and Waters* (DBCA 2017a) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), Swan and Canning Rivers Management Act 2006 (SCRM Act) and lands identified under the Land Administration Act 1997 (LA Act). The *Lands of Interest* (DBCA 2017b) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Lands as the responsible agency.

Bush Forever Site 392 (Harry Waring Marsupial Reserve) incorporates three areas denoted as DBCA legislated lands and waters. R15556 and R29241 are nature reserves and R48291 is a conservation park under the CALM Act 1984 (DBCA 2017a). Location of these DBCA managed reserves are shown on **Figure 4**.

2.11 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The movement of fauna and the exchange of genetic material between vegetation remnants improve the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). This study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

One ecological linkage (number 50) from the Perth Biodiversity Project (WALGA and PBP 2004) occurs in a small portion of the north eastern corner of the site. One additional ecological linkage (number 49) occurs approximately 500 m north-east of the site. These ecological linkages connect areas of *Bush Forever* and intact vegetation located in the wider local area. The location of these linkages are shown in **Figure 4**.

2.12 Previous surveys

A fauna survey was previously completed within Lot 107 in 2016 (Harewood 2016). During this survey broad scale mapping of fauna habitat types and black cockatoo breeding habitat was completed. No fauna surveys of Lot 76 are known to have been undertaken.

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3 Methods

3.1 Desktop assessment

A search was conducted for fauna species that have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020a), *NatureMap* (DBCA 2020), DBCA's conservation significant fauna database (reference no. FAUNA6416), previous surveys and literature references.

3.2 Field survey

An ecologist from Emerge visited the site on the 18 August 2020 during the day to conduct the basic fauna survey and targeted black cockatoo field survey. The survey was conducted from approximately 10:30 AM until 3:30 PM.

The weather conditions during the survey were cool and wet with temperatures ranging from a minimum of 12.4°C to maximum of 16.1°C with 5.4 mm of rainfall according to the Jandakot Aero weather station.

3.2.1 Basic fauna

Transects were traversed across the site, during the day, and the characteristics of fauna habitat and presence of fauna species was recorded. Microhabitats such as logs, rocks and leaf litter were investigated and secondary evidence of species presence such as tracks, scats, skeletal remains, foraging evidence or calls was also noted.

An opportunistic fauna species list was compiled, and fauna habitat values were described, with particular reference to conservation significant fauna species with potential to occur within the site.

3.2.2 Targeted black cockatoo

Transects were traversed across the site and the presence of potential black cockatoo breeding, night roosting and foraging habitat was recorded. If observed, the presence of black cockatoos within or near the site was noted. Active searches for secondary evidence of breeding, roosting and foraging activity such as chew marks, branch clippings, droppings, moulted feathers and chewed marri or banksia fruit were conducted.

3.2.2.1 Breeding habitat

A 'habitat tree' was defined as a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum, with a DBH ≥ 50 cm or DBH ≥ 30 cm for wandoo or salmon gum. As any tree that has a suitable hollow may provide breeding habitat for black cockatoos, other tree species were also considered to be habitat trees if they contained a suitable hollow.

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To be suitable for use as breeding habitat by black cockatoos it was considered a hollow must:

- have an entrance opening of at least 10 cm but preferably 20-30 cm (Saunders *et al.* 1982; Groom 2010; Johnstone *et al.* 2013) (Groom 2010; Saunders *et al.* 1982; Johnstone *et al.* 2013)
- be located at least 3 m from the ground (Saunders 1979b; Johnstone and Storr 1998; Groom 2010; Saunders 2014)
- be located in a trunk or branch that is generally large enough to contain a hollow that has a floor diameter of at least 40 cm and depth of 50-200 cm such that it could house an adult black cockatoo and nestlings (Saunders 1979a; Johnstone and Storr 1998; Saunders 2014; DPaW 2015)
- have vertical or near vertical orientation (Johnstone and Kirkby 2008; Johnstone *et al.* 2013).

Occasionally, native eucalypts were encountered that met DBH requirements but did not contain a trunk/branch of a sufficient size to support a hollow suitable for use by black cockatoos. For example, the tree may have been less than 3 m tall or had a trunk that forked between 1.3 m and 3 m in height and after the fork no limbs had a diameter such that they could contain a suitable hollow. These trees were not recorded as habitat trees as the likelihood they would ever form a suitable hollow was low.

Habitat trees were individually identified, tagged and the attributes outlined in **Table 4** were recorded for each tree.

Table 4: Attributes recorded for each habitat tree in the site

Attribute	Description
Tag	Unique identifier on a metal tag was nailed to each habitat tree
Image	Each habitat tree was individually photographed
GPS location	The location of each habitat tree was recorded using a handheld GPS unit
Tree species	Species and common name were identified
Diameter at breast height (DBH) (cm)	DBH was measured at breast height (1.3 metres) using a diameter tape
Hollows potentially suitable for breeding by a black cockatoo	Number of hollows potentially suitable for breeding by a black cockatoo (assessed from ground level only)

Hollows that appeared potentially suitable for use by a black cockatoo from the ground were further inspected using a drone and/or a pole-mounted camera. During the hollow inspection the internal dimensions of the hollow were confirmed, if possible, and an assessment was made for signs of use such as chew marks around the hollow entrance, nesting material, feathers or the presence of birds within the hollow.

All recorded habitat trees were assigned to a category listed in **Table 5**.

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Table 5: Habitat tree categories

Category	Specifications
Nest	The tree contains a hollow used by black cockatoos for breeding as confirmed by records of black cockatoos, their eggs or fledglings or other evidence of recent nesting activity by black cockatoos
Potential nest	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection [^] and evidence of use by an unidentified bird such as feathers, chew marks or nest material has been recorded within a hollow
Suitable hollow(s)	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection [^]
Potentially suitable hollow(s)	The tree contains or is suspected to contain one or more hollows that have the potential to be suitable for use by black cockatoos when either viewed from the ground or following an internal hollow inspection that was inconclusive [^]
No suitable hollow(s)	The tree does not contain hollow(s) that have the potential to be suitable for use by black cockatoos when viewed from the ground <u>or</u> contains hollows that were determined to be unsuitable for use by black cockatoos by internal inspection [^]

[^]Hollow determined to be suitable for use as breeding habitat by black cockatoos as listed above in **Section 3.1.1**.

3.2.2.2 Roosting habitat

The site was assessed for the presence of active or historical roosts and its potential to provide roosting habitat for black cockatoos. Groups of large native and non-native trees were generally assumed to provide potential roosting habitat.

No disk roost survey was undertaken but the site was searched for secondary evidence of roosting activity, such as branch clippings, droppings or moulted feathers.

3.2.2.3 Foraging habitat

Foraging habitat was identified by comparing the literature on plant species known to be foraged upon by black cockatoos (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Groom 2011; Johnstone *et al.* 2011; DSEWPaC 2012) against the vegetation within the site.

Foraging habitat was then further classified as primary or secondary foraging habitat. Primary foraging plants were defined as those with historical and contemporary records of regular consumption by black cockatoos. Secondary foraging plants were defined as plants that black cockatoos have been recorded consuming occasionally or that, based on their limited extent or agricultural origin, should not be considered a sustaining resource. Each patch of foraging habitat was assigned a percentage cover of primary and secondary foraging plants. Where plants that had no foraging value occurred amongst foraging plants, they were also assigned a cover value if practicable. A list of plant species classified as primary or secondary foraging plants is provided as **Appendix B**.

Secondary evidence of black cockatoo foraging, such as chewed marri, jarrah, tuart or banksia fruits, was searched for within the site and allocated to a species where possible. The locations of black cockatoo foraging evidence within the site were mapped using a hand-held GPS unit.

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3.3 Data analysis, presentation and mapping

3.3.1 Fauna habitat

Fauna habitats were described according to the dominant flora species and vegetation type present, as determined from observations made during the field survey and information provided in the 'Spring Flora and Vegetation Assessment' (Emerge Associates 2020c). The identified fauna habitats were mapped on aerial photography with the boundaries interpreted from aerial photography, the plant communities previously identified in Emerge Associates (2020c) and notes taken in the field.

3.3.2 Potential to occur

A total number of species with potential to occur within the site was determined from the results of the desktop assessment.

The habitat requirements of conservation significant vertebrate fauna were specifically reviewed to ensure that any conservation significant fauna species included in the count legitimately had potential to occur within the site or wider area.

3.3.3 Likelihood of occurrence

Information on habitat preferences and distribution of conservation significant fauna species with potential occur within the site or wider area was reviewed and assessed against the general site conditions and fauna habitat types recorded during the field survey.

Based on the results of the desktop assessment and information recorded during the field survey, an assessment of the likelihood of occurrence of conservation significant fauna within the site was undertaken using the categories outlined in **Table 6**.

Table 6: Likelihood of occurrence assessment categories and definitions

Likelihood	Definition
Recorded	The species was recorded during the current field survey or during previous field surveys.
Likely	The site contains suitable habitat for the species and it is likely the species may occur based on presence of a recent historical record within or close to the site.
Possible	The site contains habitat of at least marginal quality and/or extent for the species and the site is located within the known distribution range of the species which is supported by recent literature records from near the site.
Unlikely	The site contains no or marginal habitat for the species and/or no recent literature records occur near the site.

3.3.4 Black cockatoo habitat

Habitat trees were classified according to the scheme outlined in **Table 5** and mapped on aerial imagery. A complete summary of the recorded attributes of habitat trees was compiled in a tabular format.

Foraging habitat was mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field.

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Foraging habitat was described according to the dominant flora species and vegetation type present, as determined from observations made during the field survey. Primary and secondary foraging habitat was mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field. Patches of vegetation comprising a combination of primary and secondary foraging plants were mapped as 'mixed' foraging habitat. As it was not always possible to separate non-foraging plants from foraging plants, some of the mapped foraging habitat may also include a proportion of non-foraging plant species.

3.3.4.1 Overall black cockatoo habitat quality

As part of environmental impact assessment and offset calculation, the Department of Agriculture, Water and the Environment (DAWE) requires that a score out of ten is provided for the overall quality of black cockatoo habitat (DAWE 2020). DAWE does not provide a methodology for scoring habitat quality but instead specifies that an assessment of quality should be undertaken by an experienced technical expert (DSEWPac 2012).

Emerge have developed a method to provide a systematic assessment of overall black cockatoo habitat quality. The method assesses and scores the quality of breeding, roosting and foraging habitat separately and then provides an overall quality score out of ten based on the highest score determined for the respective habitat categories. The assessment methodology is detailed in **Appendix C**.

3.4 Nomenclature and sources of information

Taxonomy and nomenclature of scientific and common names for fauna species follow the *Western Australian Museum (WAM) Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2020). This is contrary to the recent EPA (2020) advice to follow the *Australian Faunal Directory* (DAWE 2020b) nomenclature for birds. Nomenclature may be adapted once the EPA (2020) technical guidance is further established and generally accepted within the professional community. Where common names were not provided by Western Australian Museum (2019); (WAM 2020), these have been derived from other sources.

Literature listed in **Appendix A** represent the main publications used to identify fauna species and habitats within the site.

3.5 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA's document *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) is provided in **Table 7**.

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Table 7: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)

Constraint	Degree of limitation	Details
Level of survey	No limitation	A basic survey (desktop study and field survey) in combination with a targeted black cockatoo survey was undertaken. The level of survey and survey effort are considered adequate to assess the fauna and black cockatoo habitat values within the site.
Scope	No limitation	The survey focused on vertebrate fauna and habitat values, with particular focus on black cockatoos and other conservation significant taxa with potential to occur within the site. Consideration of invertebrate fauna species was limited to those of conservation significance listed in <i>Protected Matters Search Tool</i> (DAWE 2020) and <i>NatureMap</i> (DFCA 2020). The basic scope of this fauna assessment did not include the application of search methods, sampling or identification information techniques or expertise required to detect invertebrate fauna within the site.
Proportion of fauna identified, recorded and/or collected.	No limitation	All observed vertebrate fauna were identified. No reptiles were observed within the site. It is likely that reptiles are present within the site but not detected due to typically low activity during cold weather.
Sources of information e.g., previously available information (whether historic or recent) as distinct from new data.	No limitation	Adequate information was available from database searches and previous surveys. The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is of limited value and relies heavily on technical experts preparing their own assessment methodology.
The proportion of the task achieved and further work which might be needed.	No limitation	The task was achieved in its entirety.
Experience level of personnel	No limitation	This fauna assessment was undertaken by a qualified ecologist with three-years' experience conducting fauna assessment and targeted black cockatoo assessment in south west Western Australia. Technical review was undertaken by a principal environmental consultant with 18 years' experience in environmental science in Western Australia.
Suitability of timing, weather and season	Minor limitation	Survey timing is not considered to be of great importance for basic fauna assessments. Nonetheless, day time survey limits the ability to detect nocturnal species. The cold seasonal conditions during the field survey likely reduced the detectability of some fauna classes such as reptiles. Regarding foraging activity, many of the jarrah and banksia trees within the site were not fruiting at the time of the survey. It is expected that more foraging evidence would have been recorded if the survey was undertaken when the jarrah and banksia trees were fruiting.
Completeness	No limitation	The desktop assessment, field survey and targeted black cockatoo components of the survey were completed comprehensively.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	All parts of the site could be accessed as required.
Survey intensity	No limitation	The intensity of the survey was adequate given the size of the site and the relatively low habitat value present.

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Table 7: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020) (continued)

Constraint	Degree of limitation	Details
Influence of disturbance	No limitation	The majority of the site is highly modified due to historical disturbance. However, no recent disturbance was noted that may have affected outcomes of the survey.
Adequacy of resources	No limitation	All resources required to perform the survey were available. The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is limited and relies heavily on technical experts preparing their own methodology. This assessment applies an internally developed methodology that is considered to provide a systematic and balanced characterisation of black cockatoo habitat.
Compliance with EPA (2020) guidance	Minor limitation	The EPA guidance requires that a full list of all fauna species with potential to occur within the site is compiled. As part of this assessment a comprehensive list of fauna species of conservation significance was compiled. Non-conservation taxa with potential to occur within the site were not compiled into a list but are provided as raw data in Appendix D . Given that all species with potential to occur within the site are still identified within the relevant appendices this is not considered to affect the outcomes of this assessment. The EPA guidance recommends that <i>the Australian Faunal Directory</i> (DAWE 2020b) nomenclature is used for bird species. This assessment uses the <i>WAM Checklist of the Terrestrial Vertebrate Fauna of Western Australia</i> (WAM 2020) nomenclature for birds and therefore does not strictly comply.

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4 Results

4.1 General site conditions

The site has a south-east facing aspect and gentle slope (5 - 15°). Surface soils are grey-brown and sandy with no rock cover. Native vegetation occurs in the northern half of Lot 76 and northern and south-west portion of Lot 107. The remaining areas are open and largely devoid of native vegetation. The southern half of Lot 76 is currently used as a residence and orchard.

4.2 Fauna habitat

Five fauna habitats were identified within the site: '**banksia woodland**', '**grassland**', '**orchard**', '**scattered native and non-native trees and shrubs**' and '**vineyard**'.

The highest fauna habitat values within the site are associated with the **banksia woodland** habitat. In particular, where this vegetation remains in good¹ or better condition, it provides a cover of native trees and shrubs, dense ground cover and contains microhabitats such as logs, rocks and leaf litter.

Historical disturbance has significantly compromised habitat values within most of the southern portion of the site which currently supports predominantly non-native vegetation.

A description and the area of each habitat is provided in **Table 8** and representative photographs of each are provided in **Plate 1** to **Plate 5**. The location of each habitat is shown on **Figure 5**.

Table 8: Fauna habitats identified within the site.

Fauna habitat classification	Description	Area (ha)
Banksia woodland	Low woodland of occasional <i>Eucalyptus marginata</i> trees over scattered <i>Allocasuarina fraseriana</i> over <i>Banksia attenuata</i> and <i>Banksia menziesii</i> over open shrubland of <i>Jacksonia sternbergiana</i> , <i>Macrozamia riedlei</i> and <i>Xanthorrhoea preissii</i> over low shrubland of <i>Hibbertia hypericoides</i> , <i>Stirlingia latifolia</i> and open sedgeland of <i>Mesomelaena pseudostygia</i> and occasional introduced pasture weeds (Plate 1).	4.80
Grassland	Disturbed areas comprising closed grassland non-native grasses such as <i>*Eragrostis curvula</i> and <i>*Ehrharta</i> spp. and herbland non-native species such as <i>*Arctotheca calendula</i> and <i>*Lupinus</i> sp. (Plate 2).	2.60
Orchard	Planted fruit trees such as <i>*Ficus carica</i> (fig), <i>*Mangifera indica</i> (mango), <i>*Malus domestica</i> (apple) and <i>*Citrus</i> spp. (citrus). over non-native grassland (Plate 3).	0.15
Scattered native and non-native trees and shrubs	Scattered individuals or small patches of native or non-native trees and shrubs, including <i>Eucalyptus marginata</i> , <i>*Eucalyptus camaldulensis</i> , <i>*Syzygium smithii</i> (common lilly pilly) and <i>*Olea europaea</i> (olive) (Plate 4).	0.34
Vineyard	Planted rows of <i>*Vitis vinifera</i> (grape vine) over non-native grass/herbland (Plate 5).	0.20

¹ Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

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Plate 1: Banksia woodland



Plate 2: Grassland

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Plate 3: Orchard



Plate 4: Scattered native and non-native trees and shrubs

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Plate 5: Vineyard

4.3 Fauna

4.3.1 Desktop assessment

A total number of 508 fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site² as listed in **Appendix D**.

Of these species, 99 are conservation significant, including 41 threatened, 15 priority, 41 migratory fauna and two other specially protected species as listed in **Appendix E**.

4.3.2 Species inventory

A total of 16 native and two introduced fauna species were directly or indirectly recorded during the field survey. This includes two species of conservation significance as detailed in **Section 4.3.3**.

A complete species list is provided in **Appendix F**.

4.3.3 Conservation significant fauna

Of the 16 native fauna species recorded, two are of conservation significance: *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo, listed as vulnerable under the EPBC Act) and *Isoodon fusciventer* (quenda, listed as P4 in WA). Foraging evidence (chewed fruit) of forest red-tailed black cockatoo and quenda diggings were recorded in the site. Detailed information on black cockatoo habitat within the site is provided in **Section 4.4**.

² Includes native and non-native species

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Based on habitat requirements, species distribution and site conditions, one conservation significant fauna species was considered likely to occur in the site and four conservation significant fauna species were considered to possibly occur in the site, as shown in **Table 9**.

The remainder of the conservation significant fauna species identified in the desktop assessment are considered 'unlikely' to occur in the site due to lack of suitable habitat or because the site lies outside of the species known distribution. Fauna species classed as unlikely to occur are listed in **Appendix F**³.

Table 9: Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		BC Act	EPBC Act		
Birds					
<i>Apus pacificus</i>	Pacific swift	MI	MI	Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Johnstone and Storr 1998).	Possible: May opportunistically occur in or fly over the site on commute or while searching for prey.
<i>Calyptorhynchus banksii naso</i>	Forest red-tailed black cockatoo	VU	VU	Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding <i>Corymbia calophylla</i> , <i>Eucalyptus marginata</i> , introduced <i>Melia azedarach</i> and <i>Eucalyptus</i> spp. trees (Johnstone and Storr 1998).	Recorded: Foraging and breeding habitat present.
<i>Calyptorhynchus latirostris</i>	Carnaby's cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of <i>Pinus</i> spp. Attracted to seeding <i>Banksia</i> spp., <i>Dryandra</i> spp., <i>Hakea</i> spp., <i>Eucalyptus</i> spp., <i>Corymbia calophylla</i> , <i>Grevillea</i> spp., and <i>Allocasuarina</i> spp. (Johnstone and Storr 1998).	Likely: Foraging and breeding habitat present.

³ Fauna species with no potential to occur within the site (e.g. marine mammals and marine fish) were excluded from this list.

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Table 9: Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		BC Act	EPBC Act		
<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Possible: May opportunistically occur in or fly over the site on commute or while searching for prey
Mammals					
<i>Isodon fusciventer</i>	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012).	Recorded: Suitable habitat occurs within the site, particularly within the banksia woodland and grassland habitats
Reptiles					
<i>Lerista lineata</i>	Perth slider	P3	-	Sandy coastal heath and low scrubland. <i>Banksia</i> spp. woodland, <i>Eucalyptus gomphocephala</i> open woodland over deep sands, and coastal dunes immediately adjacent to the beach.	Possible: May utilise the remnant banksia woodland habitat.
Invertebrates					
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	-	Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003).	Possible: Limited habitat information but site occurs on sandy soils.

4.3.1 Declared pests

Two species, listed as a declared pests (C3) pursuant to the BAM Act, *Oryctolagus cuniculus* (rabbit) and *Vulpes vulpes* (fox), were recorded within the site. These species were both identified from secondary evidence (scats).

4.4 Black cockatoos

Indirect evidence (chewed fruits) of forest red-tailed black were recorded within the site. No evidence of Carnaby's cockatoo was recorded. Note that Baudin's cockatoo is not considered in this section as the site lies outside of their distribution (refer **Section 2.7.1.1**).

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4.4.1 Habitat

4.4.1.1 Breeding

Four black cockatoo habitat trees were recorded within the site as shown in **Figure 6**. The habitat trees were all *Eucalyptus marginata* (jarrah). None of the habitat trees present within the site contain hollows that are suitable for use for breeding by black cockatoos. No internal hollow inspection was undertaken as any small hollows present could be identified as unsuitable from the ground.

A summary of the habitat trees recorded within the site is provided in **Table 10** and an inventory in **Appendix G**.

Table 10: Habitat trees recorded within the site

Category	No. trees	No. suitable hollows
Confirmed nest	0	0
Potential nest	0	0
Suitable hollow(s)	0	0
Potentially suitable hollow(s)	0	0
No suitable hollow(s)	4	0
Total	0	0

4.4.1.2 Roosting

No dusk roost survey was undertaken within the site. No evidence of roosting, such as droppings, moulted feathers or branch clippings were observed within the site during the field survey.

Native and non-native trees within the site have the potential to provide roosting habitat for black cockatoos.

4.4.1.3 Foraging

Foraging evidence attributed to black cockatoos was recorded in multiple locations within the site but primarily within the banksia woodland habitat. However, foraging evidence was scattered and less than expected was recorded, considering the presence of many primary foraging species. All of the foraging evidence recorded was attributed to forest red-tailed black cockatoo. No black cockatoos were observed foraging within the site during the field survey.

The primary black cockatoo foraging habitat within the site consists of jarrah and, to a lesser extent, banksia and sheoak trees. Jarrah is classified as primary foraging habitat for both Carnaby's and forest red-tailed black cockatoo and banksia is primary foraging habitat for Carnaby's cockatoo. Sheoak is classified as secondary foraging habitat. A summary of foraging habitat within the site is provided in **Table 11**.

Other plants which may comprise secondary foraging habitat also occur in the site as scattered trees. These plants were not considered separately as very few individuals are present.

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Table 11: Dominant primary and secondary black cockatoo foraging plants recorded within the site

Common name	Foraging habitat category and black cockatoo species	
	Carnaby's	Forest red-tailed
Jarrah	Primary	Primary
Banksia	Primary	-
Sheoak	-	Secondary

Approximately 4.85 ha of foraging habitat was mapped within the site. This comprises 1.25 ha of primary foraging plants for Carnaby's cockatoo and 0.36 ha of foraging habitat for forest red-tailed black cockatoo. Secondary foraging plants also occur within the mapped foraging habitat but the majority of the area comprises non-foraging plants as outlined in **Table 12**. The location of foraging habitat is shown in **Figure 7** and **Figure 8**.

Table 12: Proportion of primary, secondary and non-foraging plants within patches of foraging habitat

	Area of foraging habitat category and black cockatoo species	
	Carnaby's	Forest red-tailed
Primary foraging plants	1.25	0.36
Secondary foraging plants	0.32	0.63
Non-foraging plants	3.11	3.63
Total	4.68	4.62

4.4.1.4 Overall quality

The outcome of the overall black cockatoo habitat quality assessment is provided in **Table 13** and summarised in **Table 14**. The site was determined to have an overall habitat score of 4 (moderate) for both Carnaby's cockatoo and forest red-tailed black cockatoo, out of a maximum possible score of 10.

The full results of the quality assessment are provided in **Appendix H**.

Table 13: Habitat quality assessment scores

Habitat category	Score	
	Carnaby's	Forest red-tailed
Breeding	4	4
Roosting	2	2
Foraging	3	3
Overall Score	4 (moderate)	4 (moderate)

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Table 14: Summary of attributes contributing to black cockatoo habitat quality scores

Habitat category	Quality component category	Attributes and black cockatoo species	
		Carnaby's	Forest red-tailed
Breeding	Site condition	The site supports habitat trees without suitable hollows.	The site supports habitat trees without suitable hollows.
	Site context	No confirmed Carnaby's nest tree occurs within 6 km of the site and 3,395 ha of potential Carnaby's cockatoo foraging habitat is mapped within 6 km of the site.	No confirmed forest-red-tailed nest tree occurs within 6 km of the site and 3,361 ha of potential forest red-tailed black cockatoo foraging habitat is mapped within 6 km of the site.
	Species stocking rate	N/A – no evidence of breeding was recorded within the site.	N/A – no evidence of breeding was recorded within the site.
Roosting	Site condition	The site supports potential roosting habitat.	The site supports potential roosting habitat.
	Site context	No roosts are located within 1 km of the site.	No roosts are located within 1 km of the site.
	Species stocking rate	N/A - no evidence of roosting was recorded within the site.	N/A - no evidence of roosting was recorded within the site.
Foraging	Site condition	The site supports foraging habitat that is proportionally of 27% primary foraging plants.	The site supports foraging habitat that is proportionally of 8% primary foraging plants.
	Site context	No roosts are located within 1 km of the site. No current or historic nests are location with 12 km of the site.	No roosts are located within 1 km of the site. Historic nest(s) are located within 12 km of the site.
	Species stocking rate	No evidence of Carnaby's cockatoo was recorded within the site.	Limited secondary evidence of forest red-tailed black cockatoo foraging was observed in the site.

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5 Discussion

5.1 Fauna and fauna habitat values

The 15 native and two non-native fauna opportunistically recorded within the site are all generally common and widespread species across the Swan Coastal Plain. The relatively low number of fauna species recorded can likely be attributed to the small size of the site and the cool weather conditions during the field survey. In addition, some species may have been undetectable because they are nocturnal.

Habitat value is greatest with respect to **banksia woodland**, as well as, scattered native trees within the site that likely provide value to a range of native species including some that are conservation significant, such as species of black cockatoo (further discussed in **Section 5.3** below). However, the extent of **banksia woodland** vegetation within the site is relatively small (4.80 ha) compared to that in the local area. The **banksia woodland** vegetation has also been subject to historical disturbance and was once part of a larger patch which has been cleared to the east and west of the site. Nevertheless, the site provides habitat values associated with a banksia woodland ecosystem as well as being suitable for common and widespread species with non-specific habitat requirements.

5.2 Conservation significant fauna

One species of black cockatoo was recorded in the site and another was considered likely to occur (refer **Section 5.3** below). One priority species, quenda (P4), was recorded within the site and is considered likely to use the site as part of a larger home range.

An additional five species of conservation significance have potential to occur in the site. *Apus pacificus* (pacific swift) and *Falco peregrinus* (peregrine falcon) may opportunistically fly over or utilise habitat within the site as part of a much larger home range but the site is not considered to represent core habitat. The banksia woodland within the site may provide habitat for the Perth slider (P3). The documented habitat preferences of the Swan Coastal Plain shield-backed trapdoor spider (P3) are broad and unspecific and therefore it is generally considered this species may occur. Targeted surveys would need to be undertaken to confirm whether these fauna species occur within the site.

5.3 Black cockatoos

Forest red-tailed black cockatoo was recorded within the site and Carnaby's cockatoo are considered likely to occur. This result was anticipated as the site lies within their modelled distributions and the wider local area contains extensive areas of habitat known to be utilised by these species.

5.3.1 Habitat

5.3.1.1 Breeding

None of the four habitat trees recorded within the site contain any hollows suitable for a black cockatoo to build a nest in. Therefore, the site does not currently support breeding habitat for any of

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the three species of black cockatoo. While all of the habitat trees within the site have the potential to form hollows in the future, based on their age, and size, it would likely take many years for hollows to form that are suitable for use by black cockatoos.

5.3.1.2 Roosting

No evidence suggesting that roosting occurs within the site was observed during the field survey and the BirdLife Australia dataset does not include any roost records within the site. Therefore, there is no reason to suspect that roosting occurs within the site. Nevertheless, the site contains tall trees and groups of tall trees that have the potential to provide roosting habitat for black cockatoos.

5.3.1.3 Foraging

Less foraging evidence was recorded than expected, considering the presence of primary foraging species such as jarrah. This may be due to the timing of the survey as the fruit on the foraging species may not have been ripe. However, in the absence of fire or other process, the chewed fruits of jarrah can persist on the soil surface for many years. The lack of foraging evidence was therefore notable but not necessarily evidence that foraging had not been occurring in recent years.

Although approximately 8 ha of foraging habitat was mapped within the site, the majority comprises non-foraging plants (80% for Carnaby's cockatoo and 87% for forest red-tailed black cockatoo). This is because most of the mapped foraging habitat comprises patches of native vegetation with scattered foraging plants such as jarrah and banksia. Since it was not possible to separate the foraging habitat from non-foraging plants they were mapped together.

5.3.1.4 Overall quality

The overall quality of the site was determined to be moderate for Carnaby's cockatoo and forest red-tailed black cockatoo. Both species scored highest for the breeding habitat component due to the presence of habitat trees within the site, albeit without hollows suitable for black cockatoos. The roosting score was consistent between both species and due solely to the presence of potential roosting habitat (tall trees) rather than evidence of roosting within the site or local area. The foraging habitat within the site scored relatively low due to the low proportion of primary foraging plants within the mapped foraging habitat.

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6 Conclusions

6.1 Fauna and fauna habitat

Around half of the site (59%) supports remnant native vegetation with high fauna habitat values. The remainder of the site has been subject to historical disturbance and is dominated by non-native and planted vegetation.

A total of 16 native and two introduced fauna species were recorded within the site, including two conservation significant species, forest red-tailed black cockatoo (vulnerable) and quenda (P4).

One fauna species of conservation significance, Carnaby's cockatoo, was considered likely to occur in the site. An additional four fauna species of conservation significance were considered to have potential to occur within the site, comprising two birds, one reptile and one invertebrate. Targeted surveys would need to be undertaken to confirm whether these species occur within the site.

6.2 Black cockatoos

The site occurs within the modeled distribution of Carnaby's cockatoo and forest red-tailed black cockatoo and the modeled breeding range of forest red-tailed black cockatoo.

Secondary evidence of forest red-tailed black cockatoo was recorded in the site in the form of chewed fruits. No evidence of Carnaby's cockatoos was recorded in the site but this species is considered likely to occur due to the presence of suitable habitat.

Four habitat trees were recorded of which none contain hollows that are suitable for breeding by black cockatoos. Therefore, the site does not currently provide breeding habitat for black cockatoos. Some of the habitat trees are large enough that they may form hollows in the future that provide breeding habitat for forest red-tailed black cockatoo. The site lies outside of the known and predicted breeding range of Carnaby's cockatoo and so the site is not considered to have the potential to provide breeding habitat for this species in the future.

No evidence of black cockatoo roosting activity was observed within the site. Potential roosting habitat for Carnaby's cockatoo and forest red-tailed black cockatoo occurs within the site in the form of large trees.

Foraging evidence attributed to forest red-tailed black cockatoo was recorded within the site. Potential foraging habitat for Carnaby's cockatoo and forest red-tailed black cockatoo occur within the site, with approximately 4.85 ha of foraging habitat mapped. Of this, 1.25 ha of primary foraging plants for Carnaby's cockatoo and 0.36 ha of foraging habitat for forest red-tailed black cockatoo occur. Secondary foraging plants for both species also occur within the mapped foraging habitat.

The overall black cockatoo habitat quality score for the site was determined to be four (moderate) for Carnaby's cockatoo and forest red-tailed black cockatoo.

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Figures



Figure 1: Site Location

Figure 2: Hydrography, Soils and Topography

Figure 3: Black Cockatoo Context

Figure 4: Environmental Features

Figure 5: Fauna Habitat

Figure 6: Black Cockatoo Habitat Trees

Figure 7: Potential Carnaby's Cockatoo Foraging Habitat

Figure 8: Potential Forest Red-tailed Black Cockatoo Foraging Habitat



Figure 1: Site Location

Project: Basic Fauna and Targeted Black Cockatoo Assessment
 Lots 76 and 107 Wattleup Road, Hammond Park
Client: Qube Hammond Link Pty Ltd

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 Drawn: GAR
 Date: 04/12/2020
 Checked: RAW
 Approved: RAW
 Date: 07/12/2020

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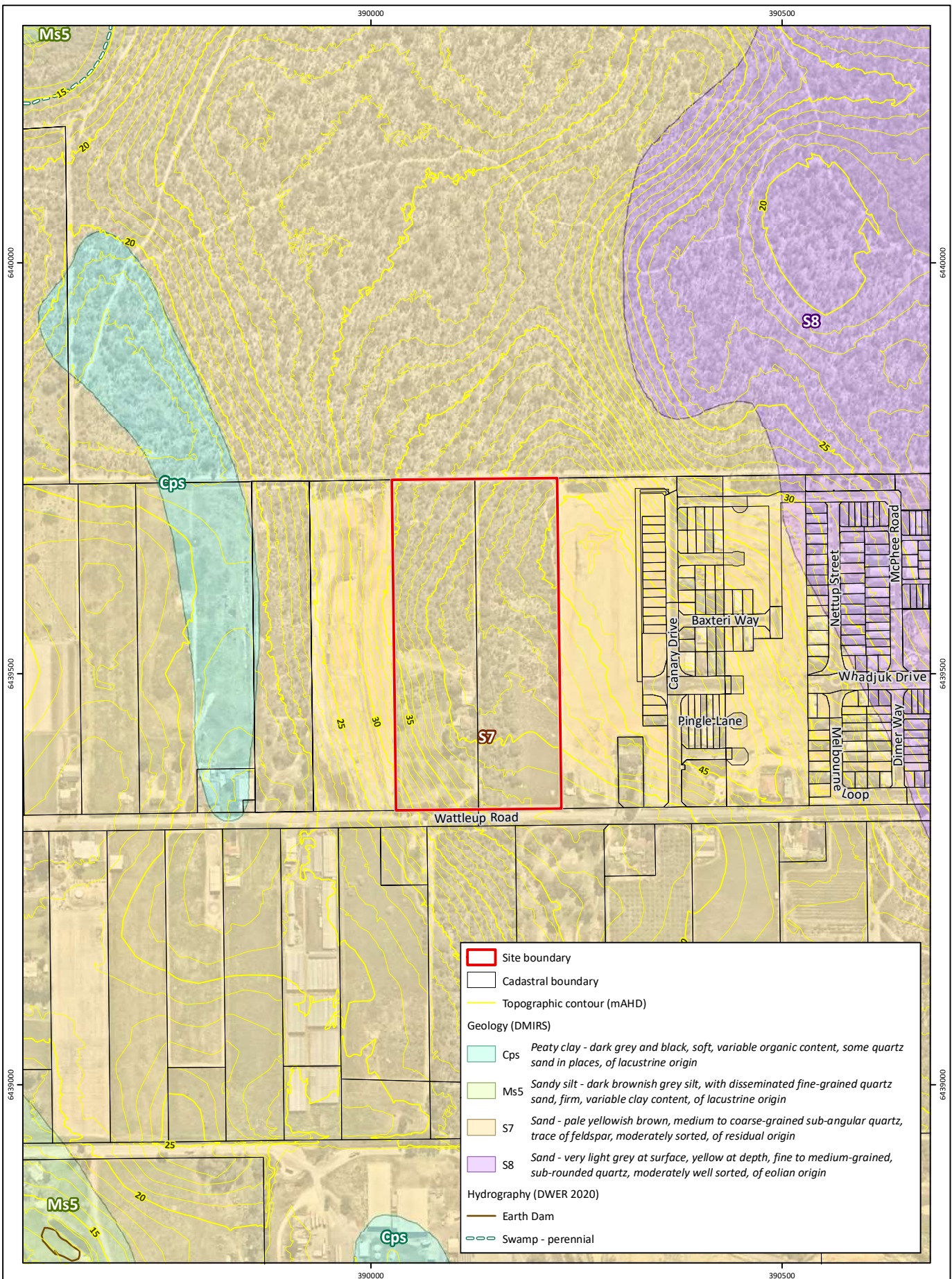

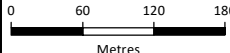



Figure 2: Hydrography, Soils and Topography

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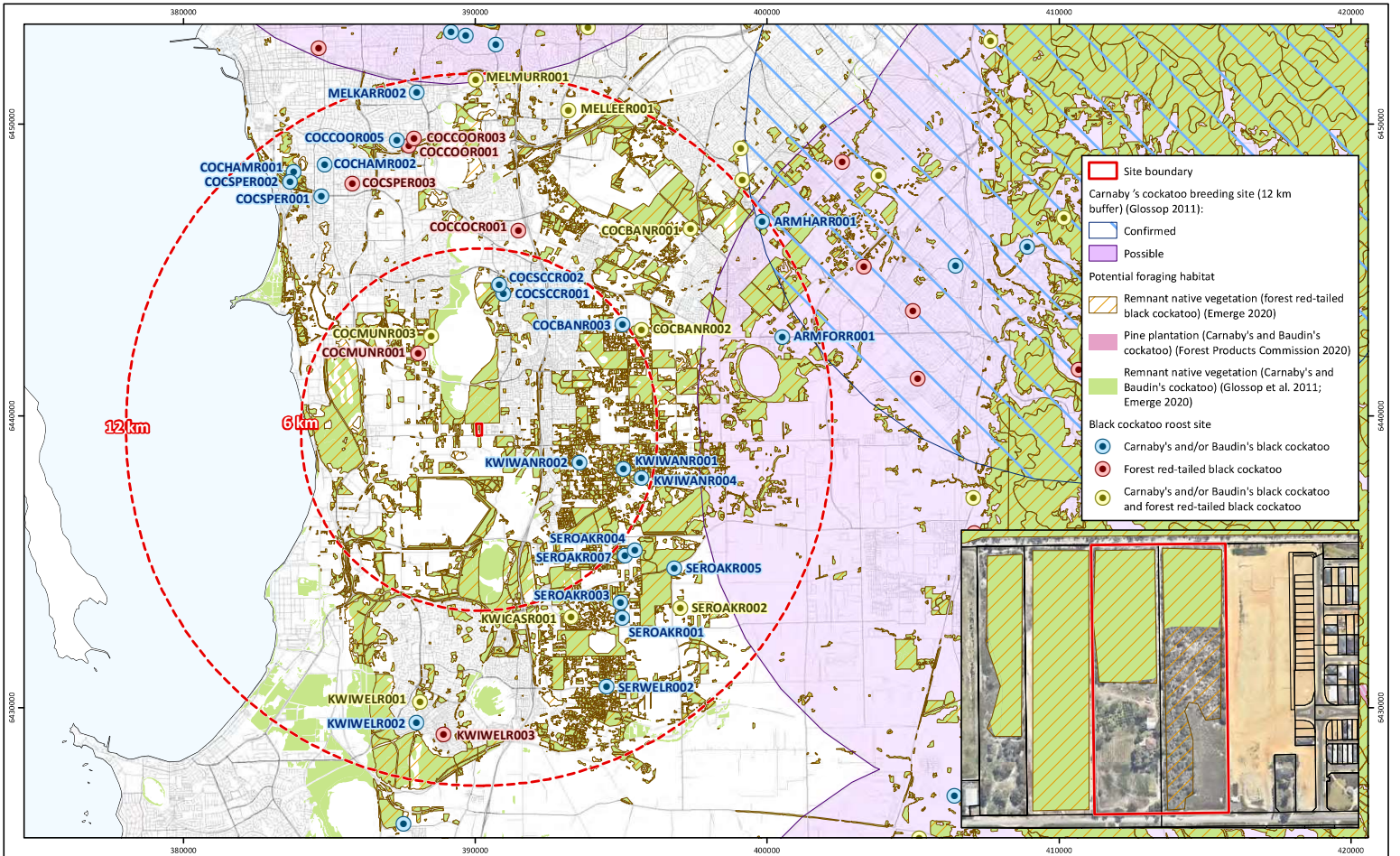
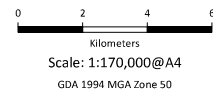


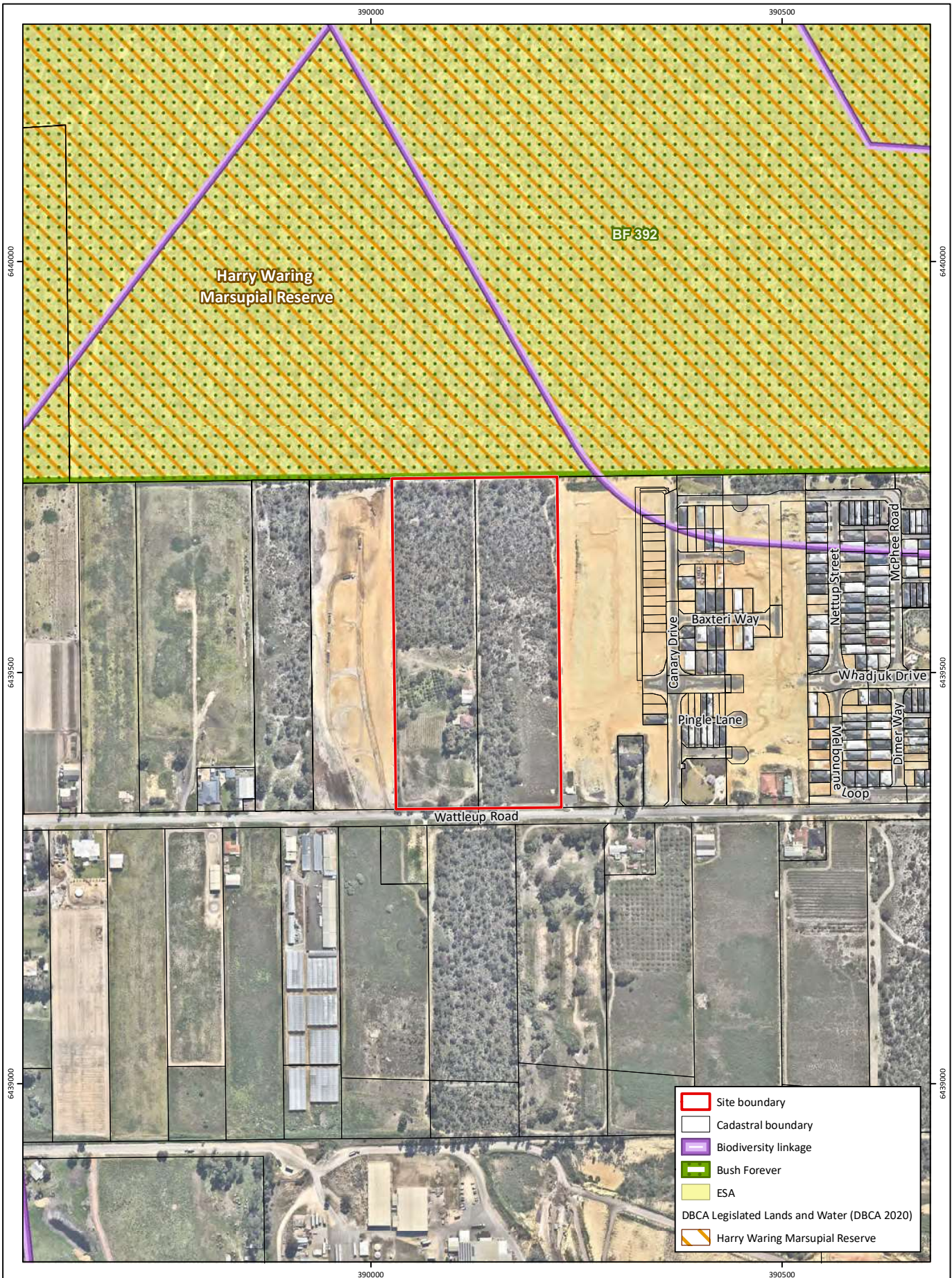
Figure 3: Black Cockatoo Habitat Context

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Lots 76 and 107 Wattleup Road, Hammond Park
Client: Qube Hammond Link Pty Ltd

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Date: 07/12/2020

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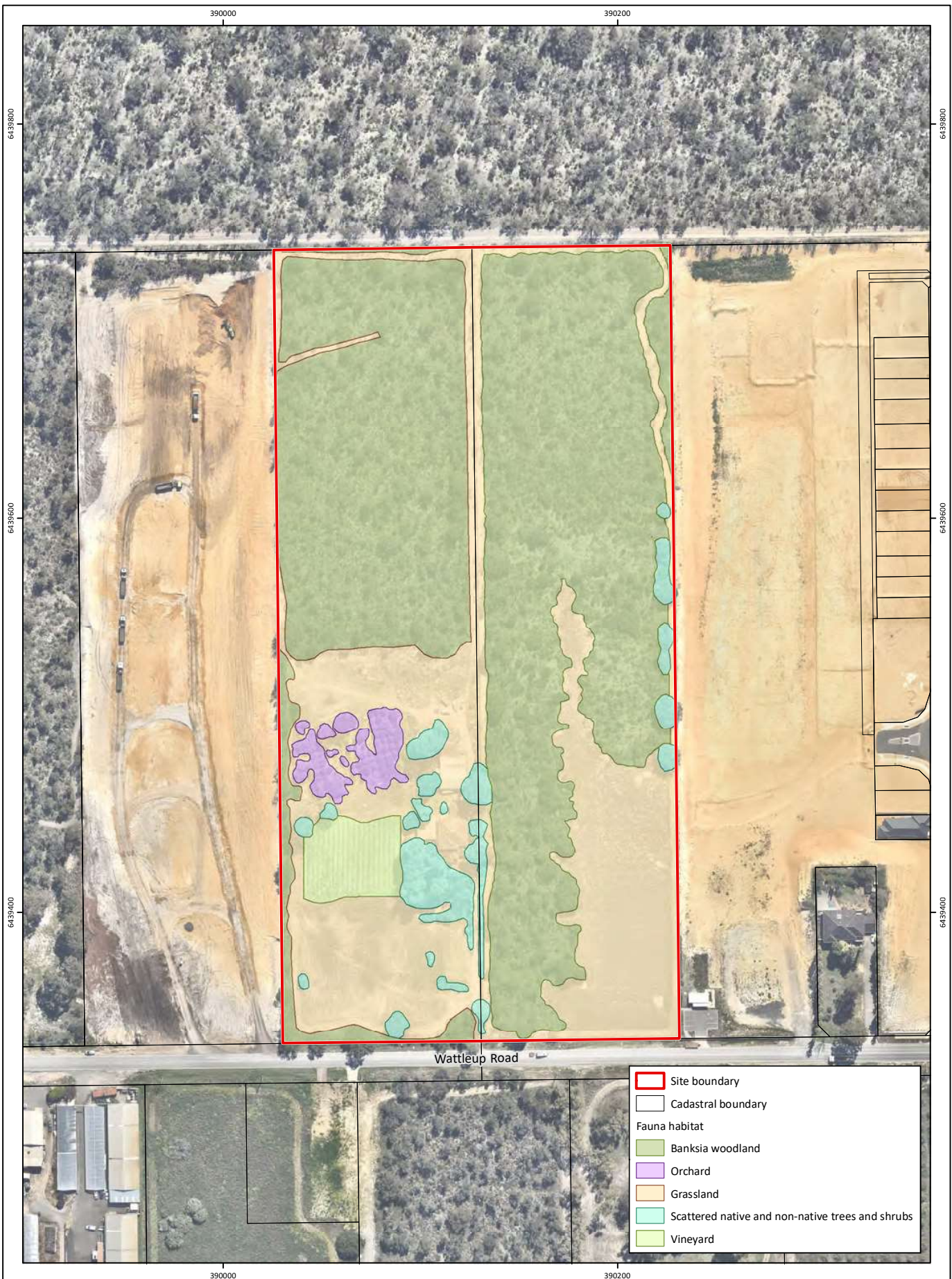




Figure 6: Black Cockatoo Habitat Trees

Project: Basic Fauna and Targeted Black Cockatoo Assessment
 Lots 76 and 107 Wattleup Road, Hammond Park

Client: Qube Hammond Link Pty Ltd

Plan Number: EP20-085(02)-F31
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Approved: RAW
Date: 07/12/2020



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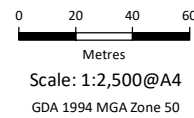


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Figure 7: Potential Carnaby's Cockatoo Foraging Habitat

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 Date: 07/12/2020



Project: Basic Fauna and Targeted Black Cockatoo Assessment
 Lots 76 and 107 Wattleup Road, Hammond Park
Client: Qube Hammond Link Pty Ltd



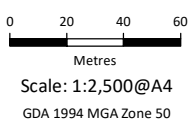
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Figure 8: Potential Forest Red-tailed Black Cockatoo Foraging Habitat

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Approved: RAW
Date: 07/12/2020



While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used.
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Appendix A

Additional Information



Conservation Significant Fauna

Threatened and priority fauna

Fauna species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, fauna species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Migratory birds may be recognised under international treaties including:

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

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as ‘matters of national environmental significance’ (MNES) under the EPBC Act. Fauna species considered ‘threatened’ pursuant to Schedule 1 of the EPBC Act are assigned categories as outlined in **Table 1**.

Table 1: Definitions of conservation significant fauna species pursuant to the EPBC Act

Conservation Code	Category
X	Threatened Fauna –Extinct There is no reasonable doubt that the last member of the species has died.
EW [#]	Threatened Fauna –Extinct in the Wild Taxa which are known only to survive in cultivation, captivity or as a naturalised population outside its past range, or taxa which have not been recorded in its known and/or expected habitat despite appropriate exhaustive surveys.
CR [#]	Threatened Fauna – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN [#]	Threatened Fauna – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU [#]	Threatened Fauna – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
Migratory [#]	Migratory Fauna 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 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.
Ma	Marine Fauna Species in the list established under s248 of the EPBC Act

[#]matters of national environmental significance (MNES) under the EPBC Act

Additional Background Information



In Western Australia, fauna taxa may be classed as ‘threatened’, ‘extinct’, or ‘specially protected’ under the *Biodiversity Conservation Act 2016* (BC Act), which is enforced by Department of Biodiversity Conservation and Attractions (DBCA) (DBCA 2019a). The definitions of these categories are provided in **Table 2**.

Table 2: Definitions of fauna categories listed under the BC Act (DBCA 2019a)

Category	Conservation Code	Definition
Threatened	CR	Critically endangered Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
	EN	Endangered Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
	VU	Vulnerable Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Extinct	EX	Extinct Species where there is no reasonable doubt that the last member of the species has died.
	EW	Extinct in the wild Species that is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form. Note that no species are currently listed as EW.
Specially protected	MI	Migratory species Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth Includes birds that subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds.
	CD	Species of special conservation interest (conservation dependent fauna) Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
	OS	Other specially protected species Fauna otherwise in need of special protection to ensure their conservation.

Additional Background Information



Fauna species that may be threatened or near threatened but lack sufficient information to be legislatively listed may be added to the DBCA's *Priority Fauna List* (DBCA 2018). Species listed under priorities 1-3 comprise possible threatened species that do not meet survey criteria or are otherwise data deficient. Species listed under priority 4 are those that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons (DBCA 2019a).

Priority fauna species are considered during State approval processes. Priority fauna categories and definitions are listed in **Table 3** (DBCA 2019a).

Table 3: Definitions of priority fauna categories on DBCA's *Priority Fauna List* (DBCA 2019a)

Conservation Code	Category
P1	<p>Priority 1 – Poorly known</p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p>
P2	<p>Priority 2 – Poorly known</p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p>
P3	<p>Priority 3 – Poorly known</p> <p>Species that are known from several locations and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p>
P4	<p>(a) Priority 4 – Rare species</p> <p>Species 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 species are usually represented on conservation lands.</p> <p>(b) Priority 4 – Near Threatened</p> <p>Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>(c) Priority 4 – Other</p> <p>Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

Additional Background Information



Black cockatoos

Three threatened species of black cockatoo occur on the Swan Coastal Plain (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

There are a range of regional studies and spatial datasets available which provide information on black cockatoo records and potential habitat mapping. These are detailed below.

Species distribution and breeding range

Broad-scale maps are available for the modelled distribution of Baudin's cockatoo, Carnaby's cockatoo and forest red-tailed black cockatoo (DSEWPaC 2011; DoEE 2016a, b).

The modelled distribution maps also include 'known breeding areas' and 'predicted breeding range' for Baudin's cockatoo and 'breeding range' and 'non-breeding range' for Carnaby's cockatoo.

No breeding range modelling is available for forest red-tailed black cockatoo but the species is known to breed mainly in the jarrah forest region (DBCA 2017) and in small populations on the Swan Coastal Plain within the Baldivis, Stake Hill, Lake McLarty and Capel area and increasingly in the Perth metropolitan area (DAWE 2020).

Breeding habitat

Department of Environment and Conservation (DEC, now Department of Biodiversity, Conservation and Attractions (DBCA)) and fauna experts, have identified and mapped Carnaby's cockatoo habitat on the Swan Coastal Plain and Jarrah Forest regions (Glossop *et al.* 2011). This dataset includes mapping of Carnaby's cockatoo breeding sites based on point records of breeding from a range of sources. Breeding sites were classified as 'confirmed' where eggs or chicks were recorded and 'possible' where observations relating to Carnaby's cockatoo breeding that did not include actual records of eggs or chicks (e.g. chewed hollows or records of breeding or nesting behaviour by an expert observer).

A 12 km buffer applies to each site to 'reflect the flexible use of these areas by cockatoos and to indicate the important zone for access to potential feeding habitat' (Glossop *et al.* 2011). Glossop *et al.* (2011) state that the areas mapped in the dataset are not a comprehensive record of Carnaby's cockatoo breeding and that many nesting sites are not known.

While this dataset only applies to Carnaby's cockatoo, the information it contains is also applicable for Baudin's cockatoo and forest red-tailed black cockatoo as they have similar breeding habitat requirements. That is, breeding sites that are suitable for Carnaby's cockatoo may also be suitable for

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Baudin's cockatoo and forest red-tailed black cockatoo, if located within their distribution/breeding ranges.

BirdLife Australia also maintain a database of confirmed black cockatoo breeding sites which is accessible via a paid search system. BirdLife Australia have advised that their database is comprised of data collected during surveys by staff and volunteers of which most (>99%) surveys are of Carnaby's cockatoo. They have also advised that the dataset is not comprehensive and that an absence of known nests does not necessarily indicate a lack of breeding activity.

The Carnaby's cockatoo recovery plan also identifies 13 'important bird areas' for Carnaby's cockatoo, which are identified as 'sites of global bird conservation importance' (DPaW 2013). These 'important bird areas' comprise sites supporting at least 20 breeding pairs or 1% of the population regularly utilising an area in the non-breeding part of the range.

Confirmed roost sites

BirdLife Australia undertakes annual monitoring of black cockatoo overnight roost sites as part of the annual 'Great Cocky Count' community-based survey. Information gathered from these monitoring events provides roost locations and recorded black cockatoo numbers (Peck *et al.* 2019).

Native foraging habitat

Glossop *et al.* (2011) also mapped 'areas requiring investigation as Carnaby's cockatoo feeding habitat' for the Swan Coastal Plain and Jarrah Forest regions, based on regional vegetation mapping that may contain plant species known to be foraged upon by Carnaby's cockatoo. Note that this dataset does not include observations or point records of Carnaby's cockatoo feeding. This dataset represents areas of vegetation that may potentially provide foraging habitat for Carnaby's cockatoo.

Given this dataset was created in 2011 and in order to account for clearing of native vegetation that has occurred since this time, Emerge have updated this dataset using the current native vegetation extent as provided by DPIRD (2019a) to only show potential foraging habitat that currently exists (Emerge Associates 2020a).

Pine plantations also provide an important food source for Carnaby's cockatoo, but were not included in the Glossop *et al.* (2011) dataset. Mapping of pine plantations is available from the Forest Products Commission (Forest Products Commission 2020).

The Glossop *et al.* (2011) dataset is broadly applicable to other black cockatoos as many plant species that are foraged upon by Carnaby's cockatoo are also consumed by Baudin's cockatoo (e.g. fruit of *Banksia* spp., *Corymbia calophylla* (marri) and *Eucalyptus marginata* (jarrah)) and forest red-tailed black cockatoo (e.g. jarrah and marri fruit). However, using the Glossop *et al.* (2011) potential foraging habitat dataset for forest red-tailed cockatoos likely overestimates available foraging habitat as it includes multiple plant species that are not consumed by this species (e.g. *Banksia* spp.), and to a lesser extent the foraging value is also over-estimated for Baudin's cockatoo.

Emerge Associates (2020b) have used a similar methodology to Glossop *et al.* (2011) to define potential foraging habitat for forest-red tailed cockatoos. Specifically, DBCA (2019b) regional vegetation complex mapping has been used to determine which areas of remnant vegetation

Additional Background Information



support plant species known to be foraged upon by forest red-tailed cockatoos, including *Allocasuarina fraseriana* (sheoak), *Corymbia calophylla* (marri), *Eucalyptus gomphocephala* (tuart) and *Eucalyptus marginata* (jarrah). Where these vegetation complexes intersect remnant vegetation mapped by DPIRD (2019b) they were considered to represent potential foraging habitat for forest red-tailed cockatoos.

Pest fauna

A number of legislative and policy documents exist in relation to pest fauna management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding pest fauna management in Western Australia and lists declared pest species.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; “a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest”.

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the ‘declared pest, prohibited - s12’ category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the ‘declared pest - s22(2)’ category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

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Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Literature

The main literature used for identifying fauna and fauna habitats is listed in **Table 7** below.

Table 7: Standard literature used for identifying fauna species and habitats.

Conservation Code	Category
Birds	Johnstone and Storr (1998b), Johnstone and Storr (1998a), Pizzey and Knight (2012), Slater <i>et al.</i> (2003)
Mammals	Menkhorst and Knight (2011), Triggs (2003)
Amphibia	Tyler and Doughty (2009), Bush <i>et al.</i> (2002)
Reptiles	Bush <i>et al.</i> (2002)

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Additional Background Information



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Menkhorst, P. and Knight, F. 2011, *Field guide to the mammals of Australia (Third edition)*, Oxford University Press Australia & New Zealand, Melbourne, VIC, Australia.

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Slater, P., Slater, P. and Slater, R. 2003, *The Slater Field Guide to Australian Birds*, Reed New Holland, Australia.

Triggs, B. 2003, *Tracks, Scats and Other Traces A Field Guide to Australian Mammals*, Oxford University Press Australia, Melbourne, Victoria.

Tyler, M. J. and Doughty, P. 2009, *Field Guide to Frogs of Western Australia*, Western Australian Museum, Perth, Western Australia.

Appendix B

Black Cockatoo Foraging Plants



Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Acacia baileyana</i>	Cootamundra wattle	Secondary			Groom 2011
<i>Acacia pentadenia</i>	Karri wattle	Secondary			Groom 2011
<i>Acacia saligna</i>	Orange wattle	Secondary			Groom 2011
<i>Agonis flexuosa</i>	Peppermint tree	Secondary			Groom 2011
<i>Allocasuarina fraseriana</i>	Sheoak		Secondary	Secondary	Johnstone & Storr 1998; Johnstone et al. 2010; Johnstone 2017
<i>Allocasuarina spp.</i>		Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Anigozanthos flavidus</i>	Tall kangaroo paw		Secondary		Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Araucaria heterophylla</i>	Norfolk island pine	Secondary			Groom 2011
<i>Banksia ashbyi</i>	Ashby's banksia	Primary			Saunders 1980; Groom 2011
<i>Banksia attenuata</i>	Slender banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Banksia baxteri</i>	Baxter's banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia carlinoides</i>	Pink dryandra	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia coccinea</i>	Scarlet banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia dallanneyi</i>	Couch honeypot dryandra	Primary			Groom 2011
<i>Banksia ericifolia</i>	Heath-leaved banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia fraseri</i>		Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia gardneri</i>	Prostrate banksia	Primary			Groom 2011
<i>Banksia grandis</i>	Bull banksia	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
<i>Banksia hookeriana</i>	Hooker's banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia ilicifolia</i>	Holly banksia	Primary	Primary		Johnstone et al. 2010; Groom 2011; Johnstone & Storr 1998
<i>Banksia kippistiana</i>		Primary			Groom 2011
<i>Banksia leptophylla</i>		Primary			Groom 2011
<i>Banksia lindleyana</i>	Porcupine banksia	Primary	Primary		Johnstone et al. 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Banksia littoralis</i>	Swamp banksia	Primary	Primary		Saunders 1980; Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
<i>Banksia menziesii</i>	Firewood banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Banksia mucronulata</i>	Swordfish dryandra	Primary			Groom 2011
<i>Banksia nivea</i>	Honeypot dryandra	Primary			Saunders 1980; Groom 2011
<i>Banksia nobilis</i>	Golden dryandra	Primary			Saunders 1980; Groom 2011
<i>Banksia praemorsa</i>	Cut-leaf banksia	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Banksia prionotes</i>	Acorn banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia prolata</i>		Primary			Johnstone et al. 2010
<i>Banksia quercifolia</i>	Oak-leaved banksia	Primary	Primary		Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
<i>Banksia sessilis</i>	Parrot bush	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
<i>Banksia speciosa</i>	Showy banksia	Primary			Johnstone et al. 2010; Groom 2011
<i>Banksia spp.</i>		Primary	Primary		Saunders 1979; DSEWPac 2012; DoEE 2017
<i>Banksia squarrosa</i>	Pingle	Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Banksia tricuspis</i>	Pine banksia	Primary			Groom 2011
<i>Banksia undata</i>	Urchin dryandra	Primary			Groom 2011
<i>Banksia verticillata</i>	Granite banksia	Primary			Saunders 1980; Groom 2011
<i>Brassica campestris</i>	Canola	Secondary			Groom 2011; DoEE 2017
<i>Callistemon spp.</i>		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
<i>Callistemon viminalis</i>	Captain cook bottlebrush	Secondary			Groom 2011
<i>Callitris sp.</i>		Secondary			Johnstone et al. 2010; Groom 2011
<i>Carya illinoensis</i>	Pecan	Primary	Secondary		Johnstone et al. 2010; Groom 2011; Groom 2014; DoEE 2017
<i>Casuarina cunninghamiana</i>	River sheoak	Secondary			Groom 2011
<i>Citrullus lanatus</i>	Pie or afghan melon	Secondary			Johnstone et al. 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Corymbia calophylla</i>	Marri	Primary	Primary	Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Saunders 1979; Johnstone & Kirkby 2008
<i>Corymbia citriodora</i>	Lemon scented gum	Secondary	Secondary	Secondary	Johnstone et al. 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017
<i>Corymbia ficifolia</i>	Red flowering gum	Secondary			Groom 2011
<i>Corymbia haematoxylon</i>	Mountain marri	Secondary		Secondary	Groom 2011; DoEE 2012; DoEE 2017
<i>Darwinia citriodora</i>	Lemon-scented darwinia	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
<i>Diaspyros sp.</i>	Sweet persimmon	Secondary	Secondary		Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Eremophila glabra</i>	Tarbush	Secondary			Groom 2011
<i>Erodium aureum</i>		Secondary			Groom 2011
<i>Erodium botrys</i>	Long storksbill	Secondary	Secondary		Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
<i>Erodium spp.</i>		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
<i>Eucalyptus caesia</i>	Silver princess	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017
<i>Eucalyptus camaldulensis</i>	River red gum			Secondary	DoEE 2012; DoEE 2017
<i>Eucalyptus decipiens</i>	Red heart/moit			Secondary	Johnstone 2017
<i>Eucalyptus diversicolor</i>	Karri			Primary	Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998
<i>Eucalyptus erythrocorys</i>	Illyarrie	Secondary		Secondary	DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone et al. 2010
<i>Eucalyptus gomphocephala</i>	Tuart	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Eucalyptus grandis</i>	Flooded gum, rose gum			Secondary	DoEE 2012; DoEE 2017
<i>Eucalyptus lehmannii</i>	Bushy yate			Secondary	Johnstone 2017
<i>Eucalyptus leucoxylon</i>	Yellow gum	Secondary			Groom 2014

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Eucalyptus loxophleba</i>	York gum	Secondary			Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Eucalyptus marginata</i>	Jarrah	Primary	Primary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone 2017
<i>Eucalyptus patens</i>	Blackbutt	Primary		Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Groom 2011
<i>Eucalyptus pleurocarpa</i>	Tallerack	Secondary			Groom 2011
<i>Eucalyptus preissiana</i>	Bell-fruited mallee	Secondary			Groom 2011
<i>Eucalyptus robusta</i>	Swamp mahogany	Secondary			Johnstone et al. 2010; Groom 2011
<i>Eucalyptus salmonophloia</i>	Salmon gum	Primary			Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DSEWPaC 2012; DoEE 2017
<i>Eucalyptus staeri</i>	Albany blackbutt			Secondary	Johnstone & Storr 1998
<i>Eucalyptus todtiana</i>	Coastal blackbutt	Secondary			Saunders 1980; Johnstone et al. 2010; Groom 2011; Johnstone & Kirkby 2008
<i>Eucalyptus wandoo</i>	Wandoo	Primary	Secondary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
<i>Ficus sp.</i>	Fig	Secondary			Groom 2011
<i>Grevillea armigera</i>	Prickly toothbrushes	Primary			Groom 2011
<i>Grevillea bipinnatifida</i>	Fuschia grevillea	Primary			Groom 2011
<i>Grevillea hookeriana</i>	Red toothbrushes	Primary			Groom 2011
<i>Grevillea hookeriana subsp. apiculata</i>	Black toothbrushes	Primary			Groom 2011
<i>Grevillea paniculata</i>	Kerosene bush	Primary			Groom 2011
<i>Grevillea paradoxa</i>	Bottlebrush grevillea	Primary			Groom 2011
<i>Grevillea petrophiloides</i>	Pink poker	Primary			Groom 2011
<i>Grevillea robusta</i>	Silky oak	Primary			Johnstone et al. 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Grevillea spp.</i>		Primary			Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Grevillea wilsonii</i>	Native fuchsia		Primary		Johnstone et al. 2010
<i>Hakea auriculata</i>		Primary			Saunders 1980; Groom 2011
<i>Hakea candolleana</i>		Primary			Groom 2011
<i>Hakea circumalata</i>	Coastal hakea	Primary			Groom 2011
<i>Hakea commutata</i>		Primary			Groom 2011
<i>Hakea conchifolia</i>	Shell-leaved hakea	Primary			Groom 2011
<i>Hakea costata</i>	Ribbed hakea	Primary			Groom 2011
<i>Hakea cristata</i>	Snail hakea	Primary	Primary		Groom 2011; Johnstone et al. 2010
<i>Hakea cucullata</i>	Snail hakea	Primary			Groom 2011
<i>Hakea cyclocarpa</i>	Ramshorn	Primary			Saunders 1980; Groom 2011
<i>Hakea eneabba</i>		Primary			Groom 2011
<i>Hakea erinacea</i>	Hedgehog hakea	Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Hakea falcata</i>	Sickle hakea	Primary			Groom 2011
<i>Hakea flabellifolia</i>	Fan-leaved hakea	Primary			Groom 2011
<i>Hakea gilbertii</i>		Primary			Saunders 1980; Groom 2011
<i>Hakea incrassata</i>	Golfball or marble hakea	Primary			Johnstone et al. 2010; Groom 2011
<i>Hakea lasiantha</i>	Woolly flowered hakea	Primary			Johnstone et al. 2010; Groom 2011
<i>Hakea lasianthoides</i>		Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Hakea laurina</i>	Pin-cushion hakea	Primary			Johnstone et al. 2010; Groom 2011
<i>Hakea lissocarpa</i>	Honeybush	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea marginata</i>			Primary		Johnstone et al. 2010
<i>Hakea megalosperma</i>	Lesueur hakea	Primary			Groom 2011
<i>Hakea multilineata</i>	Grass leaf hakea	Primary			Groom 2011
<i>Hakea neospathulata</i>		Primary			Groom 2011
<i>Hakea obliqua</i>	Needles and corks	Primary			Saunders 1980; Groom 2011
<i>Hakea oleifolia</i>	Dungyn	Primary			Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Hakea pandanocarpa subsp. crassifolia</i>	Thick-leaved hakea	Primary			Groom 2011
<i>Hakea petiolaris</i>	Sea urchin hakea	Primary			Groom 2011
<i>Hakea polyanthema</i>		Primary			Groom 2011
<i>Hakea preissii</i>	Needle tree	Primary			Groom 2011
<i>Hakea prostrata</i>	Harsh hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea psilorrhyncha</i>		Primary			Groom 2011
<i>Hakea ruscifolia</i>	Candle hakea	Primary	Primary		Saunders 1980; Groom 2011; Johnstone et al. 2010
<i>Hakea scoparia</i>	Kangaroo bush	Primary			Groom 2011
<i>Hakea smilacifolia</i>		Primary			Groom 2011
<i>Hakea spp.</i>		Primary	Primary		Saunders 1979; DSEWPaC 2012; DoEE 2017
<i>Hakea stenocarpa</i>	Narrow-fruited hakea	Primary	Primary		Johnstone et al. 2010; Groom 2011
<i>Hakea sulcata</i>	Furrowed hakea	Primary			Groom 2011
<i>Hakea trifurcata</i>	Two-leaved hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea undulata</i>	Wavy-leaved hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
<i>Hakea varia</i>	Variable-leaved hakea	Primary	Primary		Saunders 1980; Groom 2011
<i>Harpephyllum caffrum</i>	Kaffir plum			Secondary	Johnstone 2017
<i>Helianthus annuus</i>	Sunflower	Secondary			Johnstone et al. 2010; Groom 2011
<i>Hibiscus sp.</i>	Hibiscus	Secondary			Groom 2011
<i>Isopogon scabriusculus</i>		Secondary			Groom 2011
<i>Jacaranda mimosifolia</i>	Jacaranda	Secondary	Secondary		Johnstone et al. 2010; Groom 2011
<i>Jacksonia furcellata</i>	Grey stinkwood	Secondary			Groom 2011
<i>Kingia australis</i>	Kingia		Secondary		Johnstone et al. 2010
<i>Lambertia inermis</i>	Chittick	Secondary			Johnstone & Storr 1998; Groom 2011
<i>Lambertia multiflora</i>	Many-flowered honeysuckle	Secondary			Saunders 1980; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Liquidamber styraciflua</i>	Liquid amber	Primary		Secondary	Johnstone et al. 2010; Groom 2011; Groom 2014; Personal observation
<i>Lupinus sp.</i>	Lupin	Secondary			Saunders 1980; Groom 2011
<i>Macadamia integrifolia</i>	Macadamia	Primary	Secondary		Johnstone et al. 2010; Grooms 2011; Groom 2014
<i>Malus domestica</i>	Apple	Secondary	Secondary		Johnstone et al. 2010; Johnstone & Storr 1998; DSEWPaC 2012; DoEE 2017; Groom 2011
<i>Melaleuca leuropoma</i>		Secondary			Saunders 1980; Groom 2011
<i>Melia azedarach</i>	Cape lilac or white cedar	Secondary		Primary	Johnstone et al. 2010; Groom 2011
<i>Mesomeleana spp.</i>		Secondary			Johnstone et al. 2010; Groom 2011
<i>Olea europea</i>	Olive			Secondary	Johnstone 2017
<i>Persoonia longifolia</i>	Snottygobble			Secondary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Pinus canariensis</i>	Canary island pine	Primary			Johnstone et al. 2010; Groom 2011
<i>Pinus caribea</i>	Caribbean pine	Primary			Johnstone et al. 2010; Groom 2011
<i>Pinus pinaster</i>	Pinaster or maritime pine	Primary			Groom 2011
<i>Pinus radiata</i>	Radiata pine	Primary	Secondary		Johnstone et al. 2010; Groom 2011
<i>Pinus spp.</i>		Primary	Secondary		Johnstone & Storr 1998; Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Protea 'Pink Ice'</i>		Secondary			Groom 2011
<i>Protea repens</i>		Secondary			Groom 2011
<i>Protea spp.</i>		Secondary			Johnstone et al. 2010
<i>Prunus amygdalus</i>	Almond tree	Secondary			Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
<i>Pyrus communis</i>	European pear		Secondary		Johnstone & Storr 1998; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
<i>Quercus spp.</i>	Oak		Secondary		Johnstone et al. 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
<i>Raphanus raphanistrum</i>	Wild radish	Secondary			Groom 2011; DoEE 2017
<i>Reedia spathacea</i>			Secondary		Johnstone et al. 2010
<i>Rumex hypogaeus</i>	Doublegee	Secondary			Saunders 1980
<i>Stenocarpus sinuatus</i>		Secondary			Johnstone et al. 2010
<i>Syzygium smithii</i>	Lilly pilly	Secondary			Groom 2014
<i>Tipuana tipu</i>	Tipu or rosewood tree	Primary			Groom 2011, Groom 2014
<i>Xanthorrhoea preissii</i>	Grass tree	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
<i>Xylomelum occidentale</i>	Woody pear	Secondary			Groom 2014

CBC=Carnaby's cockatoo, BBC=Baudin's cockatoo and FRTBC=Forest red-tailed black

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Appendix C

Black Cockatoo Habitat Quality Assessment (Emerge 2020)



Introduction

As part of environmental impact assessment and offset calculation, the Department of Agriculture, Water and the Environment (DAWE) requires that a score out of ten is provided for the overall quality of black cockatoo habitat within a site (DAWE 2020). DAWE does not provide a methodology for scoring habitat quality, specifying instead that an assessment of quality should be undertaken by an experienced technical expert (DSEWPac 2012).

Emerge Associates (Emerge) have developed this method to provide a systematic assessment of overall black cockatoo habitat quality. Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories. Our method assesses and scores the quality of breeding, roosting and foraging habitat separately and then provides an overall quality score (out of ten) based on the highest score determined for the respective habitat categories.

Methodology

The International Organization for Standardization defines 'quality' as the "*degree to which a set of inherent characteristics fulfils requirements*" (ISO 9000 2020). Developing an objective scoring system for quality is therefore challenging, as quality is both relative and, to some extent, subjective. An ecological value like habitat may also have a wide range of characteristics, with varying relevance to the requirements of a species and that may be independent, interdependent or contrasting with other characteristics, such that habitat quality must be assessed holistically to be properly understood.

The three categories of black cockatoo habitat are intrinsically linked in that breeding and roosting activity is directly related to the availability of foraging and watering resources surrounding nests or roosts (Saunders 1990; Shah 2006; Le Roux 2017). Black cockatoos can also move over large distances within their range to access breeding and foraging habitat and will not necessarily return to the same locations within a year or across years (Saunders 1980; Johnstone and Kirkby 2008; Johnstone *et al.* 2017; Peck *et al.* 2019). Therefore, evaluating the overall quality of black cockatoo habitat requires acknowledgement of the relationships between the different habitat categories and the potential for use of all habitats within a site, given the condition of each habitat, the sites' location and the history of use of habitat within a site by black cockatoos.

While breeding, roosting and foraging habitat are interrelated, we suggest that the different habitat categories should not be scored cumulatively as this can overestimate quality. That is, if a site contains multiple categories of habitat it does not necessarily contain greater quality habitat. For example, a site that contains a roost is not necessarily of higher overall quality if it also contains breeding habitat.

Alternatively, averaging the scores from all three habitat categories can act to underestimate habitat, since certain types of habitat are recorded less frequently than others and therefore their absence would act to devalue quality. For example, the likelihood of recording a roost is generally low compared to recording foraging or breeding habitat but a site that lacks a roost is not necessarily of lower overall quality.

Black Cockatoo Habitat Quality Assessment



Hence, our scoring system selects the highest habitat category score to represent overall habitat quality. Adopting the highest score from any habitat category within a site avoids over or under estimating habitat quality because the most important value always drives, or is reflected in, the overall score.

To provide a score for each habitat category, the following three ‘quality components’ are considered as recommended by DAWE (DAWE 2020):

- Site condition which is the “*condition of a site in relation to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features*”.
- Site context which is the “*relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community. This includes considerations such as movement patterns of the species, the proximity of the site in relation to other areas of suitable habitat, and the role of the site in relation to the overall population or extent of a species or community*”.
- Species stocking rate which is the “*usage and/or density of a species at a particular site...It includes considerations such as survey data for a site in regards to a particular species population or, in the case of a threatened ecological community this may be a number of different populations. It also includes consideration of the role of the site population in regards to the overall species population viability or community extent*”.

A habitat quality assessment should aim to combine current information on the status of black cockatoos and habitat characteristics within a site with the best available information regarding the status of black cockatoo populations and black cockatoo habitat within areas surrounding a site. Black cockatoo habitat assessments for a given site don’t typically allow scope for physical survey of areas surrounding a site and so the ability to obtain new information is usually limited to that which can be obtained within a site. Therefore, we considered that, when assessing the above components, site condition is best defined from a current survey, site context is best defined from literature and relevant databases (Glossop *et al.* 2011; DPaW 2013; DoEE 2016a, c, b; Peck *et al.* 2019) and information on species stocking rate is best obtained from a combination of current survey, previous survey or databases (Glossop *et al.* 2011; DPaW 2013; DoEE 2016a, c, b; Peck *et al.* 2019).

Method

The *Habitat Quality Scale* provided as **Plate 1** outlines the attributes measured within each habitat category and quality component. It also shows the associated quality classification (low, moderate or high) and score (1-10).

As shown in the *Habitat Quality Scale*, the highest scores are reserved for habitat that has active or historical roosts or nests as it is considered that the presence of black cockatoos provides the best indication of the quality of habitat. Foraging habitat is weighted lower than breeding and roosting habitat as the occurrence of roost or nests provides the best confirmation that foraging habitat surrounding a site is adequate and therefore worthy of a higher quality score. Therefore, a maximum

Black Cockatoo Habitat Quality Assessment



total of ten is achievable for breeding habitat and a total of eight is achievable for both roosting and foraging habitat (refer **Plate 1**).

The *Habitat Scoring Tool* provided as **Plate 2** is an *Excel* spreadsheet document that is used to determine a quality score for each habitat category component by answering queries about habitat within and surrounding the site. A quality score is calculated for each habitat category by summing maximum scores for each query. Because maximum scores are selected, multiple answers may be provided for any query where appropriate without exaggerating the quality score. For key confirmed habitat such as roosts or nests, the scoring tool ensures that relevant, higher scores are achieved irrespective of whether all preceding queries have been answered positively (for example a roost always scores 7 or 8 irrespective of whether other quality criteria have been met).

The highest score from any of the three habitat categories is then adopted as the overall score for black cockatoo habitat quality within the site.

Black Cockatoo Habitat Quality Assessment



Emerge Black Cockatoo Habitat Quality Assessment - Scale

Quality Component	Habitat Quality Score										
	Low			Moderate			Moderate - High		High		
	1	2	3	4	5	6	7	8	9	10	
Breeding habitat	Site condition	Habitat trees with suitable hollows occur within the site AND/ OR habitat trees without suitable hollows occur within the site			Habitat trees with suitable hollows occur within the site			N/A			
	Site context	No nest has been recorded within 12 km of the site AND <100 ha of potential foraging habitat occurs within 6 km of the site			A nest(s) (active, historical or potential) has been recorded within 12 km of the site AND / OR >100 ha of potential native foraging habitat occurs within 6 km of the site			A nest(s) (active, historical or potential) has been recorded within 6 km of the site AND / OR >1000 ha of potential native foraging habitat occurs within 6 km of the site			
	Species stocking rate	No evidence of black cockatoos nesting has been recorded within the site			A potential nest(s) occurs within the site OR a historical nest(s) has been recorded within the site			A Potential nest(s) occurs within the site AND a historical nest(s) has been recorded within the site		An active nest(s) occurs within the site AND a historical nest(s) has been recorded within the site	
Roosting habitat	Site condition	Trees potentially suitable for roosting occur within the site			N/A			N/A			
	Site context	No water source occurs within or nearby the site			A water source occurs within or nearby the site OR no water source occurs within or nearby the site			N/A			
	Species stocking rate	No roost has been recorded within 1 km of the site			A small roost (active or historical) has been recorded within 500 m of the site OR a large roost (active or historical) has been recorded within 1 km of the site OR no roost has been recorded within 1 km of the site		A small roost (active or historical) has been recorded within the site		A large roost (active or historical) has been recorded within the site		An active small roost occurs within the site
Foraging habitat	Site condition	Foraging habitat with 1-10% primary foraging plants occurs within the site		Foraging habitat with 1-50% primary foraging plants occurs within the site		Foraging habitat with 1-100% primary foraging plants occurs within the site		Foraging habitat with 10-100% primary foraging plants occurs within the site		Foraging habitat with 50-100% primary foraging plants occurs within the site	
	Site context	No nest or roost has been recorded within 12 km of the site		A nest(s) (active, potential or historical) AND / OR a roost(s) (active or historical) has been recorded within 12 km of the site			A nest(s) (active, potential or historical) has been recorded within 6 km of the site			N/A	
	Species stocking rate	No evidence of foraging by black cockatoos has been recorded within the site		Evidence of foraging by black cockatoos may have been recorded within the site (limited or abundant)			Abundant evidence of foraging by black cockatoos has been recorded in the site			N/A	

Note that breeding, roosting and foraging habitat are assessed separately and the highest score is the overall quality score.

Black Cockatoo Habitat Scale definitions

'Habitat tree' is a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum, with a DBH ≥50 cm or DBH ≥30 cm for wandoo or salmon gum (DSEWPoC 2012).

'Nest' is a hollow in which black cockatoo breeding has been recorded. A nest is **'active'** if breeding was recorded within the last 2 years and **'historical'** if breeding was recorded more than 2 years ago. A hollow with potential secondary signs of breeding (e.g. chew marks) or a hollow with potential signs of breeding that could not be attributed to a bird species is a **'potential'** nest.

'Roost' is a black cockatoo roost site confirmed by a roost survey (e.g. BirdLife Australia Great Cocky Count). A roost is considered **'large'** if more than 150 individuals were recorded and **'small'** if less than 150 individuals were recorded (BirdLife Australia 2019). A roost is **'active'** if roosting was

'Primary foraging plants' are plants with historical and/or contemporary records of regular consumption by black cockatoos, including native and non-native plant species.

Plate 1: Black Cockatoo Habitat Quality Scale

Black Cockatoo Habitat Quality Assessment



Black Cockatoo Habitat Quality Assessment - Scoring Tool (Carnaby's cockatoo)

<insert site name>

		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)		2.0	0.0	0.0
			habitat tree(s) without suitable hollow(s)		1.0	0.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)		1.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)		0.5	0.0	
	1.3	The site is located within 6 km of:					
		>1000 ha of potential foraging habitat		3.0	0.0	0.0	
		100 to 1000 ha of potential foraging habitat		1.0	0.0		
	Species stocking rate	1.4	The site contains:				
historical nest(s)				1.0	0	0.0	
The site contains:							
active nest(s)				3.0	0		
potential nest(s)				1.0	0		
Score	0	10.0					

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting		1.0	0.0	0.0
			2.2	The site contains a water source or one exists nearby		1.0	
	Site context	2.3	The site is located:				
			within 1 km of a large roost (≥150 individuals) (active or historical)		1.0	0.0	0.0
			within 500 m of a small roost (<150 individuals) (active or historical)		1.0	0.0	
	Species stocking rate	2.4	The site contains:				
			a historical record of a large roost (≥150 individuals)		2.0	0	0.0
			a historical record of a small roost (<150 individuals)		1.0	0	
The site contains:							
an active record of a large roost (≥150 individuals)				2.0	0.0		
an active record of a small roost (<150 individuals)		1.0	0.0				
Score	0	7.0					

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				
			≥50% primary foraging plants		4.0	0.0	0.0
			≥10% to <50% primary foraging plants		2.0	0.0	
	<10% primary foraging plants		1.0	0.0			
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)		2.0	0.0	0.0
		6-12 km from a nest(s) (active, historical or potential)		1.00	0.0		
		3.3	The site is located:				
	within 6 km of a roost(s) (active or historical)			1.0	0.0		
	6-12 km from a roost(s) (active or historical)		0.5	0.0			
Species stocking rate	3.4	The site contains:					
		abundant evidence of foraging		2.0	0.0	0.0	
		limited evidence of foraging		1.0	0.0		
Score	0	8.0					

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	0	No habitat
Roosting	0	No habitat
Foraging	0	No habitat

Overall habitat quality score	0	No habitat
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Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

Plate 2: Black Cockatoo Habitat Scoring Tool

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Black Cockatoo Habitat Quality Assessment



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Appendix D

Database Search Results



NatureMap Species Report

Created By Guest user on 14/08/2020

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 50' 05" E, 32° 10' 30" S
Buffer	10km

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
2.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
3.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
4.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
5.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
6.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
7.	24282 <i>Accipiter fasciatus</i> subsp. <i>fasciatus</i> (Brown Goshawk)			
8.	<i>Acentrogobius pflaumi</i>			Y
9.	42368 <i>Acritoscincus trilineatus</i> (Western Three-lined Skink)			
10.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
11.	24831 <i>Acrocephalus australis</i> subsp. <i>gouldi</i> (Australian Reed Warbler)			
12.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
13.	<i>Afraflacilla huntorum</i>			Y
14.	<i>Afurcagobius suppositus</i>			
15.	<i>Akamptogonus novarae</i>			
16.	<i>Allotherua maculata</i>			
17.	<i>Aname mainae</i>			
18.	<i>Aname tepperi</i>			
19.	24310 <i>Anas castanea</i> (Chestnut Teal)			
20.	24312 <i>Anas gracilis</i> (Grey Teal)			
21.	24313 <i>Anas platyrhynchos</i> (Mallard)			
22.	<i>Anas platyrhynchos</i> subsp. <i>domesticus</i>			
23.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
24.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
25.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
26.	44629 <i>Anilius australis</i>			
27.	<i>Anoplocapros lenticularis</i>			
28.	<i>Anoplocapros robustus</i>			
29.	<i>Anser anser</i>			
30.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
31.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
32.	<i>Aploactisoma milesii</i>			
33.	<i>Apogon rueppellii</i>			
34.	<i>Apogon victoriae</i>			
35.	24991 <i>Aprasia repens</i> (Sand-plain Worm-lizard)			
36.	25554 <i>Apus pacificus</i> (Fork-tailed Swift, Pacific Swift)		IA	
37.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
38.	<i>Arachnura higginsii</i>			
39.	<i>Araneus cyphoxis</i>			
40.	<i>Araneus eburniventris</i>			
41.	<i>Araneus senicaudatus</i>			
42.	24337 <i>Ardea garzetta</i> subsp. <i>nigripes</i> (Little Egret)			
43.	25558 <i>Ardea ibis</i> (Cattle Egret)			
44.	25559 <i>Ardea intermedia</i> (Intermediate Egret)			
45.	41324 <i>Ardea modesta</i> (great egret, white egret)			
46.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
47.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
48.	41326 <i>Ardenna carneipes</i> (Flesh-footed Shearwater, Fleishy-footed Shearwater)		T	
49.	48573 <i>Ardenna pacifica</i> (Wedge-tailed Shearwater)		IA	
50.	25736 <i>Arenaria interpres</i> (Ruddy Turnstone)		IA	
51.	<i>Argiope protensa</i>			
52.	<i>Argiope trifasciata</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
53.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
54.	24352 <i>Artamus cinereus</i> subsp. <i>melanops</i> (Black-faced Woodswallow)			
55.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
56.	<i>Artema atlanta</i>			
57.	<i>Artoria flavimana</i>			
58.	<i>Artoria linnaei</i>			
59.	<i>Artoria taeniifera</i>			
60.	<i>Artoriopsis expolita</i>			
61.	<i>Austracantha minax</i>			
62.	47713 <i>Austronomus australis</i> (White-striped Free-tailed Bat)			
63.	24318 <i>Aythya australis</i> (Hardhead)			
64.	<i>Backobourkia brounii</i>			
65.	<i>Backobourkia heroine</i>			
66.	<i>Badumna insignis</i>			
67.	<i>Ballarra longipalpus</i>			
68.	<i>Barnardius zonarius</i>			
69.	<i>Bianor maculatus</i>			
70.	24319 <i>Biziura lobata</i> (Musk Duck)			
71.	24345 <i>Botaurus poiciloptilus</i> (Australasian Bittern)		T	
72.	42381 <i>Brachyurophis semifasciatus</i> (Southern Shovel-nosed Snake)			
73.	25713 <i>Cacatua galerita</i> (Sulphur-crested Cockatoo)			
74.	25714 <i>Cacatua pastinator</i> (Western Long-billed Corella)			
75.	25715 <i>Cacatua roseicapilla</i> (Galah)			
76.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
77.	24729 <i>Cacatua tenuirostris</i> (Eastern Long-billed Corella)	Y		
78.	25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo)			
79.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
80.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
81.	24780 <i>Calidris alba</i> (Sanderling)		IA	
82.	25738 <i>Calidris canutus</i> (Red Knot, knot)		IA	
83.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
84.	24786 <i>Calidris melanotos</i> (Pectoral Sandpiper)		IA	
85.	24787 <i>Calidris minuta</i> (Little Stint)			
86.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)		IA	
87.	24789 <i>Calidris subminuta</i> (Long-toed Stint)		IA	
88.	24790 <i>Calidris tenuirostris</i> (Great Knot)		T	
89.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
90.	24731 <i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black Cockatoo)		T	
91.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)		T	
92.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)		T	
93.	48400 <i>Calyptorhynchus</i> sp. (white-tailed black cockatoo)		T	
94.	34031 <i>Carcharodon carcharias</i> (Great White Shark)		T	
95.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
96.	<i>Cercophonium sulcatus</i>			
97.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
98.	24187 <i>Chalinolobus morio</i> (Chocolate Wattled Bat)			
99.	25574 <i>Charadrius dubius</i> (Little Ringed Plover)		IA	
100.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)		T	
101.	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
102.	43380 <i>Chelodina colliei</i> (South-western Snake-necked Turtle)			
103.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
104.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
105.	33939 <i>Cherax cainii</i> (Marron)			
106.	<i>Cherax destructor</i>			
107.	<i>Cherax preissii</i>			
108.	<i>Cherax quinquecarinatus</i>			
109.	<i>Cherax</i> sp.			
110.	41332 <i>Chlidonias leucopterus</i> (White-winged Black Tern, white-winged tern)		IA	
111.	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
112.	<i>Chroicocephalus novaehollandiae</i>			
113.	25601 <i>Chrysococcyx lucidus</i> (Shining Bronze Cuckoo)			
114.	24288 <i>Circus approximans</i> (Swamp Harrier)			
115.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
116.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
117.	<i>Clynotis albobarbatatus</i>			
118.	<i>Clynotis severus</i>			
119.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
120.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
121.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
122.	<i>Cormocephalus aurantipes</i>			
123.	<i>Cormocephalus novaehollandiae</i>			
124.	<i>Cormocephalus rubriceps</i>			
125.	24416 <i>Corvus bennetti</i> (Little Crow)			
126.	25592 <i>Corvus coronoides</i> (Australian Raven)			
127.	24417 <i>Corvus coronoides subsp. perplexus</i> (Australian Raven)			
128.	24419 <i>Corvus splendens</i> (House Crow)			
129.	<i>Coryphaena hippurus</i>			
130.	24671 <i>Coturnix pectoralis</i> (Stubble Quail)			
131.	25701 <i>Coturnix ypsilophora</i> (Brown Quail)			
132.	24673 <i>Coturnix ypsilophora subsp. australis</i> (Brown Quail)			
133.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
134.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
135.	24422 <i>Cracticus tibicen subsp. dorsalis</i> (White-backed Magpie)			
136.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
137.	25398 <i>Crinia georgiana</i> (Quacking Frog)			
138.	25399 <i>Crinia glauerti</i> (Clicking Frog)			
139.	25400 <i>Crinia insignifera</i> (Squelching Froglet)			
140.	<i>Cristiceps</i> sp.			
141.	<i>Crustulina bicrucata</i>			
142.	30893 <i>Cryptoblepharus buchananii</i>			
143.	25020 <i>Cryptoblepharus plagiocephalus</i>			
144.	<i>Cryptoerithus quobba</i>			
145.	30899 <i>Ctenophorus adalaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
146.	25027 <i>Ctenotus australis</i>			
147.	25039 <i>Ctenotus fallens</i>			
148.	25040 <i>Ctenotus gemmula</i> (Jewelled South-west Ctenotus (Swan Coastal Plain subpop P3), skink)			
149.	<i>Cyclosa trilobata</i>			
150.	24322 <i>Cygnus atratus</i> (Black Swan)			
151.	24323 <i>Cygnus olor</i> (Mute Swan)	Y		
152.	<i>Cyrtophora parnasia</i>			
153.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
154.	<i>Dactylopus dactylopus</i>			
155.	<i>Daphnia carinata</i>			
156.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
157.	24687 <i>Daption capense</i> (Cape Petrel)			
158.	24092 <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T	
159.	<i>Delena cancerides</i>			
160.	25766 <i>Delma fraseri</i> (Fraser's Legless Lizard)			
161.	24999 <i>Delma grayii</i>			
162.	25296 <i>Demansia psammophis subsp. reticulata</i> (Yellow-faced Whipsnake)			
163.	25346 <i>Dermochelys coriacea</i> (Leatherback Turtle)		T	
164.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
165.	<i>Dingosa serrata</i>			
166.	30836 <i>Diomedea exulans subsp. exulans</i> (Snowy Albatross)		T	
167.	25100 <i>Egernia napoleonis</i>			
168.	<i>Egretta garzetta</i>			
169.	<i>Egretta novaehollandiae</i>			
170.	<i>Elanus axillaris</i>			
171.	25250 <i>Elapognathus coronatus</i> (Crowned Snake)			
172.	47937 <i>Elsayornis melanops</i> (Black-fronted Dotterel)			
173.	<i>Eodelena convexa</i>			
174.	<i>Eolophus roseicapillus</i>			
175.	<i>Epinephelus</i> sp.			
176.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
177.	<i>Eriophora biapicata</i>			
178.	<i>Ero aphana</i>			
179.	<i>Erythracarus decoris</i>			
180.	24379 <i>Erythronyx cinctus</i> (Red-kneed Dotterel)			
181.	25746 <i>Eudyptula minor</i> (Little Penguin)			
182.	24818 <i>Eudyptula minor subsp. novaehollandiae</i> (Little Penguin)			
183.	24368 <i>Eurostopodus argus</i> (Spotted Nightjar)			
184.	25621 <i>Falco berigora</i> (Brown Falcon)			
185.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
186.	25623 <i>Falco longipennis</i> (Australian Hobby)			
187.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
188.	24189 <i>Falsistrellus mackenziei</i> (Western False Pipistrelle, Western Falsistrelle)		P4	
189.	24041 <i>Felis catus</i> (Cat)	Y		

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
190.	25727 <i>Fulica atra</i> (Eurasian Coot)			
191.	24761 <i>Fulica atra</i> subsp. <i>australis</i> (Eurasian Coot)			
192.	24791 <i>Gallinago hardwickii</i> (Latham's Snipe, Japanese snipe)		IA	
193.	25729 <i>Gallinula tenebrosa</i> (Dusky Moorhen)			
194.	24763 <i>Gallinula tenebrosa</i> subsp. <i>tenebrosa</i> (Dusky Moorhen)			
195.	25730 <i>Gallirallus philippensis</i> (Buff-banded Rail)			
196.	42314 <i>Gavicalis virescens</i> (Singing Honeyeater)			
197.	24959 <i>Gehyra variegata</i>			
198.	47954 <i>Gelochelidon nilotica</i> (Gull-billed Tern)		IA	
199.	<i>Geogarypus taylori</i>			
200.	24401 <i>Geopelia cuneata</i> (Diamond Dove)			
201.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
202.	24271 <i>Gerygone fusca</i> subsp. <i>fusca</i> (Western Gerygone)			
203.	<i>Girella zebra</i>			
204.	47962 <i>Glyciphila melanops</i> (Tawny-crowned Honeyeater)			
205.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
206.	<i>Gymnothorax woodwardi</i>			
207.	25627 <i>Haematopus fuliginosus</i> (Sooty Oystercatcher)			
208.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
209.	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
210.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
211.	<i>Hasarius adansoni</i>			
212.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
213.	25119 <i>Hemiergis quadrilineata</i>			
214.	<i>Heterodontus portusjacksoni</i>			
215.	24961 <i>Heteronotia binoei</i> (Bynoe's Gecko)			
216.	<i>Heurodes turrilus</i>			
217.	47965 <i>Hieraetus morphnoides</i> (Little Eagle)			
218.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
219.	24775 <i>Himantopus himantopus</i> subsp. <i>leucocephalus</i> (Black-winged Stilt)			
220.	<i>Hippocampus elongatus</i>			
221.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
222.	<i>Hogna crispipes</i>			
223.	<i>Holasteron perth</i>			
224.	<i>Holoplatys dejongi</i>			
225.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
226.	25366 <i>Hydrophis elegans</i> (Elegant Seasnake, Bar-bellied Seasnake)			
227.	42410 <i>Hydrophis ornatus</i> (Ornate Reef Seasnake, Sea Snake)			
228.	43384 <i>Hydrophis platurus</i> (Yellow-bellied Seasnake)			
229.	48587 <i>Hydroprogne caspia</i> (Caspian Tern)		IA	
230.	<i>Idiommatia blackwalli</i>			
231.	48935 <i>Idiosoma sigillatum</i> (Swan Coastal Plain shield-backed trapdoor spider)		P3	
232.	48588 <i>Isodon fusciventer</i> (Quenda, southwestern brown bandicoot)		P4	
233.	<i>Isopeda leishmanni</i>			
234.	47975 <i>Ixobrychus dubius</i> (Australian Little Bittern)		P4	
235.	<i>Kanekonica queenslandica</i>			
236.	<i>Kangarosa properipes</i>			
237.	<i>Kyphosus sydneyanus</i>			
238.	<i>Lampona brevipes</i>			
239.	<i>Lampona cylindrata</i>			
240.	25637 <i>Larus novaehollandiae</i> (Silver Gull)			
241.	24511 <i>Larus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Silver Gull)			
242.	25638 <i>Larus pacificus</i> (Pacific Gull)			
243.	<i>Latrodictus hasseltii</i>			
244.	33982 <i>Leioproctus contrarius</i> (a short-tongued bee)		P3	
245.	25128 <i>Lerista christinae</i>			
246.	25131 <i>Lerista distinguenda</i>			
247.	25133 <i>Lerista elegans</i>			
248.	25147 <i>Lerista lineata</i> (Perth Slider, Lined Skink)		P3	
249.	25005 <i>Lialis burtonis</i>			
250.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
251.	24582 <i>Lichmera indistincta</i> subsp. <i>indistincta</i> (Brown Honeyeater)			
252.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
253.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)		IA	
254.	25741 <i>Limosa limosa</i> (Black-tailed Godwit)		IA	
255.	25378 <i>Litoria adelaidensis</i> (Slender Tree Frog)			
256.	25388 <i>Litoria moorei</i> (Motorbike Frog)			
257.	25683 <i>Lonchura castaneothorax</i> (Chestnut-breasted Mannikin)			
258.	<i>Longepi woodman</i>			
259.	<i>Lophoictinia isura</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
260.	<i>Lycosa ariadnae</i>			
261.	<i>Lycosa australicola</i>			
262.	<i>Lycosa gilberta</i>			
263.	<i>Lycosa godeffroyi</i>			
264.	<i>Lycosa lacertosa</i>			
265.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		IA	
266.	24691 <i>Macronectes halli</i> (Northern Giant Petrel)		IA	
267.	24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo)			
268.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
269.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
270.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
271.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
272.	<i>Maratus pavonis</i>			
273.	<i>Maxillcosta scabriceps</i>			
274.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
275.	47997 <i>Melanodryas cucullata</i> (Hooded Robin)			
276.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
277.	24587 <i>Melithreptus chloropsis</i> (Western White-naped Honeyeater)			
278.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
279.	25184 <i>Menetia greyii</i>			
280.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
281.	<i>Meuschenia hippocrepis</i>			
282.	<i>Microcanthus strigatus</i>			
283.	<i>Microcarbo melanoleucos</i>			
284.	25693 <i>Microeca fascinans</i> (Jacky Winter)			
285.	25542 <i>Milvus migrans</i> (Black Kite)			
286.	<i>Missulena granulosa</i>			
287.	<i>Missulena hoggi</i>			
288.	<i>Missulena occatoria</i>			
289.	<i>Mituliodon tarantulinus</i>			
290.	<i>Mitoruga insularis</i>			
291.	<i>Molycrria vokes</i>			
292.	25191 <i>Morethia lineoocellata</i>			
293.	25192 <i>Morethia obscura</i>			
294.	48008 <i>Morus serrator</i> (Australasian Gannet)			
295.	24223 <i>Mus musculus</i> (House Mouse)	Y		
296.	<i>Myandra bicincta</i>			
297.	25610 <i>Myiagra inquieta</i> (Restless Flycatcher)			
298.	25420 <i>Myobatrachus gouldii</i> (Turtle Frog)			
299.	24146 <i>Myrmecobius fasciatus</i> (Numbat, Walpurti)		T	
300.	<i>Nanometa gentilis</i>			
301.	25248 <i>Neelaps bimaculatus</i> (Black-naped Snake)			
302.	25249 <i>Neelaps calonotos</i> (Black-striped Snake, black-striped burrowing snake)		P3	
303.	<i>Neoodax balteatus</i>			
304.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
305.	24739 <i>Neophema petrophila</i> (Rock Parrot)			
306.	<i>Nephila edulis</i>			
307.	<i>Nicodamus mainae</i>			
308.	25747 <i>Ninox connivens</i> (Barking Owl)			
309.	48024 <i>Notamacropus eugenii</i> subsp. <i>derbianus</i> (Tammar Wallaby, Tammar)		P4	
310.	48022 <i>Notamacropus irma</i> (Western Brush Wallaby)		P4	
311.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
312.	24798 <i>Numenius madagascariensis</i> (Eastern Curlew)		T	
313.	25742 <i>Numenius phaeopus</i> (Whimbrel)		IA	
314.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
315.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
316.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
317.	24497 <i>Oceanites oceanicus</i> (Wilson's Storm-petrel)		IA	
318.	<i>Ocrisiona parmeliae</i>			
319.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
320.	<i>Oecobius navus</i>			
321.	<i>Ommatoiulus moreletii</i>			
322.	41347 <i>Onychoprion anaethetus</i> (Bridled Tern)		IA	
323.	<i>Ophisurus serpens</i>			
324.	24085 <i>Oryctolagus cuniculus</i> (Rabbit)	Y		
325.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
326.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
327.	48591 <i>Pandion cristatus</i> (Osprey, Eastern Osprey)		IA	
328.	25253 <i>Parasuta gouldii</i>			
329.	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
330.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
331.	24642 <i>Passer montanus</i> (Eurasian Tree Sparrow)	Y		
332.	<i>Pegasus volitans</i>			
333.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
334.	48060 <i>Petrochelidon ariel</i> (Fairy Martin)			
335.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
336.	48066 <i>Petroica boodang</i> (Scarlet Robin)			
337.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
338.	24663 <i>Phaethon rubricauda</i> (Red-tailed Tropicbird)		P4	
339.	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
340.	24665 <i>Phalacrocorax fuscescens</i> (Black-faced Cormorant)			
341.	25698 <i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
342.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
343.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
344.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
345.	25587 <i>Phaps elegans</i> (Brush Bronzewing)			
346.	<i>Phenasteron longiconductor</i>			
347.	24802 <i>Philomachus pugnax</i> (Ruff, reeve)		IA	
348.	<i>Phryganoporus candidus</i>			
349.	48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater)			
350.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
351.	<i>Phyllophryne scortea</i>			
352.	<i>Pinkfloydia harveii</i>			
353.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
354.	24842 <i>Platalea regia</i> (Royal Spoonbill)			
355.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
356.	24747 <i>Platycercus spurius</i> (Red-capped Parrot)			
357.	25721 <i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot)			
358.	24750 <i>Platycercus zonarius</i> subsp. <i>semitorquatus</i> (Twenty-eight Parrot)			
359.	24843 <i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
360.	25509 <i>Pletholax gracilis</i> (Keeled Legless Lizard)			
361.	25007 <i>Pletholax gracilis</i> subsp. <i>gracilis</i> (Keeled Legless Lizard)			
362.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)		IA	
363.	24383 <i>Pluvialis squatarola</i> (Grey Plover)		IA	
364.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
365.	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
366.	<i>Podykippus collinus</i>			
367.	25510 <i>Pogona minor</i> (Dwarf Bearded Dragon)			
368.	24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
369.	24681 <i>Poliocephalus poliocephalus</i> (Hoary-headed Grebe)			
370.	25722 <i>Polytelis anthopeplus</i> (Regent Parrot)			
371.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
372.	24767 <i>Porphyrio porphyrio</i> subsp. <i>bellus</i> (Purple Swamphen)			
373.	24769 <i>Porzana fluminea</i> (Australian Spotted Crake)			
374.	25732 <i>Porzana pusilla</i> (Baillon's Crake)			
375.	24770 <i>Porzana pusilla</i> subsp. <i>palustris</i> (Baillon's Crake)			
376.	24771 <i>Porzana tabuensis</i> (Spotless Crake)			
377.	<i>Prionosternum nitidiceps</i>			
378.	<i>Prionosternum scutatatum</i>			
379.	<i>Pseudalampona woodman</i>			
380.	25511 <i>Pseudonaja affinis</i> (Dugite)			
381.	25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
382.	42416 <i>Pseudonaja mengdeni</i> (Western Brown Snake)			
383.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
384.	48085 <i>Psittacula krameri</i> (Indian Ringnecked Parrot, Rose-ringed Parakeet)	Y		
385.	24702 <i>Pterodroma brevirostris</i> (Kerguelen Petrel)			
386.	25711 <i>Pterodroma mollis</i> (Soft-plumaged Petrel)			
387.	<i>Pterois antennata</i>			
388.	<i>Pterygotrigla polyommata</i>			
389.	24711 <i>Puffinus assimilis</i> subsp. <i>assimilis</i> (Little Shearwater)			
390.	<i>Purpureicephalus spurius</i>			
391.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
392.	24243 <i>Rattus fuscipes</i> (Western Bush Rat)			
393.	24245 <i>Rattus rattus</i> (Black Rat)	Y		
394.	<i>Raveniella arenacea</i>			
395.	<i>Raveniella cirrata</i>			
396.	<i>Raveniella peckorum</i>			
397.	<i>Raveniella subcirrata</i>			
398.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
399.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
400.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
401.	48237 <i>Rostratula australis</i> (Australian Painted Snipe)		T	
402.	<i>Scolopendra laeta</i>			
403.	<i>Scorpis georgianus</i>			
404.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
405.	<i>Servaea melaina</i>			
406.	<i>Servaea spinibarbis</i>			
407.	24145 <i>Setonix brachyurus</i> (Quokka)		T	
408.	<i>Simaetha tenuior</i>			
409.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
410.	25267 <i>Simoselaps littoralis</i> (West Coast Banded Snake)			
411.	<i>Siphonognathus radiatus</i>			
412.	<i>Smeringopus natalensis</i>			
413.	30948 <i>Smicromis brevirostris</i> (Weebill)			
414.	<i>Steatoda capensis</i>			
415.	<i>Steatoda grossa</i>			
416.	48116 <i>Stercorarius antarcticus</i> (Brown Skua)		P4	
417.	24516 <i>Stercorarius longicaudus</i> (long-tailed jaeger, long-tailed skua)		IA	
418.	24517 <i>Stercorarius parasiticus</i> (Arctic jaeger, Arctic Skua)		IA	
419.	24518 <i>Stercorarius pomarinus</i> (Pomarine Jaeger, Pomarine Skua)		IA	
420.	25640 <i>Sterna dougallii</i> (Roseate Tern)		IA	
421.	25642 <i>Sterna hirundo</i> (Common Tern)		IA	
422.	24526 <i>Sterna hirundo</i> subsp. <i>hirundo</i> (Common Tern)		IA	Y
423.	24528 <i>Sterna hybrida</i> subsp. <i>javanica</i> (Whiskered Tern)			
424.	48593 <i>Sternula albifrons</i> (Little Tern)		IA	
425.	48594 <i>Sternula nereis</i> (Fairy Tern)			
426.	24329 <i>Stictonetta naevosa</i> (Freckled Duck)			
427.	<i>Stigmatopora argus</i>			
428.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
429.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
430.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
431.	30950 <i>Streptopelia senegalensis</i> subsp. <i>senegalensis</i> (Laughing Turtle-Dove)	Y		
432.	24942 <i>Strophurus spinigerus</i> subsp. <i>spinigerus</i>			
433.	<i>Supunna funerea</i>			
434.	<i>Supunna picta</i>			
435.	24259 <i>Sus scrofa</i> (Pig)	Y		
436.	33992 <i>Synemon gratioa</i> (Graceful Sunmoth)		P4	
437.	<i>Synothele michaelsoni</i>			
438.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
439.	24682 <i>Tachybaptus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
440.	24207 <i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
441.	25552 <i>Tadorna radjah</i> (Radjah Shelduck)			
442.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
443.	<i>Tamopsis distinguenda</i>			
444.	<i>Tamopsis perthensis</i>			
445.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
446.	<i>Tetragnatha nitens</i>			
447.	<i>Tetragnatha valida</i>			
448.	44607 <i>Thalassarche melanophris</i> (Black-browed Albatross)		T	
449.	48597 <i>Thalasseus bergii</i> (Crested Tern)		IA	
450.	48135 <i>Thinornis rubricollis</i> (Hooded Plover, Hooded Dotterel)		P4	
451.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
452.	33994 <i>Throscodectes xiphos</i> (Stylet Bush Cricket, Stylet Throscro (Jandakot))		P1	Y
453.	25203 <i>Tiliqua occipitalis</i> (Western Bluetongue)			
454.	25519 <i>Tiliqua rugosa</i>			
455.	25204 <i>Tiliqua rugosa</i> subsp. <i>aspera</i>			
456.	25207 <i>Tiliqua rugosa</i> subsp. <i>rugosa</i>			
457.	<i>Tinytrema yarra</i>			
458.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
459.	24309 <i>Todiramphus sanctus</i> subsp. <i>sanctus</i> (Sacred Kingfisher)			
460.	<i>Torquigener pleurogramma</i>			
461.	48141 <i>Tribonyx ventralis</i> (Black-tailed Native-hen)			
462.	25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
463.	24754 <i>Trichoglossus haematodus</i> subsp. <i>rubitorquis</i> (Red-collared Lorikeet)			
464.	25521 <i>Trichosurus vulpecula</i> (Common Brushtail Possum)			
465.	24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum)			
466.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)		P4	
467.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	
468.	24808 <i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
469.	24809 <i>Tringa stagnatilis</i> (Marsh Sandpiper, little greenshank)		IA	
470.	48147 <i>Turnix varius</i> (Painted Button-quail)			
471.	24851 <i>Turnix velox</i> (Little Button-quail)			
472.	24069 <i>Tursiops truncatus</i> (Bottlenose Dolphin)			
473.	24852 <i>Tyto alba subsp. delicatula</i> (Barn Owl)			
474.	24855 <i>Tyto novaehollandiae subsp. novaehollandiae</i> (Masked Owl (southwest))		P3	
475.	<i>Urodacus novaehollandiae</i>			
476.	25577 <i>Vanellus miles</i> (Masked Lapwing)			
477.	24386 <i>Vanellus tricolor</i> (Banded Lapwing)			
478.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
479.	<i>Venator immansueta</i>			
480.	<i>Venatrix pullastra</i>			
481.	24206 <i>Vespadelus regulus</i> (Southern Forest Bat)			
482.	24040 <i>Vulpes vulpes</i> (Red Fox)	Y		
483.	34113 <i>Westralunio carteri</i> (Carter's Freshwater Mussel)		T	
484.	<i>Westrarchaea sinuosa</i>			
485.	41351 <i>Xenus cinereus</i> (Terek Sandpiper)		IA	
486.	<i>Zebraplatys fractivittata</i>			
487.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silvereye)			

Conservation Codes

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

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.



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 [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 03/08/20 15:07:48

[Summary](#)

[Details](#)

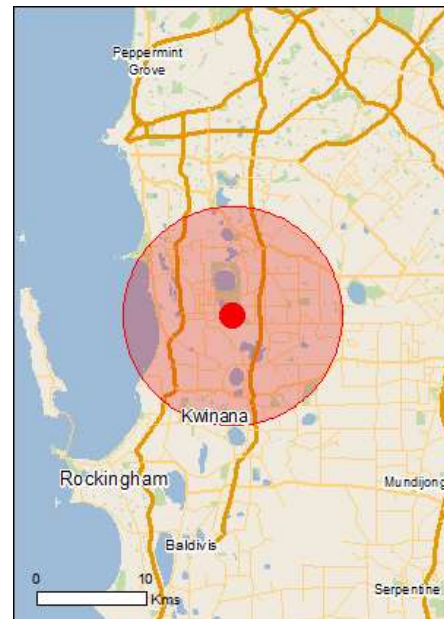
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

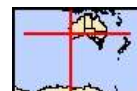
[Acknowledgements](#)



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[Coordinates](#)

Buffer: 10.0Km



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 [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	58
Listed Migratory Species:	60

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 heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) 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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	91
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	12
Regional Forest Agreements:	None
Invasive Species:	42
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Forrestdale and thomsons lakes	Within Ramsar site
Peel-yalgorup system	30 - 40km upstream

Listed Threatened Ecological Communities	[Resource Information]
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 distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.	

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species	[Resource Information]	
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii		
Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Roosting known to occur within area
Calyptorhynchus latirostris		
Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area

Name	Status	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Insects		
Neopasiphae simplicior A native bee [66821]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat may occur within area
Dasyurus geoffroi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardeenna carneipes Flesh-footed Shearwater, Fleishy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Puffinus carneipes Flesh-footed Shearwater, Fleishy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Whales and other Cetaceans		
		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Gibbs Road	WA
Harry Waring Marsupial Reserve	WA
Modong	WA
Piara	WA
Thomsons Lake	WA
Unnamed WA39584	WA
Unnamed WA39752	WA
Unnamed WA42469	WA
Unnamed WA48291	WA
Unnamed WA49220	WA
Unnamed WA49561	WA
Wandi	WA

Invasive Species	[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 Resources Audit, 2001.	

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		within area Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area

Mammals

Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Plants

Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species

Name	Status	Type of Presence
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		habitat may occur within area Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
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]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands		<u>[Resource Information]</u>
Name	State	
Gibbs Road Swamp System	WA	
Spectacles Swamp	WA	
Thomsons Lake	WA	

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 and National Heritage properties, Wetlands of International and National 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 distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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.

Coordinates

-32.17512 115.83461

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

Appendix E

Conservation Significant Species and Likelihood of
Occurrence Assessment



Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Bird					
<i>Anous stolidus</i>	Common noddy	MI	MI	Tropical and subtropical seas, cayes, reefs, buoys and piles (Pizzey & Knight 2012).	Unlikely
<i>Anous tenuirostris melanops</i>	Australian lesser noddy	EN	VU	Very common in blue-water seas around the Abrolhos (endemic to this area, accidental occurrences on lower west coast of Australia) (Johnstone and Storr 1998).	Unlikely
<i>Apus pacificus</i>	Pacific swift	MI	MI	Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Pizzey & Knight 2012).	Possible
<i>Ardenna carneipes</i>	Flesh-footed shearwater	VU	MI	Marine species that breeds on islands off south coast from near Cape Leeuwin (Johnstone and Storr 1998).	Unlikely
<i>Arenaria interpres</i>	Ruddy turnstone	MI	MI	Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	Unlikely
<i>Botaurus poiciloptilus</i>	Australasian bittern	EN	EN	In or over water, in tall reedbeds, sedges, rushes, cumbungi, lignum. Also occurs in ricefields, drains in tussocky paddocks and occasionally in saltmarshes and brackish wetlands.	Unlikely
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	MI	MI	Occurs in tidal mudflats, saltmarshes and mangroves, as well as, shallow fresh, brackish or saline inland wetlands. It is also known from floodwaters, irrigated pastures and crops, sewage ponds, saltfields.	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Calidris alba</i>	Sanderling	MI	MI	Mainly steeply shelving sandy beaches exposed to ocean swell. Also sandy inlets, estuarine sandbanks and near-coastal saltlakes (including saltwork ponds) (Johnstone & Storr 1998).	Unlikely
<i>Calidris canutus</i>	Red knot	EN	EN (MI)	Mud and sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds.	Unlikely
<i>Calidris ferruginea</i>	Curlew sandpiper	CR	CR (MI)	Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater lakes and swamps. Also beaches and near-coastal sewage ponds.	Unlikely
<i>Calidris melanotos</i>	Pectoral sandpiper	MI	MI	Mainly fresh waters (swamps, lagoons, river pools, irrigation channels and sewage ponds); also samphire flats around estuaries and saltlakes (Johnstone & Storr 1998).	Unlikely
<i>Calidris ruficollis</i>	Red-necked stint	MI	MI	Tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands (coastal and inland), saltfields, sewage ponds (Pizzey and Knight 2012).	Unlikely
<i>Calidris subminuta</i>	Long-toed stint	MI	MI	Mainly freshwater swamps (especially when drying and where vegetation is short), river pools, lagoons and claypans; also brackish pools, sewage ponds and samphire flats around estuaries and saltlakes.	Unlikely
<i>Calidris tenuirostris</i>	Great knot	CR	CR (MI)	Mud or sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds.	Unlikely
<i>Calyptorhynchus banksii naso</i>	Forest red-tailed black cockatoo	VU	VU	Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding Corymbia calophylla, Eucalyptus marginata, introduced Melia azdarach and Eucalyptus spp. trees.	Recorded

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Calyptorhynchus baudinii</i>	Baudin's cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding <i>Corymbia calophylla</i> , <i>Banksia</i> spp., <i>Hakea</i> spp., and to fruiting apples and pears (Johnstone and Storr 1998).	Unlikely
<i>Calyptorhynchus latirostris</i>	Carnaby's cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of <i>Pinus</i> spp. Attracted to seeding <i>Banksia</i> spp., <i>Dryandra</i> spp., <i>Hakea</i> spp., <i>Eucalyptus</i> spp., <i>Corymbia calophylla</i> , <i>Grevillea</i> spp., and <i>Allocasuarina</i> spp. (Johnstone and Storr 1998).	Possible
<i>Charadrius dubius</i>	Little ringed plover	MI	MI	Open, muddy or sandy shores of lakes, swamps, tidal areas, sewage ponds or farm dams. Rare but regular summer migrant to Australia (Pizzey & Knight 2012).	Unlikely
<i>Charadrius leschenaultii</i>	Great sand plover	VU	VU (MI)	Wide sandy or shelly beaches, sandpits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dune wilderness, bare paddocks, seldom far inland (Pizzey & Knight 2012).	Unlikely
<i>Charadrius mongolus</i>	Lesser sand plover	EN	EN (MI)	Sandy beaches and tidal estuarine flats. Also near-coastal saltlakes, including saltwork ponds (Johnstone & Storr 1998).	Unlikely
<i>Chlidonias leucopterus</i>	White-winged black tern	MI	MI	Vegetated and open wetlands, brackish and saline lakes, saltfields, irrigated lands, sewage ponds and occasionally offshore.	Unlikely
<i>Diomedea amsterdamensis</i>	Amsterdam albatross	CR	EN (MI)	The Amsterdam albatross is a marine, pelagic seabird. It nests in open patchy vegetation (among tussocks, ferns or shrubs) near exposed ridges or hillocks (Weimerskirch et al. 1985). It sleeps and rests on ocean waters when not breeding (Marchant and Higgins 1990)	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Diomedea dabbenena</i>	Tristan albatross	CR	EN (MI)	The Tristan albatross is a marine, pelagic seabird. It forages in open water in the Atlantic Ocean near the Cape of Good Hope, South Africa. It sleeps and rests on ocean waters when not breeding (Marchant and Higgins 1990).	Unlikely
<i>Diomedea epomophora</i>	Southern royal albatross	VU	VU (MI)	Rare visitor to Western Australian seas; it breeds on subantarctic islands south of New Zealand (Johnstone and Storr 1998).	Unlikely
<i>Diomedea exulans exulans</i>	Snowy albatross	VU	VU (MI)	Regular visitor to open ocean and slope waters (mostly March-October) and less commonly over shelf. Nests at high latitude in the southern Indian and southern Atlantic Oceans	Unlikely
<i>Diomedea sanfordi</i>	Northern royal albatross	EN	EN	Species is marine, pelagic and aerial. Habitat includes subantarctic, subtropical, and occasionally Antarctic waters (Marchant & Higgins 1990). Rare visitors to south Western Australian waters.	Unlikely
<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Possible
<i>Gallinago hardwickii</i>	Latham's snipe	MI	MI	Soft, wet ground or shallow water with tussocks and other green or dead growth, wet parts of paddocks, seepage below dams, irrigated areas, scrub or open woodland from sea level to alpine bogs over 2000 m, samphire on saltmarshes and mangrove fringes. Rare visitor to Western Australia.	Unlikely
<i>Halobaena caerulea</i>	Blue petrel	MI	VU (MI)	Marine species that breeds on southern subantarctic and northern arctic islands. Only an accidental or uncommon visitor to Western Australian waters (Johnstone & Storr 1998).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Ixobrychus dubius</i>	Australian little bittern	P4	-	Dense vegetation surrounding/within freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of Typha spp., Baumea spp. and tall rushes in freshwater swamps around lakes and along rivers (Johnstone and Storr 1998).	Unlikely
<i>Leipoa ocellata</i>	Mallefowl	VU	VU	Scrubs and thickets of Eucalyptus spp., Melaleuca lanceolata and Acacia linophylla; also other dense litter-forming shrublands. Attracted to fallen wheat in stubbles and along roads (Johnstone and Storr 1998).	Unlikely
<i>Limicola falcinellus</i>	Broad-billed sandpiper	MI	MI	Tidal mudflats, reefs, saltmarsh, freshwater wetlands, sewage ponds, favours muddy ooze (Pizzey & Knight 2012).	Unlikely
<i>Limosa lapponica baueri</i>	Bar-tailed godwit	VU	VU	Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	Unlikely
<i>Limosa lapponica menzbieri</i>	Bar-tailed godwit	CR	CR	Mainly coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins and Davies 1996).	Unlikely
<i>Limosa limosa</i>	Black-tailed godwit	MI	MI	Tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes, flooded pastures, airfields (Pizzey & Knight 2012).	Unlikely
<i>Macronectes giganteus</i>	Southern giant-petrel	MI	EN (MI)	Breeds on southern subantarctic and antarctic islands. May visit Western Australian waters from February to December (mostly June to September) (Johnstone and Storr 1998).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Macronectes halli</i>	Northern giant petrel	MI	VU (MI)	Breeds on subantarctic islands. May visit Western Australian water from February to September (Johnstone and Storr 1998).	Unlikely
<i>Motacilla cinerea</i>	Grey wagtail	MI	MI	In Australia mostly near running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields and airfields (Pizzey & Knight 2012).	Unlikely
<i>Ninox connivens connivens</i>	Barking owl (southwest subpop.)	P2	-	Open forests, woodlands, dense scrubs, foothills, river red gums, and other large trees near watercourses penetrating otherwise open country. Also Melaleuca woodlands, mangroves, rainforests and deciduous vine scrubs (Johnstone and Storr 1998; Pizzey & Knight 2012).	Unlikely
<i>Numenius madagascariensis</i>	Eastern curlew	CR	CR (MI)	Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (including saltwork ponds) (Johnstone and Storr 1998).	Unlikely
<i>Numenius phaeopus</i>	Whimbrel	MI	MI	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, bare grasslands, sportsgrounds and lawns.	Unlikely
<i>Oceanites oceanicus</i>	Wilson's storm petrel	MI	MI	Marine, migratory species that may visit south-western Australian waters and shores in late autumn to winter (Pizzey & Knight 2012).	Unlikely
<i>Onychoprion anaethetus</i>	Bridled tern	MI	MI	Tropical and subtropical seas, offshore islands, rarely coasts (Pizzey & Knight).	Unlikely
<i>Oxyura australis</i>	Blue-billed duck	P4	-	Mainly deeper freshwater swamps and lakes; occasionally salt lakes and estuaries freshened by flood waters (Johnstone and Storr 1998).	Unlikely
<i>Pachyptila turtur subantarctica</i>	Fairy prion	-	VU	Breeds on subantarctic islands and is presumed to frequent subtropical waters during non-breeding period (TSSC 2015).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Pandion haliaetus</i>	Osprey	MI	MI	Coasts, estuaries, bays, inlets, islands, and surrounding waters; coral atolls, reefs, lagoons, rock cliffs, stacks (Pizzey & Knight 2012).	Unlikely
<i>Phaethon rubricauda</i>	Red-tailed tropicbird	P4 (M)	MI	Spend most of their lives at sea and rarely venture near land. This bird is normally found in tropical and subtropical seas around northern Australia. Though rarely seen in colder areas, a few pairs breed on Sugarloaf Rock, south of Cape Naturaliste (DPAW 2017b).	Unlikely
<i>Philomachus pugnax</i>	Ruff	MI	MI	Fresh, brackish and saline wetlands; tidal mudflats, saltfields, sewage ponds (Pizzey & Knight 2012).	Unlikely
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI	Well-vegetated wetlands, wet pasture, ricefields, floodwaters, floodplains, brackish or occasionally saline wetlands, mangroves, mudflats and occasionally dry grassland (Pizzey & Knight 2012).	Unlikely
<i>Pluvialis fulva</i>	Pacific golden plover	MI	MI	Estuaries, mudflats, saltmarshes, mangroves; rocky reefs and stranded seaweed on ocean shores; margins of shallow open inland swamps; sewage ponds, short-grass paddocks, sportsgrounds, airfields, ploughed land (Pizzey & Knight 2012).	Unlikely
<i>Pluvialis squatarola</i>	Grey Plover	MI	MI	Mudflats, saltmarsh, tidal reefs and estuaries, rarely inland (Pizzey and Knight 2012).	Unlikely
<i>Pterodroma mollis</i>	Soft-plumaged petrel	MI	VU (MI)	Marine species that breeds on temperate and subantarctic islands in south Atlantic and south Indian Ocean. Visitor to West Australian waters from March to September. Rarely observed inshore (Johnstone & Storr 1998).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Puffinus pacificus</i>	Wedge-tailed shearwater	MI	MI	Pelagic, marine bird known from tropical and subtropical waters. Tolerates a range of surface-temperatures and salinities, but is most abundant where temperatures are greater than 21 °C and salinity is greater than 34.6 ‰ (sprat).	Unlikely
<i>Rostratula australis</i>	Australian painted snipe	EN	EN	Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Marchant and Higgins 1993).	Unlikely
<i>Stercorarius antarcticus</i>	Brown skua	MI	MI	Mostly beyond shelf break; occasionally on beaches foraging on dead seals or whales (Pizzey & Knight 2012).	Unlikely
<i>Stercorarius longicaudus</i>	Long-tailed skua	MI	MI	Marine, migratory species that rarely occurs in south-western Australia (Pizzey & Knight 2012)	Unlikely
<i>Stercorarius parasiticus</i>	Arctic skua	MI	MI	Offshore waters, bays and harbours, seldom ashore. Also follows ships.	Unlikely
<i>Stercorarius pomarinus</i>	Pomarine Skua (Pomarine Jaeger)	MI	MI	Oceans, offshore waters, entrances of harbours, bays	Unlikely
<i>Sterna albifrons</i>	White-shafted Little Tern (Little Tern)	MI	MI	Coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewage ponds near coast	Unlikely
<i>Sterna bergii</i>	Crested tern	MI	MI	Mainly blue-water seas (especially within 3 km of land), including southern estuaries in summer and autumn (when free of silt); also tidal creeks in north, but not penetrating far into larger estuaries.	Unlikely
<i>Sterna caspia</i>	Caspian tern	MI	MI	Mainly sheltered areas, estuaries (when not laden with silt) and tidal creeks; occasionally near-coastal saltlakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh waters.	Unlikely
<i>Sterna dougallii</i>	Roseate tern	MI	MI	Offshore waters, islands, coral reefs, sand cays, beaches, tidal inlets (Pizzey & Knight 2012).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Sterna hirundo</i>	Common tern	MI	MI	Offshore waters, beaches, reefs, bays, estuaries, sandflats, saltfields, sewage ponds, freshwater wetlands (Pizze & Knight 2012).	Unlikely
<i>Sterna hirundo hirundo</i>	n/a	MI	MI	Offshore waters, beaches, reefs, bays, estuaries, sandflats, saltfields, sewage ponds, freshwater wetlands.	Unlikely
<i>Sterna nilotica</i>	Gull-billed tern	MI	MI	Beaches, mudflats; fresh, brackish wetlands, including far inland; grasslands, crops, ploughed fields, airfields (Pizze & Knight 2012).	Unlikely
<i>Sternula nereis nereis</i>	Australian fairy tern	VU	VU	Sheltered blue-water seas close to land, estuaries (when free of silt) and near-coastal lakes (Johnstone and Storr 1998).	Unlikely
<i>Thalassarche carteri</i>	Indian yellow-nosed albatross	EN	VU (MI)	Marine species that inhabits seas of south and west coast of Western Australia and breeds on islands in the south Indian Ocean and in the south Atlantic (Johnstone & Storr 1998).	Unlikely
<i>Thalassarche cauta cauta</i>	Shy albatross	VU	VU (MI)	Scarce visitor (late May to mid-October) to southwestern and western seas. Breeds on islands off Tasmania and south New Zealand (Johnstone and Storr 1998).	Unlikely
<i>Thalassarche chrysostoma</i>	Grey-headed albatross	VU	E (MI)	Marine migratory species that remains at sea for most of its life. Breeding habitat on subantarctic and Antarctic islands of the Indian and Atlantic Oceans and seas south of New Zealand (Marchant and Higgins 1993).	Unlikely
<i>Thalassarche melanophris</i>	Black-browed albatross	EN	VU (MI)	Seas of south and west coasts. Visitor to Western Australian mainland from January to early November (mostly May to September). Breeds on southern subantarctic and antarctic islands (Johnstone and Storr 1998).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Thalassarche melanophris impavida</i>	Campbell albatross	VU	VU (MI)	Scarce visitor to south western and western seas. Breeds on Campbell island.	Unlikely
<i>Thalassarche steadi</i>	White-capped albatross	VU	VU (MI)	Marine species that occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America (Marchant & Higgins 1990). The species has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore (Marchant 1977) and enters harbours and bays (Jehl 1973). Birds gather to scavenge at commercial fishing grounds.	Unlikely
<i>Thinornis rubricollis</i>	Hooded plover	P4	VU	Margins and shallows of saltlakes, sandy and seaweedy beaches and estuaries; also dams (Johnstone & Storr 1998).	Unlikely
<i>Tringa brevipes</i>	Grey-tailed tattler	P4 (MI)		Tidal mud and reef flats, sheltered rocky coasts, stony and seaweedy beaches and sandpits, dry coral ridges (Abrolhos) and pebbly shores of near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	Unlikely
<i>Tringa cinerea</i>	Terek sandpiper	MI	MI	Tidal mudflats, estuaries; shores and reefs of islands; coastal swamps, commercial saltfields (Pizzey & Knight 2012).	Unlikely
<i>Tringa glareola</i>	Wood sandpiper	MI	MI	Mainly shallow fresh waters (lagoons, swamps, claypans, river pools, dams, bore overflows and sewage ponds); occasionally brackish swamps, rarely saltlakes and estuaries (Pizzey & Knight).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Tringa hypoleucos</i>	Common sandpiper	MI	MI	Edge of sheltered waters salt or fresh, e.g. estuaries, mangrove creeks, rocky coasts, near-coastal saltlakes (including saltwork ponds), river pools, lagoons, claypans, drying swamps, flood waters, dams and sewage ponds. Preferring situations where low perches are available (Johnstone & Storr 1998).	Unlikely
<i>Tringa nebularia</i>	Common greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes, wetlands, claypans (fresh and saline), commercial saltfields, sewage ponds (Pizzey & Knight 2012).	Unlikely
<i>Tringa stagnatilis</i>	Marsh sandpiper	MI	MI	Mainly shallow fresh or brackish waters: swamps, lakes, river pools, soaks, sewage ponds and bore overflows. Occasionally estuaries and salt ponds, and rarely coasts.	Unlikely
<i>Tyto novaehollandiae novaehollandiae</i>	Australian masked owl	P3	-	Forests, open woodlands, farmlands with large trees. E.g. river red gums, adjacent cleared country, timbered watercourses, paperbark woodlands and caves (Pizzey & Knight 2012).	Unlikely
Invertebrate					
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	-	Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003).	Possible
<i>Westralunio carteri</i>	Carter's freshwater mussel	VU	VU	Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots. Also occupies lentic systems including large water supply dams and even on-stream farm dams. Salinity tolerance quite low (Morgan et al. 2011).	Unlikely
<i>Neopasiphae simplicior</i>	a short-tongued bee	EN	CR	This species of native bee has been collected on flowers of <i>Goodenia filiformis</i> , <i>Lobelia tenuior</i> , <i>Angianthus preissianus</i> and <i>Velleia</i> sp. (Houston 2000).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Leioproctus contrarius</i>	a short-tongued bee	P3	-	Life history and habits are poorly documented/ unknown. It has been recorded only on flowers of Goodeniaceae and possibly <i>Lechenaultia stenosepala</i> (Bamford 2003).	Unlikely
<i>Synemon gratiosa</i>	Graceful sunmoth	P4	-	Coastal heathland on Quindalup dunes where it is restricted to secondary sand dunes due to the abundance of the preferred host plant <i>Lomandra maritima</i> . Banksia woodland on Spearwood and Bassendean dunes, where the second known host plant <i>L. hermaphrodita</i> is widespread (DEC 2011).	Unlikely
<i>Throscodectes xiphos</i>	Stylet bush cricket	P1	-	Species poorly understood and documented. Known from Jandacot area, where it was originally collected in the axial leaf bases of grass trees (<i>Xanthorrhoea preisei</i>) (Invertebrate Solutions 2019).	Unlikely
Mammal					
<i>Isoodon fusciventer</i>	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	Recorded
<i>Dasyurus geoffroii</i>	Chuditch	VU	VU	Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along road sides in the wheatbelt (DEC 2012b).	Unlikely
<i>Setonix brachyurus</i>	Quokka	VU	VU	On the mainland mostly dense streamside vegetation or shrubland and heath areas, particularly around swamps (Cronin 2007).	Unlikely
<i>Bettongia penicillata ogilbyi</i>	Woylie	CR	EN	Woodlands and adjacent heaths with a dense understorey of shrubs, particularly <i>Gastrolobium</i> spp. (TSSC 2018).	Unlikely
<i>Myrmecobius fasciatus</i>	Numbat	EN	EN	Generally dominated by <i>Eucalyptus</i> spp. that provide hollow logs and branches for shelter and termites for food (van Dyck & Strahan 2008).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Pseudocheirus occidentalis</i>	Western ringtail possum	CR	CR	On the Swan Coastal Plain in <i>Agonis flexuosa</i> woodlands and <i>Agonis flexuosa</i> / <i>Eucalyptus gomphocephala</i> forests. Also <i>Eucalyptus marginata</i> forests (DBCAs 2017).	Unlikely
<i>Falsistrellus mackenziei</i>	Western false pipistrelle	P4	-	High rainfall forests dominated by jarrah, karri, marri, and tuart. Occupies hollow logs for breeding and resting (Van Dyck and Strahan 2008). Also known to utilise <i>Banksia</i> woodland on the Swan Coastal Plain (Hosken and O'Shea 1995).	Unlikely
<i>Hydromys chrysogaster</i>	Rakali	P4	-	Areas with 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).	Unlikely
<i>Notamacropus eugenii derbianus</i>	Tammar wallaby	P4	-	Dry sclerophyll forest, <i>Banksia</i> spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	Unlikely
<i>Notamacropus irma</i>	Western brush wallaby	P4	-	Dry sclerophyll forest, <i>Banksia</i> spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	Unlikely
<i>Phascogale tapoatafa wambenger</i>	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	Unlikely
Reptile					
<i>Lerista lineata</i>	Perth slider	P3	-	Sandy coastal heath and low scrubland. <i>Banksia</i> spp. woodland, <i>Eucalyptus gomphocephala</i> open woodland over deep sands, and coastal dunes immediately adjacent to the beach (Wilson and Swan 2017).	Possible
<i>Neelaps calonotos</i>	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and <i>Banksia</i> spp. woodlands (Bush et al. 2002).	Unlikely

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		

Note: CE=critically endangered, EN=endangered, VU=vulnerable, CD=conservation dependent, MI=migratory, OS=other specially protected, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4. Species recorded or considered to potentially occur within the site are shaded green.

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Appendix F

Species List



Category	Status	Species name	Common name	Record type
Birds		<i>Anthochaera carunculata</i>	Red wattlebird	Sight, call
		<i>Cacatua roseicapilla</i>	Galah	Sight, call
	VU	<i>Calyptorhynchus banksii naso</i>	Forest red-tailed black cockatoo	Foraging evidence
		<i>Coracina novaehollandiae</i>	Black-faced cuckoo-shrike	Sight, call
		<i>Corvus coronoides</i>	Australian raven	Sight, call
		<i>Cracticus tibicen</i>	Australian magpie	Sight, call
		<i>Dacela novaeguineae</i>	Laughing kookaburra	Sight, call
		<i>Hirundo neoxena</i>	Welcome swallow	Sight
		<i>Pardalotus striatus</i>	Striated pardalote	Sight, call
		<i>Phylidonyris novaehollandiae</i>	New Holland honey eater	Sight, call
		<i>Platycercus zonarius semitorquatus</i>	Twenty-eight parrot	Sight, call
		<i>Rhipidura leucophrys</i>	Willie wagtail	Sight, call
		<i>Smicronis brevirostris</i>	Weebill	Sight, call
	<i>Threskiornis moluccus</i>	Australian white ibis	Sight	
Mammals	P4	<i>Isoodon fusciventer</i>	Quenda	Digging
		<i>Macropus fuliginosus</i>	Western grey kangaroo	Scat
	* DP	<i>Oryctolagus cuniculus</i>	Rabbit	Scat
	* DP	<i>Vulpes vulpes</i>	Fox	Scat

Note: * denotes introduced fauna species, DP=declared pest under the BAM Act, EN=Endangered under the EPBC Act,VU=Vulnerable under the EPBC Act

Appendix G

Black Cockatoo Habitat Tree Data





Black Cockatoo Habitat Tree Inventory
Lots 76 and 107 Wattleup Road, Hammond Park

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
548	390037.71	6439448.27	95	<i>Eucalyptus marginata</i>	No suitable hollows	
549	390032.43	6439544.00	86	<i>Eucalyptus marginata</i>	No suitable hollows	
550	390037.77	6439729.32	68	<i>Eucalyptus marginata</i>	No suitable hollows	
551	390083.53	6439588.24	69	<i>Eucalyptus marginata</i>	No suitable hollows	

Appendix H

Overall Habitat Quality Assessment



		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	N	2.0	0.0	1.0
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				0.0
			within 6 km of a nest(s) (active, historical or potential)	N	1.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	N	0.5	0.0	
		1.3	The site is located within 6 km of:				3.0
			>1000 ha of potential foraging habitat	Y	3.0	3.0	
	Species stocking rate	1.4	The site contains:				0.0
			historical nest(s)	N	1.0	0	
The site contains:						0.0	
active nest(s)			N	3.0	0		
potential nest(s)			N	1.0	0		
Score			4	10.0			

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0	
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0		
	Site context	2.3	The site is located:				0.0	
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0		
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0		
	Species stocking rate	2.4	The site contains:				0.0	
			a historical record of a large roost (≥150 individuals)	N	2.0	0		
			a historical record of a small roost (<150 individuals)	N	1.0	0		
			The site contains:					0.0
			an active record of a large roost (≥150 individuals)	N	2.0	0.0		
an active record of a small roost (<150 individuals)	N	1.0	0.0					
Score			2	7.0				

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				2.0
			≥50% primary foraging plants		4.0	0.0	
			≥10% to <50% primary foraging plants	Y	2.0	2.0	
			<10% primary foraging plants		1.0	0.0	
	Site context	3.2	The site is located:				1.0
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				1.0
			within 6 km of a roost(s) (active or historical)	Y	1.0	1.0	
	6-12 km from a roost(s) (active or historical)	Y	0.5	0.5			
Species stocking rate	3.4	The site contains:				0.0	
		abundant evidence of foraging	N	2.0	0.0		
		limited evidence of foraging	N	1.0	0.0		
Score			3	8.0			

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	4	Moderate
Roosting	2	Low
Foraging	3	Low

Overall habitat quality score	4	Moderate
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Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

		Query	Answer	Potential score	Site score	Sum	
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	N	2.0	0.0	1.0
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	1.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	Y	0.5	0.5	
		1.3	The site is located within 6 km of:				3.0
	>1000 ha of potential foraging habitat		Y	3.0	3.0		
	100 to 1000 ha of potential foraging habitat		Y	1.0	1.0		
	Species stocking rate	1.4	The site contains:				0.0
historical nest(s)			N	1.0	0		
The site contains:						0.0	
active nest(s)			N	3.0	0		
potential nest(s)			N	1.0	0		
Score			4	10.0			

Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0	
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0		
	Site context	2.3	The site is located:				0.0	
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0		
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0		
	Species stocking rate	2.4	The site contains:				0.0	
			a historical record of a large roost (≥150 individuals)	N	2.0	0		
			a historical record of a small roost (<150 individuals)	N	1.0	0		
			The site contains:					0.0
			an active record of a large roost (≥150 individuals)	N	2.0	0.0		
an active record of a small roost (<150 individuals)	N	1.0	0.0					
Score			2	7.0				

Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				1.0
			≥50% primary foraging plants		4.0	0.0	
			≥10% to <50% primary foraging plants		2.0	0.0	
			<10% primary foraging plants	Y	1.0	1.0	
	Site context	3.2	The site is located:				1.0
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	
			6-12 km from a nest(s) (active, historical or potential)	Y	1.00	1.0	
		3.3	The site is located:				0.5
			within 6 km of a roost(s) (active or historical)	Y	1.0	1.0	
	6-12 km from a roost(s) (active or historical)	Y	0.5	0.5			
Species stocking rate		3.4	The site contains:				1.0
			abundant evidence of foraging	N	2.0	0.0	
	limited evidence of foraging		Y	1.0	1.0		
Score			3	8.0			

SUMMARY		
Habitat category	Score	Habitat quality
Breeding	4	Moderate
Roosting	2	Low
Foraging	3	Low

Overall habitat quality score	4	Moderate
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Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category