State Football Centre Native Vegetation Clearing Permit Application – Supporting Information

Attachment 5

Basic Fauna and Targeted Black Cockatoo Habitat Assessment (Emerge Associates 2020)

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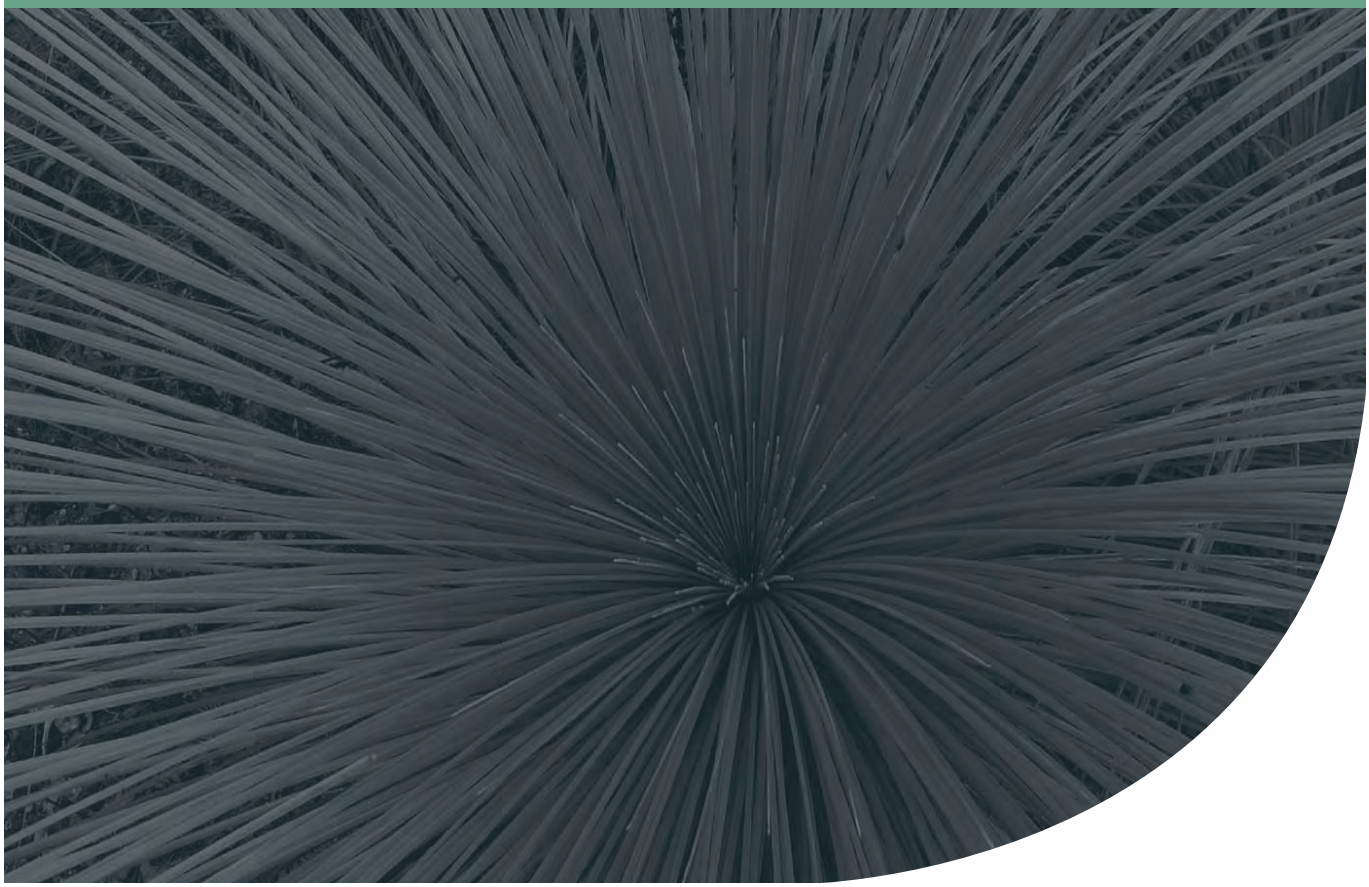
Basic Fauna and Targeted Black Cockatoo Assessment

State Football Centre

Project No: EP20-012(14)

Prepared for Department of Finance – Building, Management and Works
September 2020



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Executive Summary

The Department of Local Government, Sport and Cultural Industries (DLGSC) in collaboration with the City of Canning (CoC) intends to develop part Lots 22 Wharf Street, 501 Welshpool Road, and two unnamed road reserves (land IDs 4423461 and 3848050) in Queens Park into a sporting facility for football (soccer). These lots (referred to as 'the site') is located approximately 10 kilometres (km) south-east of the Perth Central Business District within the City of Canning.

As part of the assessment a desktop assessment of relevant background information was completed and a field survey was undertaken on 29 July 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 survey was undertaken concurrently to determine the presence of habitat for three threatened black cockatoo species, Baudin's cockatoo, Carnaby's cockatoo and forest red-tailed black cockatoo that occur on the Swan Coastal Plain.

Outcomes of the basic fauna survey include the following:

- The majority of the site contains turf and bare ground with low fauna habitat values. The site also contains small patches of native woodland which provides the highest habitat value for native fauna.
- A total of 20 native and four introduced fauna species were positively identified to occur within the site, including threatened (endangered) Carnaby's cockatoo and (vulnerable) forest red-tailed black cockatoo.
- Additionally, it is considered possible that eight species of conservation significance not recorded during the field survey might occasionally occur within the site. Targeted surveys would need to be undertaken to confirm whether these species occur within the site.

Outcomes of the targeted black cockatoo survey include the following:

- The site occurs within the modeled distribution of all three species of black cockatoo and within the breeding range for Carnaby's cockatoo and forest red-tailed black cockatoo. Secondary foraging evidence attributed to forest red-tailed black cockatoo and Carnaby's cockatoo were recorded in multiple locations in the site.
- A total of 46 habitat trees were recorded of which none contain hollows that are suitable for breeding by black cockatoos. Therefore, the site does currently not provide breeding habitat for any of the three species of black cockatoo. The site lies outside of the known and predicted breeding range of Baudin's cockatoo and so the site would not provide breeding habitat for this species even if suitable hollows were present.
- No evidence of black cockatoo roosting activity was observed within the site. Roosting habitat for all three species of black cockatoo occurs within the site in the form of large trees.
- Foraging habitat for black cockatoos occurs within the site as scattered trees and relatively small patches of vegetation. A total of 1.57 ha primary and 0.23 ha secondary foraging habitat for Carnaby's cockatoo, 1.4 ha primary and 0.33 ha secondary foraging habitat for Baudin's cockatoo and 1.4 ha primary and 0.39 ha secondary foraging habitat for forest red-tailed black cockatoo was recorded within the site.

- The overall black cockatoo habitat quality score for the site was determined to be seven (high to moderate) for forest red-tailed black cockatoo, six (moderate) for Baudin's cockatoo and five (moderate) for Baudin's cockatoo.

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
BMW	Department of Finance – Building, Management and Works
CoC	City of Canning
DBCA	Department of Biodiversity, Conservation and Attractions
DLGSC	The Department of Local Government, Sport and Cultural Industries
DPaW	Department of Parks and Wildlife (now DBCA)
DAWE	Department of Agriculture, Water and the Environment
EPA	Environmental Protection Authority
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	*Biosecurity and Agriculture Management Act 2007*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
BC Act	*Biodiversity Conservation Act 2016*

Table A4: Abbreviations – planning

Planning terms	
MRS	Metropolitan Region Scheme
LPS	Local Planning Scheme

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

The Department of Local Government, Sport and Cultural Industries (DLGSC) in collaboration with the City of Canning (CoC) intends to develop part Lots 22 Wharf Street, 501 Welshpool Road, and two unnamed road reserves (land IDs 4423461 and 3848050) in Queens Park into a sporting facility for football (soccer). These lots (referred to as 'the site') are located approximately 10 kilometres (km) south-east of the Perth Central Business District within the City of Canning and are zoned 'parks and recreation' under the *Metropolitan Region Scheme* and 'parks and recreation' under the City of Canning *Local Planning Scheme No. 42.*

The site is approximately 16 hectares (ha) in size and is surrounded by Welshpool Road to the north, Wharf Street and residential lots to the west, Gibb Street to east and native bushland and Maniana Park 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 Department of Finance – Building, Management and Works (BMW) on behalf of the DLGSC and the CoC 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 relevant parts of 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.

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 14.4 mm of rainfall is recorded in July 2020 from the Gosnells weather station. Temperatures at the Gosnells weather station in July 2020 ranged from a mean maximum of 19^{o}C to a mean minimum of 8^{o}C (BoM 2020).

The average rainfall in July 2020 was therefore significantly lower than the average rainfall for July of 157.4 mm recorded from the Gosnells weather station (BoM 2020). The mean maximum and minimum temperatures are approximately consistent with the mean temperatures recorded for July by the Gosnells weather station.

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 soil mapping by (Gozzard 2011) places the site in Bassendean sand (S8) which was later confirmed during the field survey. The Bassendean sands are typically very light grey at the surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin (Purdie *et al.* 2004).

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

2.3 Topography

The elevation of the site ranges from 14 m in relation to the Australian height datum (mAHD) in the cenral part of the site to 11 mAHD in the southern part of the site (DoW 2008) (**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 2017b)
- *A Directory of Important Wetlands in Australia* (DBCA 2018).

No Ramsar or listed 'important wetlands' are located within or near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows that two 'perennial lakes' are located in the southern portion of the site. Aerial photography indicates that these features are connected or part of the same feature. The dataset also shows that four separate 'major drains' occur in the eastern and central portion of the site. Aerial photography indicates that three of these features are connected and are part of the same hydrological feature.

On the Swan Coastal Plain DBCA (2017a) have used 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 Department of Biodiversity, Conservation and Attractions (DBCA) maintains the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2020), which further 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) indicates that part of a 'multiple use' category wetland features (UFIs 7490) occurs within the majority of the site. One 'resource enhancement category wetland feature (UFI 15819) occurs in the south-eastern part of the site. Both features are classified as 'dampland' wetlands. A small portion of a larger wetland feature classed as 'no longer a wetland' is mapped over the western portion of the site. The locations of the geomorphic wetlands (excluding the wetland feature classed a no longer being a wetland) and other hydrological features in and near the site are shown in **Figure 2**.

2.5 Regional vegetation

Vegetation types and resulting fauna habitats also 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 'Southern river complex', which is described as open woodland of *Corymbia calophylla* - *Eucalyptus marginata* - *Banksia* spp. with fringing woodland of *Eucalyptus rudis* - *Melaleuca rhaphiophylla* along creek beds.

2.6 Historic land use

Review of historical images available from 1953 (WALIA 2020) onwards shows that the majority of the site was cleared of native vegetation prior to 1953, likely for residential, grazing and/or cropping uses.

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**.

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

Table 1: Summary of black cockatoo background review

Category	Site context	Source
Species distribution	• Site is in the western-most extent of the modelled distribution of Baudin's cockatoo, but not within its known or predicted breeding range. • Site is within the modelled distribution of Carnaby's cockatoo and within its 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	• No confirmed nesting records occur within the site or within 12 km. • Potential evidence of forest red-tailed black cockatoo breeding activity occurs within 6 km of the site.	BirdLife Australia database search (2020)

Table 1: Summary of black cockatoo background review (continued)

Category		Site context	Source
Carnaby's cockatoo breeding areas (12 km radius surrounding breeding sites)		• No confirmed breeding areas intersect the site. • No possible breeding areas intersect the site.	(Glossop *et al.* 2011)
Important bird areas for Carnaby's cockatoo		• None within the site • Northern Swan Coastal Plain and Mundaring-Kalamunda important bird areas occur within 12 km of the site	DPaW (2013)
Roost site		• None within the site • 43 roost sites within 12 km of the site (see **Table 2** and **Table 3**): o 10 associated with white-tailed^ black cockatoos o 19 associated with forest red-tailed black cockatoos o 14 associated with white^ and red-tailed black cockatoos	BirdLife Australia database search (2020)
Foraging habitat	White-tailed black cockatoo^	• Potential native foraging habitat mapped within the eastern portion of the site. • Extensive areas of potential native foraging habitat mapped within the wider local area of the site.	(Emerge Associates 2020a)
	White-tailed black cockatoo^	• No pine plantations mapped within the site or within 12 km.	Forest Products Commission (2017)
	Forest red-tailed black cockatoo	• Potential native foraging habitat mapped within eastern portions of the site. • Extensive areas of potential native foraging habitat mapped within the wider local area.	(Emerge Associates 2020b)

^Carnaby's and/or Baudin's cockatoo

Table 2: 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
CANWILR001	0	0	0	0	68	0	0	0	0	0
GOSCNVR001	0	19	NS	NS	0	0	0	0	NS	80
GOSCNVR002	NS	NS	26	52	0	0	151	0	0	0
GOSMARR001	NS	NS	NS	NS	NS	NS	NS	0	120	36
GOSSOUR002	NS	NS	NS	NS	NS	NS	50	0	0	0
KALMAIR002	NS	NS	NS	NS	0	NS	0	0	0	11
KALPIER001	NS	82	46	0	0	0	163	NS	210	133
KALWALR001	0	5	0	0	0	0	NS	0	0	NS
MELLEER001	0	0	12	0	70	0	0	0	15	2

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

Roost ID	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
MUNHELR001	NS	3	16	42	124	0	44	0	3	0
MUNHELR002	NS	NS	NS	NS	NS	NS	NS	NS	0	66
SOUCOMR001	408	645	558	301	402	460	242	289	470	563
SOUSALR001	12	0	0	0	5	0	0	0	2	0
VICKENR001	0	NS	0	0	0	0	0	0	0	2

NS = not surveyed

Table 3: 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
BAYMAYR001	NS	NS	0	0	NS	4
CANRIVR001	NS	NS	6	11	7	16
CANROSR001	NS	NS	0	0	14	2
CANWILR001	4	7	7	5	16	82
GOSCNVR001	2	0	0	0	NS	0
GOSCNVR002	0	4	0	0	0	0
GOSGOSR004	19	NS	31	32	79	0
GOSKENR001	NS	NS	NS	51	334	35
GOSKENR002	NS	NS	NS	NS	72	0
GOSMARR001	NS	NS	NS	75	37	18
GOSSOUR002	NS	NS	0	36	208	15
KALCARR003	NS	NS	NS	NS	NS	76
KALFORR002	NS	NS	NS	NS	42	65
KALFORR003	NS	NS	NS	NS	31	10
KALHIGR001	NS	NS	NS	7	78	5
KALHIGR003	NS	NS	0	7	0	NS
KALMAIR002	25	NS	56	98	137	304

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

Roost ID	Year					
	2014	2015	2016	2017	2018	2019
KALMAIR005	NS	NS	3	0	0	0
KALMAIR006	NS	NS	NS	3	NS	NS
KALPIER001	0	0	25	NS	29	6
KALWALR001	43	1	NS	0	0	NS
KALWATR002	NS	NS	150	31	150	23
MELLEER001	0	0	11	25	5	0
MUNHELR001	0	0	4	31	0	13
MUNHELR002	NS	NS	NS	NS	79	0
SOUCOMR001	0	0	0	0	0	1
SOUSALR001	2	0	0	0	8	0
STIMENR002	0	NS	0	5	0	0
SWAHAZR001	NS	NS	NS	NS	NS	12
VICKENR001	94	121	0	116	108	140
VICKENR002	NS	35	42	0	NS	NS
VICLATR001	0	0	0	0	15	32
VICWATR002	NS	NS	0	45	85	51

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 Department of Biodiversity, Conservation and Attractions (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 though 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**.

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 to Australia but some Australian or West 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.

The entirety of the site is mapped as a Bush Forever Site No. 283 (Queens Park Bushland). that also extends to the east of the site. Bush Forever Site No. 424 (McDowell Street Bushland) is adjacent to the site in the north-eastern corner but is separated from the site through Welshpool Road. The location of Bush Forever sites associated with the site is shown in **Figure 2**.

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. However, exemptions under Schedule 6 of the EP Act still apply, which includes any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

One ESA is mapped over the entirety of the site. Multiple additional ESAs are located within the wider area of the site. The location of the ESA mapped over the site and ESAs near the site are shown in **Figure 2**.

2.10 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).

There are no mapped ecological linkages within or adjacent to the site. Multiple ecological linkages occur within the wider area of the site as shown in **Figure 2.**

2.11 Previous surveys

Ecoscape (2010) have undertaken a 'Level 2' fauna assessment over a larger area including the site. One fauna species of conservation significance, namely Carnaby's cockatoo was positively identified as occurring within the surveys study area.

Prendergast (2020) have conducted surveys for native bees over multiple study sites in the wider Perth area including Maniana Park in close proximity to the site. Unpublished results available online indicate a range of bee species have been recorded including one undescribed bee species (*Leioproctus* (Euryglossidia) sp. F480 'knob-nosed").

3 Methods

3.1 Desktop assessment

A search was conducted for conservation significant fauna that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020), *NatureMap* (DBCA 2020a) and within 5 km using DBCA's conservation significant fauna database (reference no. FAUNA6196), previous surveys and literature references.

A total number of species with potential to occur within the site was calculated by adding the total number of non-conservation significant species provided by *NatureMap* to the combined number of conservation significant species provided by *NatureMap* and *Protected Matters Search Tool*.

3.2 Field survey

An ecologist from Emerge visited the site on 29 July 2020 during the day to conduct the basic fauna survey and targeted black cockatoo field survey. The survey was conducted from approximately 9:00 AM until 4:00 PM.

The weather conditions during the survey were dry with temperatures ranging from a minimum of 11.6^{o}C to maximum of 21^{o}C (AccuWeather 2020).

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.

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)

If hollows potentially suitable for breeding by a black cockatoo were recorded, the hollow was inspected further using a drone and/or a pole-mounted camera to confirm whether the hollows' internal dimensions were suitable. The internal hollow inspection also searched for signs of hollow use such as chew marks around the hollow entrance, nesting material such as feathers and presence of birds perching at the entrance or entering the hollow.

Following the internal hollow inspection, where required, all habitat trees were assigned to a category listed in **Table 5**.

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 or 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 assumed to provide potential roosting habitat.

No dusk 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 against the vegetation within the site (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Groom 2011; Johnstone *et al.* 2011; DSEWPaC 2012).

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 occasionally been recorded consuming 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. A list of plant species classified as primary or secondary foraging plants is provided as **Appendix B.**

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.

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. The identified fauna habitats were mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field.

3.3.2 Likelihood of occurrence

Information on specific habitat requirements and distribution of conservation significant fauna species identified to potentially 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.

3.3.3 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 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 also include a proportion of non-foraging plant species.

3.3.3.1 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 2020a). 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). 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**.

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 *Protected Matters Search Tool* (DAWE 2020) and *NatureMap* (DBCA 2020a). The basic scope of this fauna assessment did not include the application of search methods, sampling or identification 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 where 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. 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 qualified ecologist with three-years' experience, respectively. Technical review was undertaken by a senior 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. The targeted black cockatoo survey was undertaken during the Carnaby's cockatoo and forest red-tailed black cockatoo breeding season, maximising the likelihood of detecting breeding activity.
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.

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 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 the EPA's Technical Guidance (EPA 2020)	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 *the Australian Faunal Directory* (DAWE 2020b) nomenclature is used for bird species. This assessment uses the WAM *Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2020) nomenclature for birds and therefore does not strictly comply.

4 Results

4.1 General site conditions

The landform in the site is gently undulating and soils are sandy and white-grey in colour. Multiple drains are present of which some contained water during the field survey.

The site is largely cleared. However, multiple relatively small patches of native and non-native vegetation are present across the site. Native vegetation occurs in varying condition, with the most intact vegetation located in the north-eastern corner of the site.

4.2 Fauna habitat

Historical disturbance has significantly compromised fauna habitat values within the site. The majority of the native vegetation has been removed and vegetation now predominantly comprises cleared area, dominated by non-native and weed species with scattered or patches of native and non-native trees and shrubs. The site also comprises multiple small areas

A total of eight fauna habitats were identified within the site, including '**banksia woodland**', '**flooded gum woodland**', '**marri woodland**', '**melaleuca woodland**', '**predominantly non-native vegetation associated with perennial lake and drains**', '**predominantly turf and bare ground**', '**scattered native and non-native trees and shrubs**' and '**water**'.

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 8**. The location of each habitat is shown on **Figure 5**.

Multiple small areas of native vegetation, including **banksia woodland**, **marri woodland and flooded gum woodland** and **melaleuca woodland** are present within the site but occur as scattered patches. This vegetation provides a cover of native trees that may be utilised by native birds and arboreal fauna species. Where this vegetation is in better condition it also provides some microhabitats including logs and leaf litter which would provide habitat for a range of native fauna species. The **predominantly non-native vegetation associated with drains and perennial lake** and **water** habitats provide habitat for aquatic fauna species and those associated with riparian areas. The **scattered native and non-native trees and shrubs** and **predominantly turf and bare ground** habitats, while highly modified, would also provide habitat to a range of common and widespread native fauna species.

Table 8: Fauna habitats identified within the site.

Fauna habitat classification	Description	Area (ha)
Banksia woodland	Open woodland *Banksia menziesii* (banksia) and *Eucalyptus marginata* (jarrah) (or absent) over limited native understorey (or absent) including *Macrozamia fraseri*, *Xanthorrhoea preissii* (grass tree), over non-native grassland or bare ground.	0.34
Flooded gum woodland	Closed forest *Eucalyptus rudis* (flooded gum) and *Melaleuca preissii* (moonah) over weeds, bare ground and occasional native species.	0.42
Marri woodland	Open woodland Corymbia calophylla (marri) over limited native understorey (or absent), including *Xanthorrhoea preissii* (grass tree) over non-native grassland or bare ground.	1.44
Melaleuca woodland	Open woodland *Melaleuca preissiana* (moonah) over non-native grassland, bare ground and occasional native species.	0.43
Predominantly non-native vegetation associated with perennial lake and drains	Predominantly non-native grasses and/or reeds with occasional scattered non-native and occasional native trees and shrubs including **Eucalyptus camaldulensis* (river gum), **Corymbia maculata* (spotted gum), **Callistemon* sp. (bottlebrush), M*elaleuca preissiana* (moonah) and *Agonis flexuosa* (peppermint) over non-native grassland and occasional native species.	1.92
Predominantly turf and bare ground	Heavily disturbed areas comprising primarily bare ground and non-native grassland with occasional native or non-native trees and shrubs.	10.44
Scattered native and non-native trees and shrubs	Scattered native and non-native trees and shrubs including *Allocasuarina fraseriana* (sheoak), Macrozamia fraseri, *Adenanthos cygnorum* (common woollybush) and **Eucalyptus* spp.	0.84
Water	Permanent and temporary areas of water as identified on aerial imagery.	0.15

*denotes non-native plant species

Plate 1: Banksia woodland

Plate 2: Flooded gum woodland

Plate 3: Marri woodland

Plate 4: Melaleuca woodland

Plate 5: Predominantly non-native vegetation associated with drains and perennial lake

Plate 6: Predominantly turf and bare ground

Plate 7: Scattered native and non-native trees and shrubs

Plate 8: Water

4.3 Fauna

4.3.1 Desktop assessment

A total number of 643 fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site[1] as listed in **Appendix D**.

Of these species, 70 are conservation significant, including 35 threatened, 14 priority, 19 migratory fauna and two specially protected species as listed in **Appendix E**.

4.3.2 Species inventory

A total of 20 native and four introduced fauna species were directly or indirectly recorded during the field survey. A complete species list is provided in **Appendix F**.

4.3.3 Conservation significant fauna

Of the 21 native fauna species recorded, two are of conservation significance. Forest red-tailed black cockatoo were observed flying over the site during the field survey. Foraging evidence attributed to Carnaby's cockatoo and forest red-tailed black cockatoo was also observed within the site.

In addition to the aforementioned species of black cockatoo 'recorded' during the field survey, eight fauna species of conservation significance were considered 'possible' to occur in the site based on habitat requirements, species distribution and site conditions as shown in **Table 9**.

[1] Includes native and non-native species

The remainder of the conservation significant fauna species identified in the desktop assessment (53 species) 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**[2].

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					
Apus pacificus	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:** Potential habitat present. May opportunistically occur in or fly over the site on commute or while searching for prey.
Calyptorhynchus banksii naso	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:** Suitable foraging and roosting habitat present. Species observed flying over the site during the field survey. Foraging debris attributed to this species was also observed.
Calyptorhynchus baudinii	Baudin's cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding Corymbia calophylla, Banksia spp., Hakea spp., and to fruiting apples and pears (Johnstone and Storr 1998).	**Possible:** Suitable foraging and roosting habitat present but the site is located at the outer limits of species known distribution range. Opportunistic occurrence possible.

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

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

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		WA	EPBC Act		
Birds					
Calyptorhynchus latirostris	Carnaby's cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Dryandra spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998).	**Recorded:** Suitable foraging and roosting habitat present. Foraging debris attributed to this species was also observed. Extensive records located adjacent to and within the wider area of the site.
Falco peregrinus	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	**Possible:** Potential habitat present. Opportunistic fly over possible.
Invertebrate					
Idiosoma sigillatum	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:** Potential habitat present (sandy soils) and multiple historical records located near the site.
Mammals					
Isoodon fusciventer	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	**Possible:** Marginal habitat present (perennial lake, marri and banksia woodland) and site located within the species known range. Multiple recent records from near the site.

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

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		WA	EPBC Act		
Mammals					
Phascogale tapoatafa wambenger	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	**Possible:** Marginal habitat present (perennial lake, marri and banksia woodland) but very limited in extent. The site is located within the species known range. Recent records located within the wider area of the site.
Reptiles					
Lerista lineata	Perth slider	P3	-	Sandy coastal heath and low scrubland. Banksia spp. woodland, Eucalyptus gomphocephala open woodland over deep sands, and coastal dunes immediately adjacent to the beach (Wilson and Swan 2017). Occurs from Perth's southern suburbs to Mandurah (Bush et al. 1995).	**Possible:** Marginal habitat present (marri and banksia woodland) but limited in extent. Site is located on northern limit of the species range.
Neelaps calonotos	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2002).	**Possible:** Marginal habitat present (marri and banksia woodland) but very limited in extent. The site is located within the species known distribution range.

4.3.1 Declared pests

A total of two species, **Oryctolagus cuniculus* (rabbit) and *Trichoglossus moluccanus* (rainbow lorikeet) listed as a declared pests (C3) pursuant to the BAM Act, were identified from direct observation or scats within the site.

4.4 Black cockatoos

Forest red-tailed black cockatoos were recorded flying over the site during the field survey. Foraging evidence in the form of chewed marri fruit attributed to Carnaby's cockatoo and forest red-tailed black cockatoo was observed within the site.

4.4.1 Habitat

4.4.1.1 Breeding

A total of 46 black cockatoo habitat trees were recorded within the site as shown in **Figure 6**. A further 14 native eucalypts with DBH ≥50 cm that had no potential to form a suitable hollow were noted but not recorded as habitat trees (as discussed in **Section 3.2.2.1**).

The habitat trees comprised 41 *Corymbia calophylla* (marri) and five *Eucalyptus rudis* (flooded gum) trees.

None of the habitat trees present within the site contain hollows that are suitable for us 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)	46	0
Total	**46**	**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 clipping 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 Carnaby's cockatoo and forest red-tailed black cockatoo was recorded in multiple locations within the site. Most 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 black cockatoo foraging habitat within the site consists predominantly of marri, jarrah, banksia and sheoak trees. Marri and jarrah were classified as primary foraging plants for all three species of black cockatoo and banksia is a primary foraging plant for Carnaby's cockatoo. Sheoak was classed as a secondary foraging plant for Baudin's cockatoo and forest red-tailed black cockatoo. A summary of foraging habitat within the site is provided in **Table 11**.

The site also contains scattered non-native or planted secondary foraging plants, including Agonis *flexuosa* (peppermint), *Callistemon* spp. (bottlebrush), *Corymbia citriodora* (lemon scented gum) and *Eucalyptus camaldulensis* (river gum). Lemon scented gum was classified as a secondary foraging plant for all three species of black cockatoo and bottlebrush was classified as a secondary foraging plant for Carnaby's cockatoo and Baudin's cockatoo. Peppermint was classed as a secondary foraging plant for Carnaby's cockatoo and river gum was classes secondary foraging plant for forest red-tailed black cockatoo.

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	Baudin's	Forest red-tailed
Marri	Primary	Primary	Primary
Jarrah	Primary	Primary	Primary
Banksia	Primary	Secondary	-
Sheoak	-	Secondary	Secondary

Collectively, the site contains approximately 1.57 ha primary and 0.23 ha secondary foraging habitat for Carnaby's cockatoo, 1.4 ha primary and 0.33 ha secondary foraging habitat for Baudin's cockatoo and 1.4 ha primary and 0.39 ha secondary foraging habitat for forest red-tailed black cockatoo as outlined in **Table 12** and in **Figure 3** to **Figure 5**. The foraging habitat within the site occurs as scattered trees and small patches of vegetation. The area mapped as foraging habitat for each species also includes a proportion non-foraging plants as shown in **Table 12.**

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

	Carnaby's	Baudin's	Forest red-tailed
	ha	ha	ha
Primary foraging plants	1.57	1.4	1.4
Secondary foraging plants	0.23	0.33	0.39
Non-foraging plants	0.14	0.05	0.21
Total	**1.94**	**1.78**	**2.00**

4.4.1.4 Overall quality

The outcome of the overall black cockatoo habitat quality assessment is provided in **Appendix C** and summarised in **Table 13**. The site was determined to have an overall habitat score of seven (7) out of a maximum score of 10 for forest red-tailed black cockatoo, six (6) for Carnaby's cockatoo and five (5) for Baudin's cockatoo. The site therefore scored 'moderate to high' for forest red-tailed black cockatoo and 'moderate' for Carnaby's cockatoo and Baudin's cockatoo using the scale provided in **Appendix C**. The full results of the quality assessment are provided in **Appendix H**.

Table 13: Habitat quality assessment scores

Habitat category	Score		
	Carnaby's	Baudin's	Forest red-tailed
Breeding	2	N/A	3
Roosting	2	2	2
Foraging	6	5	7
Overall Score	**6 Moderate**	**5 Moderate**	**7 Moderate to high**

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

Habitat category	Quality component category	Attributes and black cockatoo species		
		Carnaby's	Baudin's	Forest red-tailed
Breeding	Site condition	The site supports habitat trees without suitable hollows.	N/A – site is located outside of its known and predicted breeding range.	The site supports habitat trees without suitable hollows.
	Site context	Potential evidence of black cockatoo (species unconfirmed) breeding activity occurs within 6 km of the site and 828.87 ha of potential Carnaby's cockatoo foraging habitat is mapped within 6 km of the site.		Potential evidence of black cockatoo (species unconfirmed) breeding activity occurs within 6 km of the site and 840.75 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.	The site supports potential roosting habitat.
	Site context	No roost occurs within 1 km of the site.	No roost occurs within 1 km of the site.	No roost occurs 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.	N/A - no evidence of roosting was recorded within the site.
Foraging	Site condition	The site supports foraging habitat that is proportionally of 80.8% primary foraging plants.	The site supports foraging habitat that is proportionally of 78.52% primary foraging plants.	The site supports foraging habitat that is proportionally of 69.93% primary foraging plants.
	Site context	Confirmed white-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.	Confirmed white-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.	Potential evidence of forest red-tailed black cockatoo breeding activity and confirmed forest red-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may potentially be used by breeding birds or by birds utilising the roosts.
	Species stocking rate	Limited secondary foraging evidence of Carnaby's cockatoo was observed in the site.	No evidence of Baudin's cockatoo foraging was observed in the site.	Limited secondary evidence of forest red-tailed black cockatoo foraging was observed in the site.

5 Discussion

5.1 Fauna and fauna habitat values

The 20 native and four non-native fauna opportunistically recorded within the site are all generally common and widespread species across the Swan Coastal Plain, including the two threatened species of black cockatoo. The relatively low number of fauna species recorded can likely be attributed to small size of the site, the relatively low fauna habitat values present and the cool weather conditions during the field survey. In addition some species may have been undetectable because they are nocturnal.

Over half of the site (65%) supports **predominantly turf and bare ground** which provides relatively low habitat values for native fauna. The native woodland habitats, including **marri woodland**, **banksia woodland**, **flooded gum woodland** and **melaleuca woodland,** provide the highest habitat values within the site. But these areas of woodland only extend over a small portion of the site (16%) and occur as scattered patches that are disconnected from other vegetation.

The **predominantly non-native vegetation associated with perennial lake and drains** and **water** habitats, although small in area (13% of the site) and primarily comprising non-native vegetation, also provide values for native fauna as water sources and wetland or aquatic habitat. The remainder of the site (5%) supports **scattered native and non-native trees and shrubs** which provide varying habitat values according to the plant species and density. The majority of the **scattered native and non-native trees and shrubs** habitat lacks understorey vegetation and so would mainly provide habitat for common avian or arboreal fauna species.

5.2 Conservation significant fauna

Carnaby's cockatoo and forest red-tailed black cockatoo (further discussed in **Section 5.4** below) were directly or indirectly (from foraging evidence) identified as occurring in the site.

It is considered possible that an additional eight species of conservation significance not recorded during the field survey could occur in the site. Nevertheless, the habitat in the site for these species is generally marginal and limited in extent and so the site is not considered to provide important habitat for them.

Baudin's cockatoo is considered to possibly occur in the site based on the presence of potential foraging habitat associated with the **marri woodland** and **banksia woodland**. However, the site is located on the outer limits of this species distribution and it is therefore likely to use the site opportunistically, if at all, rather than regularly occurring within 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.

The native woodland habitats provide potential habitat for *Idiosoma sigillatum* (Swan Coastal Plain shield-backed trapdoor spider) *Isodoon fusciventer* (quenda), *Phascogale tapoatafa wambenger* (south-western brush-tailed phascogale), *Lerista lineata* (Perth slider) and *Neelaps calonotos* (black-striped snake). However, these habitats would be considered marginal for all of these species due to

the lack of understorey vegetation and tree hollows. Nonetheless, the site is connected to better quality habitat and the species may therefore also occasionally occur within the site. Further targeted surveys would need to be undertaken to confirm whether these fauna species occur within the site.

5.3 Other fauna

A turtle shell attributed to *Chelodina colliei* (snake necked turtle) was recorded within the site. The shell appeared to be quite old. It is unknown whether this species currently occurs within the site. Nonetheless, the perennial lake would provide potential habitat for this species. Snake necked turtles are not currently listed as threatened or priority species, but are considered to be in decline on the swan coastal plain (Santoro 2017).

None of the bee species recorded by Prendergast (2020) within the Maniana park study are listed as threatened or priority species. The Maniana Park study site is reported to support a healthy and diverse population of native bee species (pers. Comms. Kit Prendergast, September 2020). Given the relatively poor condition of habitat within the site, it is considered unlikely that conservation significant bee species occur within the site. However, it is acknowledged that the basic scope of this fauna assessment did not include the application of search methods, sampling or identification techniques or expertise required to detect invertebrate fauna within the site.

5.4 Black cockatoos

A total of six individuals of forest red-tailed black cockatoos were observed flying over the site during the field survey. Foraging evidence attributed to forest red-tailed black cockatoo and Carnaby's cockatoo was recorded in multiple locations in the site. Records for these species of black cockatoo were anticipated as the site lies within their expected range and suitable habitat occurs within the site and local area.

5.4.1 Habitat

5.4.1.1 Breeding

None of the 46 habitat trees recorded within the site contain hollows suitable for breeding by black cockatoos. Therefore, the site does not currently support breeding habitat for any of 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.

5.4.1.2 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 in the site. Therefore, there is no reason to suspect that roosting occurs in the site. Nevertheless, the site contains many tall trees and groups of tall trees that have the potential to provide roosting habitat for black cockatoos.

5.4.1.3 Foraging

The site contains approximately 1.57 ha of primary foraging habitat for Carnaby's cockatoo (9.82% of the site) and 1.4 ha for Baudin's cockatoo and forest red-tailed black cockatoo (8.76% of the site). The slightly larger area of primary foraging habitat for Carnaby's cockatoo is associated with the banksia woodland vegetation within the northern portion of the site. In the absence of suitable breeding habitat within the site, the foraging resource present would support the highest black cockatoo habitat values within the site. However, the area of primary foraging habitat present is still relatively small when compared to the potential foraging habitat present within 6-12 km of the site.

Even though evidence of foraging was recorded at multiple locations within the site, the frequency with which forging evidence was recorded was generally low.

5.4.1.4 Overall quality

Overall habitat quality for all three species of black cockatoo was scored highest for foraging value. The higher score for foraging was primarily due to the high proportion of mature primary foraging plants within areas mapped as potential foraging habitat (more than 50%). In addition, the foraging and overall quality score for forest red-tailed black cockatoo (7) was higher than the scores for Baudin's cockatoo (5) and Carnaby's cockatoo (6) due to the presence of a potential forest red-tailed black cockatoo breeding site within less than 6 km of the site, as listed in **Section 2.7.1.1**. A nearby record of a potential breeding site is considered to increase the relative quality of foraging habitat within the site as it indicates that foraging habitat may more likely be used to support breeding.

6 Conclusions

6.1 Fauna and fauna habitat

The majority of the site contains turf and bare ground with low fauna habitat values. The site also contains small patches of native woodland and perennial lake which provides the highest habitat value for native fauna.

A total of 20 native and four introduced fauna species were positively identified to occur within the site, including threatened (endangered) Carnaby's cockatoo and (vulnerable) forest red-tailed black cockatoo.

Additionally, it is possible that eight species of conservation significance not recorded during the field survey may occasionally occur within the site.

6.2 Black cockatoos

The site occurs within the modeled distribution of all three species of black cockatoo and within the breeding range for Carnaby's cockatoo and forest red-tailed black cockatoo. Secondary foraging evidence attributed to forest red-tailed black cockatoo and Carnaby's cockatoo was recorded in multiple locations in the site.

A total of 46 habitat trees were recorded within the site, of which none contain hollows that are suitable for breeding by black cockatoos. Therefore, the site does currently not provide breeding habitat for any of the three species of black cockatoo. The site lies outside of the known and predicted breeding range of Baudin's cockatoo and so the site is unlikely to provide breeding habitat for this species even if suitable hollows were present.

No evidence of black cockatoo roosting activity was observed within the site. Roosting habitat for all three species of black cockatoo occurs within the site in the form of large trees.

Foraging habitat for black cockatoos occurs within the site as scattered trees and relatively small patches of vegetation. A total of 1.57 ha primary and 0.23 ha secondary foraging habitat for Carnaby's cockatoo, 1.4 ha primary and 0.33 ha secondary foraging habitat for Baudin's cockatoo and 1.4 ha primary and 0.39 ha secondary foraging habitat for forest red-tailed black cockatoo was recorded within the site.

The overall black cockatoo habitat quality score for the site was determined to be seven (high to moderate) for forest red-tailed black cockatoo, six (moderate) for Baudin's cockatoo and five (moderate) for Baudin's cockatoo.

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Figures

Figure 1: Site Location

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F18

Drawn:	GAR
Date:	14/08/2020
Checked:	MS
Approved:	TAA
Date:	24/08/2020

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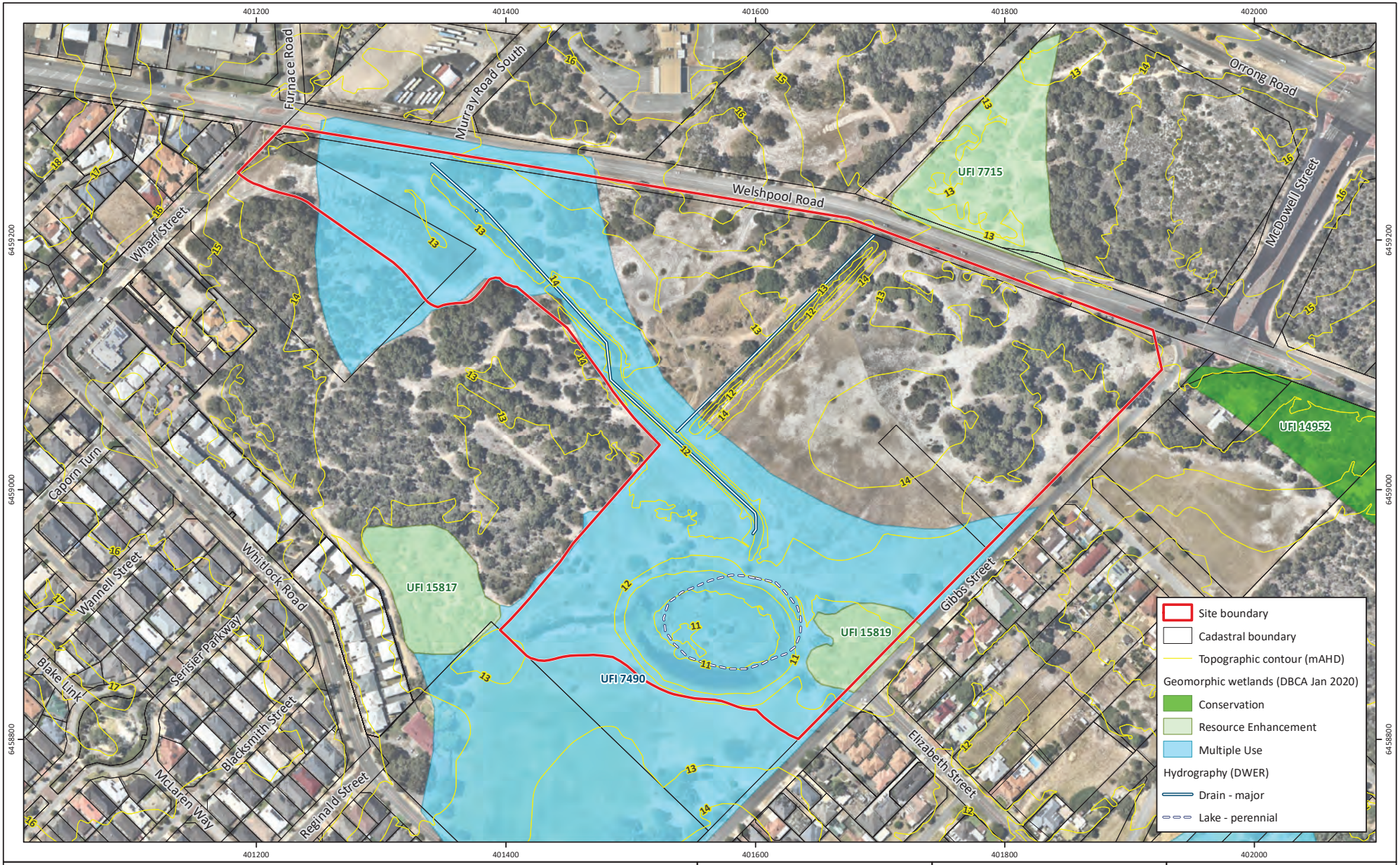

Figure 2: Geomorphic Wetlands

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Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F19

Drawn:	GAR
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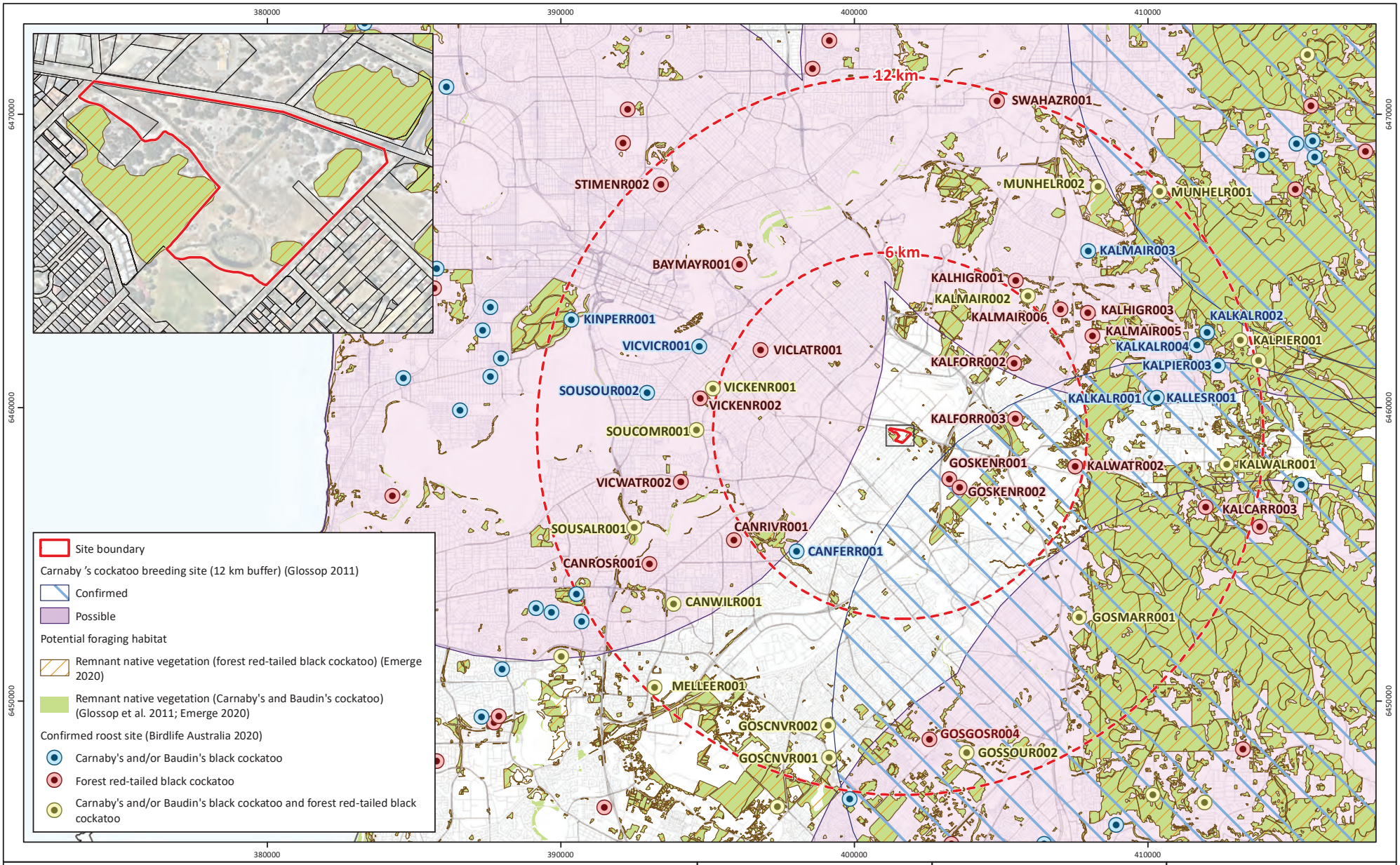

Figure 3: Black Cockatoo Habitat Context

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F20

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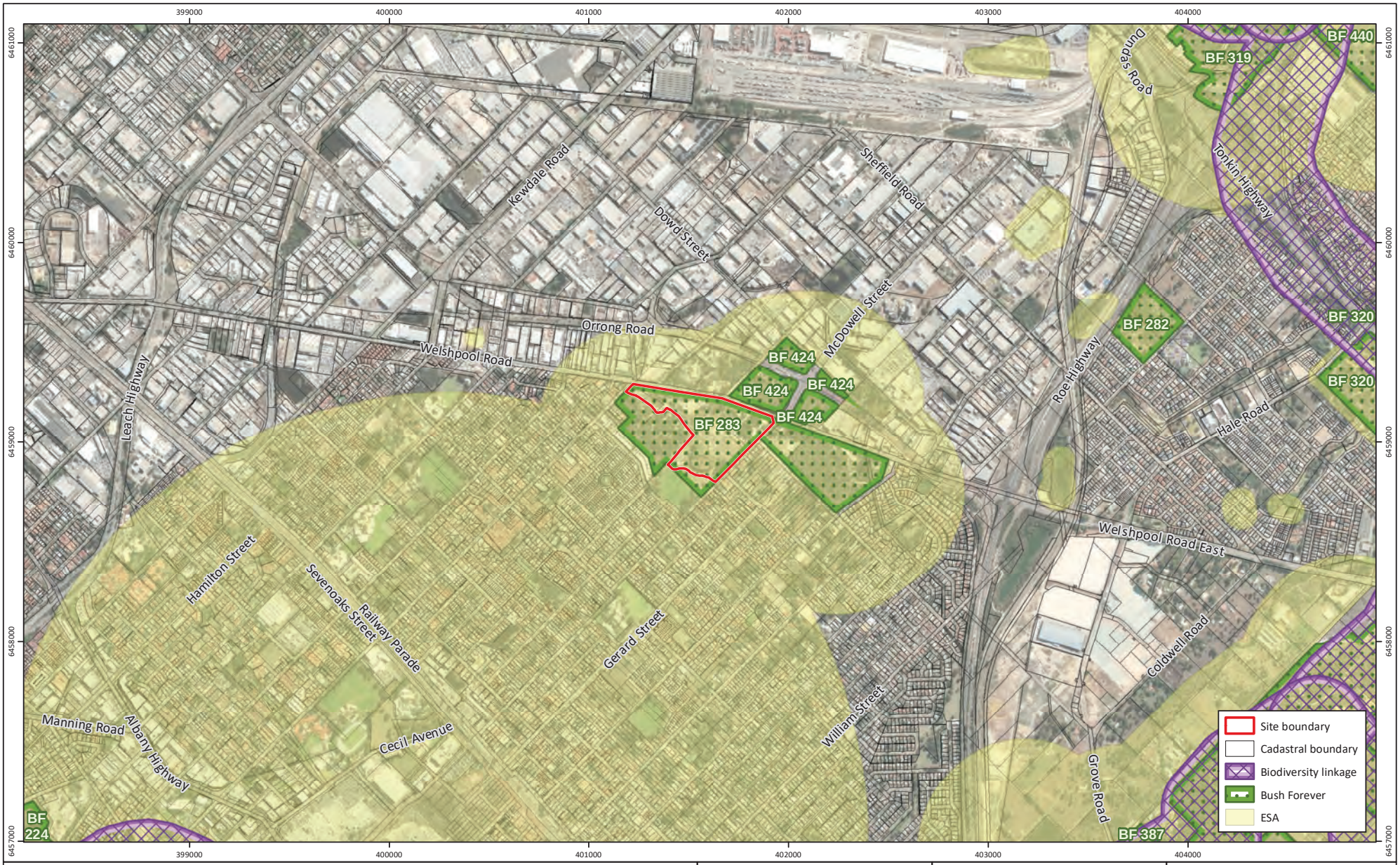

Figure 4: Environmental Features

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F21

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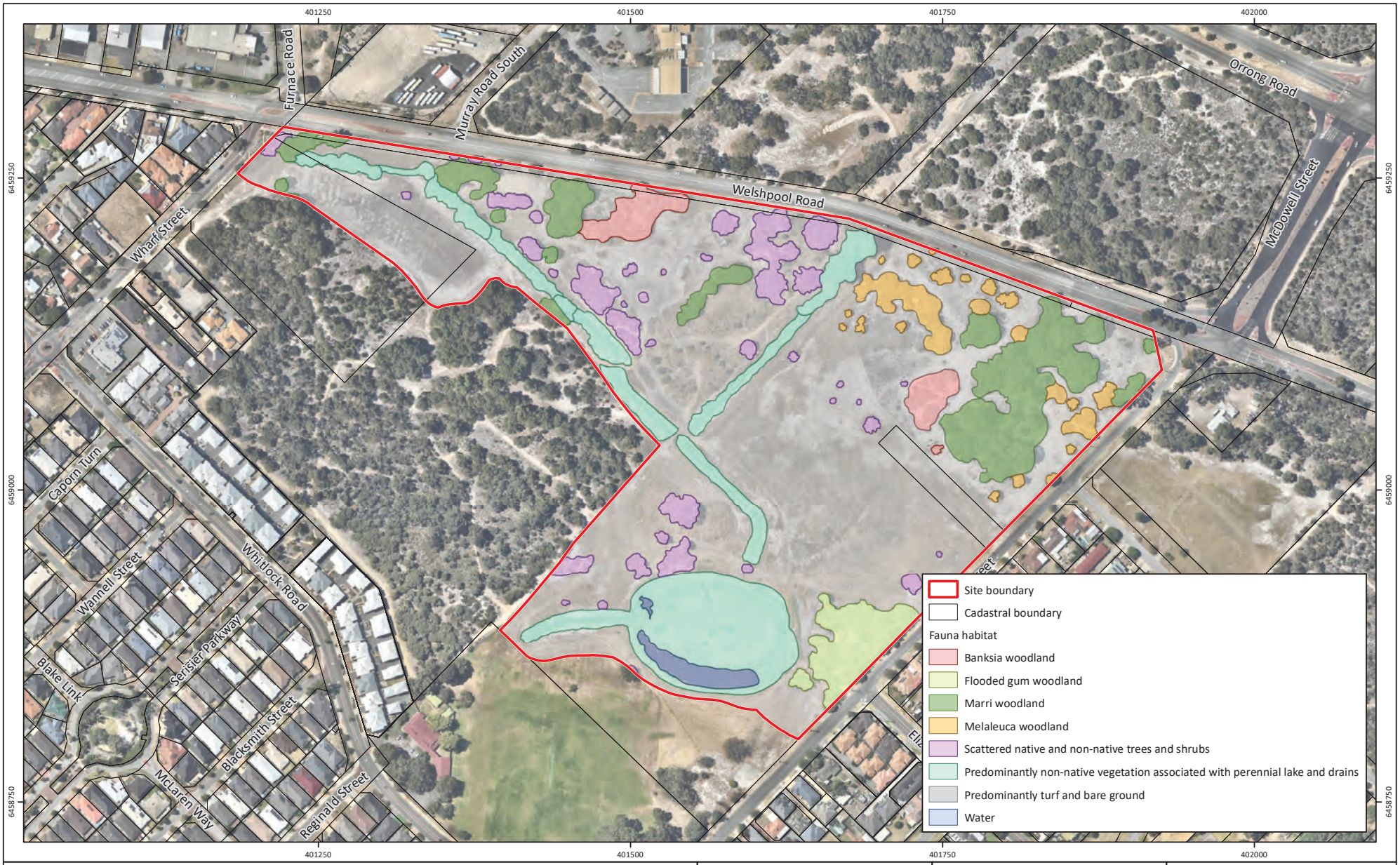

Figure 5: Fauna Habitat

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F22

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Approved:	TAA
Date:	24/08/2020

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GDA 1994 MGA Zone 50

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Figure 6: Black Cockatoo Habitat Trees

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F23

Drawn:	GAR
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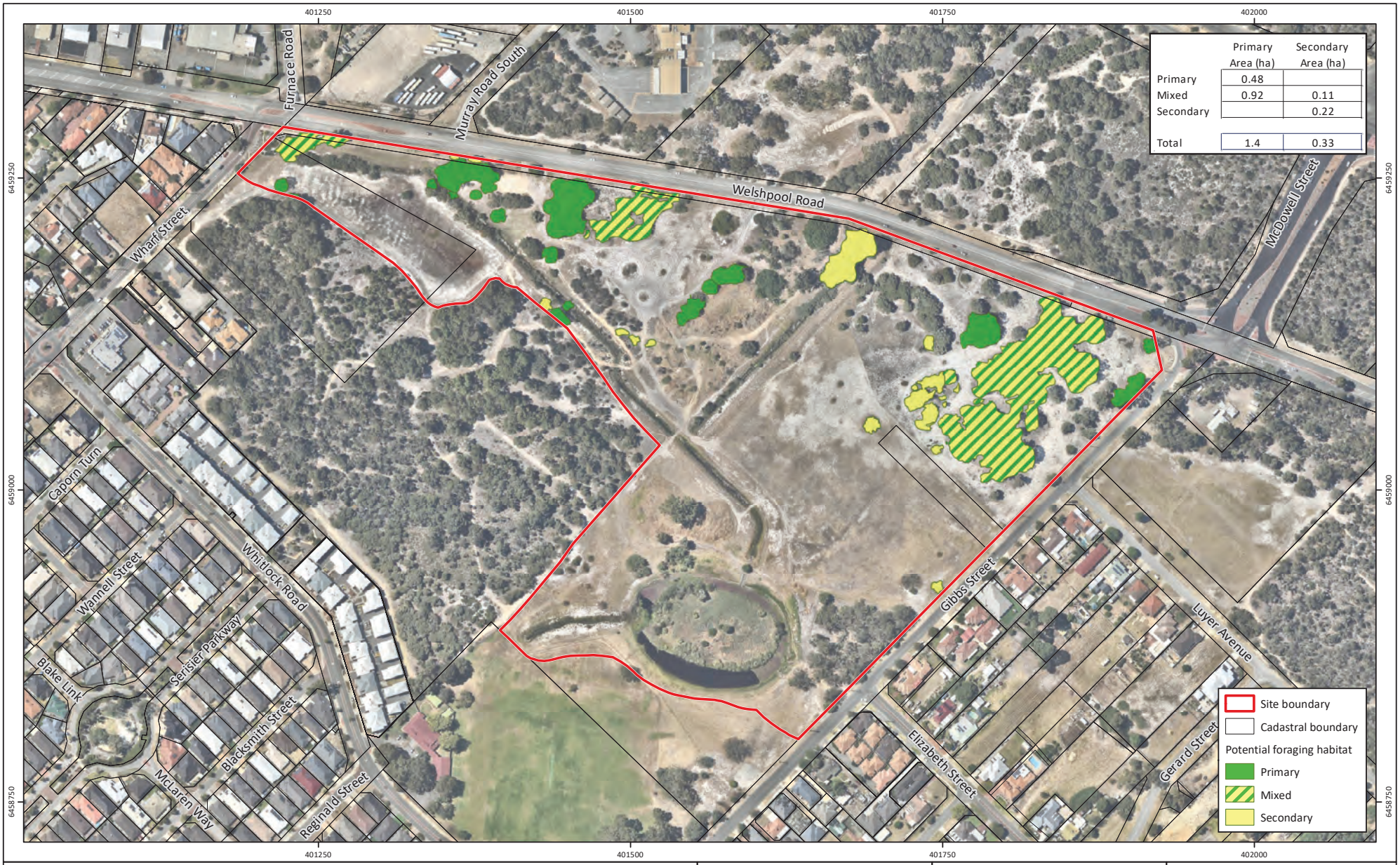

Figure 7: **Potential Baudin's Cockatoo Foraging Habitat**

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F24

Drawn:	GAR
Date:	14/08/2020
Checked:	MS
Approved:	TAA
Date:	24/08/2020

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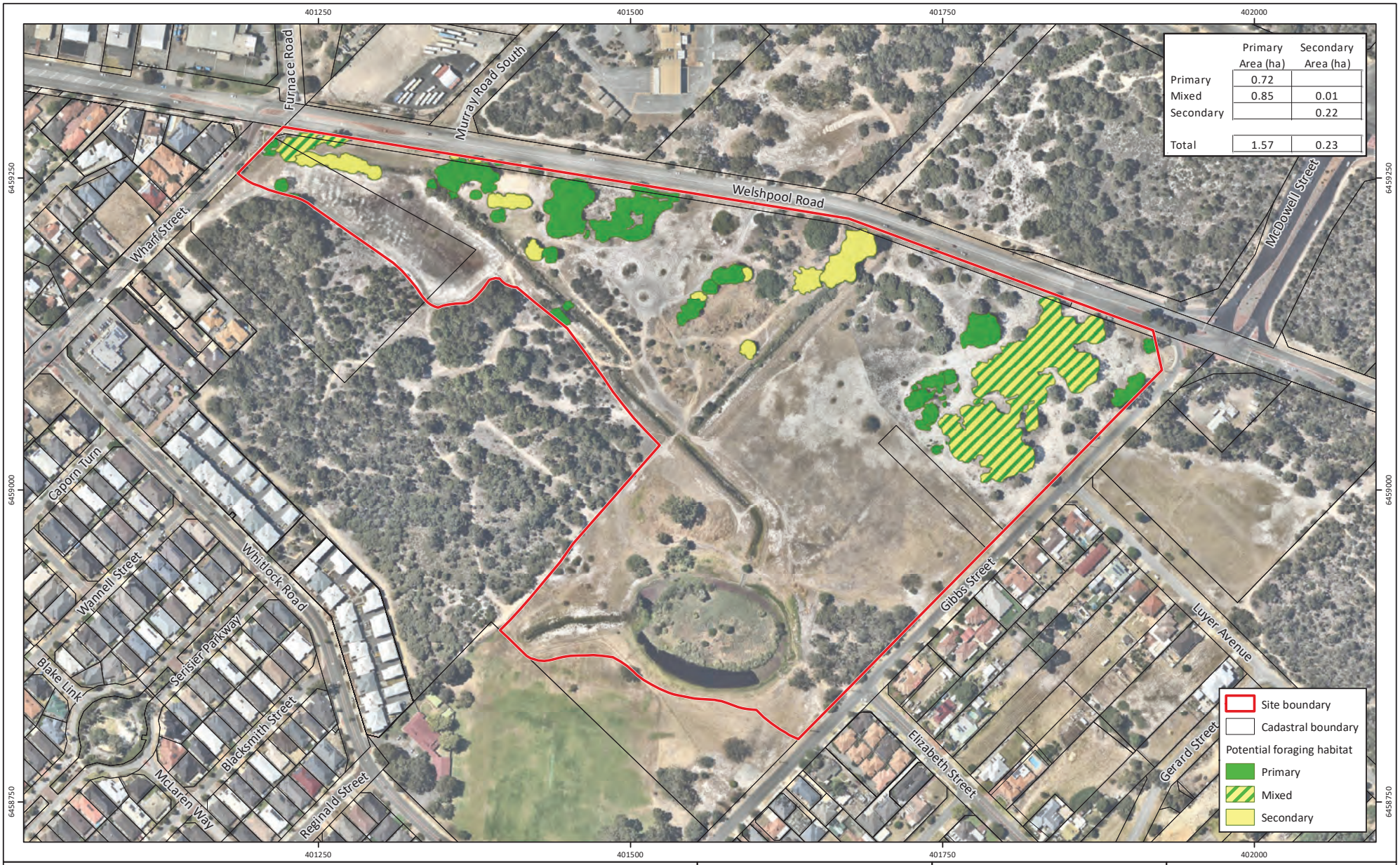

Figure 8: **Potential Carnaby's Cockatoo Foraging Habitat**

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F25

Drawn:	GAR
Date:	14/08/2020
Checked:	MS
Approved:	TAA
Date:	24/08/2020

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GDA 1994 MGA Zone 50

emerge ASSOCIATES

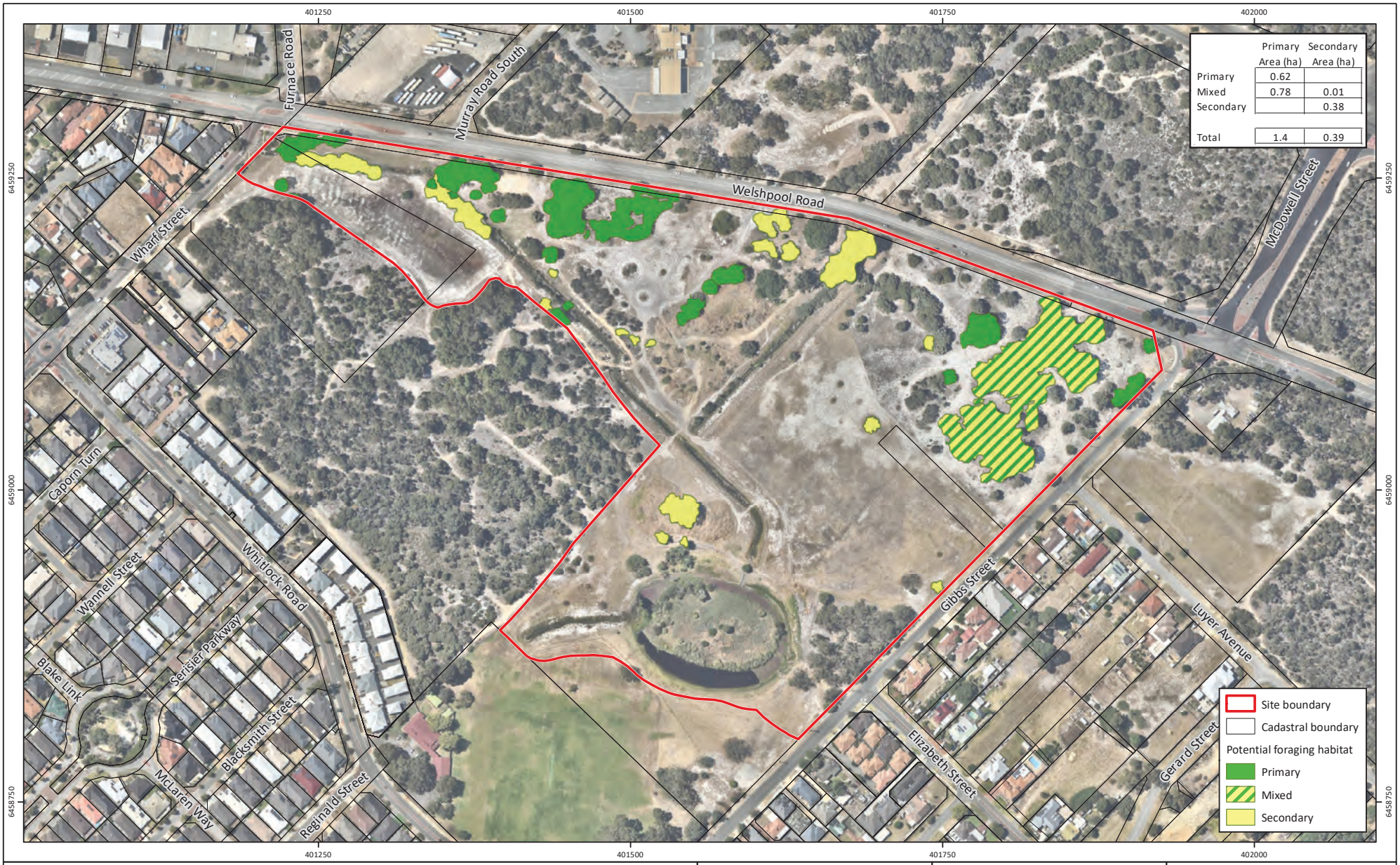

Figure 9: **Potential Forest Red-tailed Black Cockatoo Foraging Habitat**

Project:	Basic Fauna and Targeted Black Cockatoo Assessment State Football Centre
Client:	Department of Finance - Building, Management and Works

Plan Number:
EP20-012(14)--F26

Drawn:	GAR
Date:	14/08/2020
Checked:	MS
Approved:	TAA
Date:	24/08/2020

N

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Meters

Scale: 1:4,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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

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.

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	Priority 1 – Poorly known 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.
P2	Priority 2 – Poorly known 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.
P3	Priority 3 – Poorly known 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.
P4	(a) Priority 4 – Rare species 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. (b) Priority 4 – Near Threatened 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. (c) Priority 4 – Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

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

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 Baudins' 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

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.

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 *et al.* (2003)
Mammals	Menkhorst and Knight (2011), Triggs (2003)
Amphibia	Tyler and Doughty (2009), Bush *et al.* (2002)
Reptiles	Bush *et al.* (2002)

References

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department of biodiversity Conservation and Attractions (DBCA) 2017, *Fauna Profile - Forest red-tailed black cockatoo Calyptorhynchus banksii naso*, Perth, Western Australia.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, *Threatened and Priority Fauna List 15 February 2018*, Perth.

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Department of Environment and Energy (DoEE) 2016b, *Modelled distribution for Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso)*, Canberra.

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Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011, *Modelled distribution of Carnaby's black cockatoo (Calyptorhynchus latirostris)*, Commonwealth of Australia, Canberra, Australian Capital Territory.

Emerge Associates 2020a, *Potential foraging habitat (Swan Coastal Plain) for the Carnaby's black cockatoo (Calyptorhynchus latirostris) - spatial dataset*, Version dated 13 February 2020.

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Pizzey, G. and Knight, F. 2012, *The Fieldguide to the Birds of Australia*, Harper Collins Publishers, Sydney, Australia.

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

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Banksia littoralis	Swamp banksia	Primary	Primary		Saunders 1980; Groom 2011Johnstone & Storr 1998; Johnstone et al. 2010
Banksia menziesii	Firewood banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
Banksia mucronulata	Swordfish dryandra	Primary			Groom 2011
Banksia nivea	Honeypot dryandra	Primary			Saunders 1980; Groom 2011
Banksia nobilis	Golden dryandra	Primary			Saunders 1980; Groom 2011
Banksia praemorsa	Cut-leaf banksia	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
Banksia prionotes	Acorn banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia prolata		Primary			Johnstone et al. 2010
Banksia quercifolia	Oak-leaved banksia	Primary	Primary		Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
Banksia sessilis	Parrot bush	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
Banksia speciosa	Showy banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia spp.		Primary	Primary		Saunders 1979; DSEWPaC 2012; DoEE 2017
Banksia squarrosa	Pingle	Primary	Primary		Johnstone et al. 2010; Groom 2011
Banksia tricuspis	Pine banksia	Primary			Groom 2011
Banksia undata	Urchin dryandra	Primary			Groom 2011
Banksia verticillata	Granite banksia	Primary			Saunders 1980; Groom 2011
Brassica campestris	Canola	Secondary			Groom 2011; DoEE 2017
Callistemon spp.		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
Callistemon viminalis	Captain cook bottlebrush	Secondary			Groom 2011
Callitris sp.		Secondary			Johnstone et al. 2010; Groom 2011
Carya illnoinensis	Pecan	Primary	Secondary		Johnstone et al. 2010; Groom 2011; Groom 2014; DoEE 2017
Casuarina cunninghamiana	River sheoak	Secondary			Groom 2011
Citrullus lanatus	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	
Corymbia calophylla	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
Corymbia citriodora	Lemon scented gum	Secondary	Secondary	Secondary	Johnstone et al. 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017
Corymbia ficifolia	Red flowering gum	Secondary			Groom 2011
Corymbia haematoxylon	Mountain marri	Secondary		Secondary	Groom 2011; DoEE 2012; DoEE 2017
Darwinia citriodora	Lemon-scented darwinia	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
Diospryros sp.	Sweet persimmon	Secondary	Secondary		Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eremophila glabra	Tarbush	Secondary			Groom 2011
Erodium aureum		Secondary			Groom 2011
Erodium botrys	Long storksbill	Secondary	Secondary		Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
Erodium spp.		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
Eucalyptus caesia	Silver princess	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017
Eucalyptus camaldulensis	River red gum			Secondary	DoEE 2012; DoEE 2017
Eucalyptus decipiens	Red heart/moit			Secondary	Johnstone 2017
Eucalyptus diversicolor	Karri			Primary	Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998
Eucalyptus erythrocorys	Illyarrie	Secondary		Secondary	DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone et al. 2010
Eucalyptus gomphocephala	Tuart	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus grandis	Flooded gum, rose gum			Secondary	DoEE 2012; DoEE 2017
Eucalyptus lehmannii	Bushy yate			Secondary	Johnstone 2017
Eucalyptus leucoxylon	Yellow gum	Secondary			Groom 2014

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

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

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

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

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

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

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.

Emerge Black Cockatoo Habitat Quality Assessment - Scale

		Habitat Quality Score									
		Low			Moderate			Moderate - High	High		
	Quality Component	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	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			
	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								
		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								
	Species stocking rate	No roost has been recorded within 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	An active large roost occurs within the site		
	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		N/A	
	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			
	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 (limted or abundant)						Abundant evidence of foraging by black cockatoos has been recorded in the site		

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 (DSEWPaC 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 - 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	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	0.0	
	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	
			a historical record of a small roost (<150 individuals)		1.0	0	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)		2.0	0.0	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	
			≥10% to <50% primary foraging plants		2.0	0.0	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	
			6-12 km from a nest(s) (active, historical or potential)		1.00	0.0	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

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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Appendix D

Database Search Results

NatureMap
Mapping Western Australia's biodiversity

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° 57' 25" E,32° 00' 01" S
Buffer 10km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	572	83815
Other specially protected fauna	3	39
Priority 2	1	1
Priority 3	7	57
Priority 4	6	842
Protected under international agreement	16	926
Rare or likely to become extinct	15	3062
TOTAL	**620**	**88742**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
2.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
3.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
4.	24790	*Calidris tenuirostris (Great Knot)*		T	
5.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
6.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
7.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
8.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
9.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
10.	33983	*Leioproctus douglasiellus (a short-tongued bee)*		T	
11.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
12.	33984	*Neopasiphae simplicior (a short-tongued bee)*		T	
13.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
14.	25345	*Pseudemydura umbrina (Western Swamp Tortoise, Western Swamp Turtle)*		T	
15.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Protected under international agreement					
16.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
17.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
18.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
19.	24786	*Calidris melanotos (Pectoral Sandpiper)*		IA	
20.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
21.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
22.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
23.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
24.	24690	*Macronectes giganteus (Southern Giant Petrel)*		IA	
25.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
26.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
27.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
28.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
29.	48597	*Thalasseus bergii (Crested Tern)*		IA	
30.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
31.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
Other specially protected fauna					
32.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
33.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
34.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale,*		S	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
		Wambenger)			
Priority 2					
35.	48581	*Glossurocolletes bilobatus (a short-tongued bee (southwest), short-tongued bee)*		P2	
Priority 3					
36.	25242	*Acanthophis antarcticus (Southern Death Adder)*		P3	
37.	48574	*Australotomurus morbidus (cemetery springtail, Guildford springtail)*		P3	
38.	41641	*Ctenotus ora (Coastal Plains Skink)*		P3	
39.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
40.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
41.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
42.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
Priority 4					
43.	25035	*Ctenotus delli (Dell's skink, Darling Range southwest Ctenotus)*		P4	
44.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
45.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
46.	47975	*Ixobrychus dubius (Australian Little Bittern)*		P4	
47.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
48.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
Non-conservation taxon					
49.		*? ?*			
50.	24559	*Acanthagenys rufogularis (Spiny-cheeked Honeyeater)*			
51.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
52.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
53.	24262	*Acanthiza inornata (Western Thornbill)*			
54.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
55.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
56.	24281	*Accipiter cirrocephalus subsp. cirrocephalus (Collared Sparrowhawk)*			
57.	25536	*Accipiter fasciatus (Brown Goshawk)*			
58.	24283	*Accipiter fasciatus subsp. didimus (Brown Goshawk)*			
59.	24282	*Accipiter fasciatus subsp. fasciatus (Brown Goshawk)*			
60.		*Acercella falcipes*			
61.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
62.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
63.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
64.		*Afurcagobius suppositus*			
65.		*Agapornis sp.*			Y
66.		*Akamptogonus novarae*			
67.		*Aldrichetta forsteri*			
68.		*Allothereua maculata*			
69.		*Amblyomma albolimbatum*			
70.		*Amblyomma triguttatum*			
71.		*Aname mainae*			
72.		*Aname tepperi*			
73.	24310	*Anas castanea (Chestnut Teal)*			
74.	24311	*Anas clypeata (Northern Shoveler)*			Y
75.	24312	*Anas gracilis (Grey Teal)*			
76.	24313	*Anas platyrhynchos (Mallard)*			
77.		*Anas platyrhynchos subsp. domesticus*			
78.	24315	*Anas rhynchotis (Australasian Shoveler)*			
79.	24316	*Anas superciliosa (Pacific Black Duck)*			
80.		*Anas superciliosa subsp. x platyrhynchos*			Y
81.		*Ancylidae sp.*			
82.		*Anguilla australis*			
83.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
84.		*Anisops hyperion*			
85.		*Anoplocapros lenticularis*			
86.		*Anser anser*			
87.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
88.	24561	*Anthochaera carunculata (Red Wattlebird)*			
89.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
90.	25670	*Anthus australis (Australian Pipit)*			
91.	24599	*Anthus australis subsp. australis (Australian Pipit)*			
92.		*Apogon rueppellii*			
93.		*Apogon victoriae*			
94.	24990	*Aprasia pulchella (Granite Worm-lizard)*			
95.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
96.	24285	*Aquila audax (Wedge-tailed Eagle)*			
97.		*Ara ararauna*			Y

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
98.		*Aracana aurita*			
99.		*Arachnura higginsi*			
100.		*Araneus cyphoxis*			
101.		*Araneus eburneiventris*			
102.		*Araneus eburnus*			
103.		*Araneus senicaudatus*			
104.		*Araneus talipedatus*			
105.	25557	*Ardea garzetta (Little Egret)*			
106.	24337	*Ardea garzetta subsp. nigripes (Little Egret)*			
107.	25558	*Ardea ibis (Cattle Egret)*			
108.	25559	*Ardea intermedia (Intermediate Egret)*			
109.	41324	*Ardea modesta (great egret, white egret)*			
110.	24340	*Ardea novaehollandiae (White-faced Heron)*			
111.	24341	*Ardea pacifica (White-necked Heron)*			
112.	25560	*Ardea sacra (Eastern Reef Egret, Eastern Reef Heron)*			
113.	24610	*Ardeotis australis (Australian Bustard)*			
114.		*Arenigobius bifrenatus*			
115.		*Argiope trifasciata*			
116.		*Argyrosomus japonicus*			
117.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
118.	24352	*Artamus cinereus subsp. melanops (Black-faced Woodswallow)*			
119.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
120.	24356	*Artamus personatus (Masked Woodswallow)*			
121.		*Artema atlanta*			
122.		*Artoria linnaei*			
123.		*Artoria taeniifera*			
124.		*Artoriopsis eccentrica*			
125.		*Artoriopsis expolita*			
126.		*Artoriopsis joergi*			
127.		*Asadipus kunderang*			
128.		*Atherinosoma wallacei*			
129.		*Aurecocrypta lugubris*			
130.		*Austracantha minax*			
131.		*Austrammo harveyi*			
132.	24318	*Aythya australis (Hardhead)*			
133.		*Backobourkia heroine*			
134.		*Badumna insignis*			
135.		*Ballarra longipalpus*			
136.		*Barnardius zonarius*			
137.	24319	*Biziura lobata (Musk Duck)*			
138.	24251	*Bos taurus (European Cattle)*	Y		
139.	42380	*Brachyurophis fasciolatus subsp. fasciolatus (Narrow-banded Shovel-nosed Snake)*			
140.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
141.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
142.	25713	*Cacatua galerita (Sulphur-crested Cockatoo)*			
143.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
144.	25715	*Cacatua roseicapilla (Galah)*			
145.	25716	*Cacatua sanguinea (Little Corella)*			
146.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
147.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
148.	24427	*Cacomantis flabelliformis subsp. flabelliformis (Fan-tailed Cuckoo)*			
149.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
150.		*Caenidae sp.*			
151.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
152.		*Carassius auratus*			
153.	25625	*Carduelis carduelis (Goldfinch, European Goldfinch)*	Y		
154.	24480	*Carduelis carduelis subsp. britannica (Goldfinch)*	Y		
155.		*Ceinidae sp.*			
156.		*Celaenia excavata*			
157.		*Ceratopogonidae sp.*			
158.		*Cercophonius granulosus*			
159.		*Cercophonius sulcatus*			
160.		*Ceryerda cursitans*			
161.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
162.	24187	*Chalinolobus morio (Chocolate Wattled Bat)*			
163.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
164.		*Cheilodactylus gibbosus*			
165.		*Chelmonops curiosus*			
166.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
167.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
168.	47909	*Cheramoeca leucosterna (White-backed Swallow)*			
169.	33939	*Cherax cainii (Marron)*			
170.		*Cherax destructor*			
171.		*Cherax preissii*			
172.		*Cherax quinquecarinatus*			
173.		*Chironominae sp.*			
174.	24980	*Christinus marmoratus (Marbled Gecko)*			
175.		*Chroicocephalus novaehollandiae*			
176.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
177.	25601	*Chrysococcyx lucidus (Shining Bronze Cuckoo)*			
178.	24432	*Chrysococcyx lucidus subsp. plagosus (Shining Bronze Cuckoo)*			
179.	24288	*Circus approximans (Swamp Harrier)*			
180.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
181.		*Cleidopus gloriamaris*			
182.		*Cnidoglanis macrocephalus*			
183.		*Coenagrionidae sp.*			
184.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
185.	24613	*Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)*			
186.	24399	*Columba livia (Domestic Pigeon)*	Y		
187.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
188.	24362	*Coracina novaehollandiae subsp. novaehollandiae (Black-faced Cuckoo-shrike)*			
189.		*Coris auricularis*			
190.		*Corixidae sp.*			
191.		*Cormocephalus aurantiipes*			
192.		*Cormocephalus novaehollandiae*			
193.		*Cormocephalus rubriceps*			
194.		*Cormocephalus strigosus*			
195.		*Cormocephalus turneri*			
196.	24416	*Corvus bennetti (Little Crow)*			
197.	25592	*Corvus coronoides (Australian Raven)*			
198.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
199.	24671	*Coturnix pectoralis (Stubble Quail)*			
200.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
201.	25595	*Cracticus tibicen (Australian Magpie)*			
202.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
203.	24423	*Cracticus tibicen subsp. tibicen (Black-backed Magpie)*			
204.	25596	*Cracticus torquatus (Grey Butcherbird)*			
205.	24424	*Cracticus torquatus subsp. torquatus (Grey Butcherbird)*			
206.		*Craterocephalus mugiloides*			
207.	25398	*Crinia georgiana (Quacking Frog)*			
208.	25399	*Crinia glauerti (Clicking Frog)*			
209.	25400	*Crinia insignifera (Squelching Froglet)*			
210.	25401	*Crinia pseudinsignifera (Bleating Froglet)*			
211.		*Crustulina bicruciata*			
212.	30893	*Cryptoblepharus buchananii*			
213.	25020	*Cryptoblepharus plagiocephalus*			
214.		*Cryptoerithus quobba*			
215.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
216.	24883	*Ctenophorus ornatus (Ornate Crevice-Dragon)*			
217.	25027	*Ctenotus australis*			
218.	25039	*Ctenotus fallens*			
219.	25040	*Ctenotus gemmula (Jewelled South-west Ctenotus (Swan Coastal Plain subpop P3), skink)*			
220.	25047	*Ctenotus impar*			
221.	25049	*Ctenotus labillardieri*			
222.		*Cyclosa trilobata*			
223.	24322	*Cygnus atratus (Black Swan)*			
224.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
225.	30902	*Dacelo novaeguineae subsp. novaeguineae (Laughing Kookaburra)*	Y		
226.		*Dactylopus dactylopus*			
227.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
228.	24606	*Daphoenositta chrysoptera subsp. pileata (Varied Sittella, Black-capped Sitella)*			
229.		*Deinopis unicolor*			Y
230.		*Delena cancerides*			
231.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
232.	24999	*Delma grayii*			
233.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
234.	25325	*Dendrelaphis punctulata (Green Tree Snake)*			
235.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
236.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			

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237.		*Dingosa murata*			
238.		*Dingosa serrata*			
239.		*Dinocambala ingens*			
240.		*Diodon nicthemerus*			
241.	44654	*Diplodactylus lateroides (Speckled Stone Gecko)*			
242.	24939	*Diplodactylus polyophthalmus*			
243.		*Dytiscidae sp.*			
244.	25251	*Echiopsis curta (Bardick)*			
245.		*Edelia vittata*			
246.	25096	*Egernia kingii (King's Skink)*			
247.	25100	*Egernia napoleonis*			
248.		*Egretta garzetta*			
249.		*Egretta novaehollandiae*			
250.		*Elanus axillaris*			
251.	25540	*Elanus caeruleus (Black-shouldered Kite)*			
252.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
253.	25250	*Elapognathus coronatus (Crowned Snake)*			
254.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
255.		*Engraulis australis*			
256.		*Enoplosus armatus*			
257.		*Eodelena lapidicola*			
258.		*Eolophus roseicapillus*			
259.	24651	*Eopsaltria australis subsp. griseogularis (Western Yellow Robin)*			
260.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
261.		*Epinephelides armatus*			
262.	24567	*Epthianura albifrons (White-fronted Chat)*			
263.		*Eriophora biapicata*			
264.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
265.		*Ethmostigmus rubripes*			
266.		*Eucyrtops latior*			
267.		*Eulimnadia sp.*			
268.		*Eupograpta kottae*			
269.		*Eurytion incisunguis*			Y
270.	25621	*Falco berigora (Brown Falcon)*			
271.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
272.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
273.	24472	*Falco cenchroides subsp. cenchroides (Australian Kestrel, Nankeen Kestrel)*			
274.	25623	*Falco longipennis (Australian Hobby)*			
275.	24474	*Falco longipennis subsp. longipennis (Australian Hobby)*			
276.	24041	*Felis catus (Cat)*	Y		
277.	25727	*Fulica atra (Eurasian Coot)*			
278.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
279.	30916	*Funambulus pennanti (Indian Palm Squirrel)*	Y		
280.	34028	*Galaxias occidentalis (Western Minnow)*			
281.		*Gallicolumba jobiensis*			
282.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
283.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
284.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
285.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
286.		*Gallus gallus*			
287.		*Gambusia affinis*			
288.	42314	*Gavicalis virescens (Singing Honeyeater)*			
289.		*Gea theridioides*			
290.	24959	*Gehyra variegata*			
291.		*Geogarypus taylori*			
292.	24401	*Geopelia cuneata (Diamond Dove)*			
293.		*Gerres subfasciatus*			
294.	25530	*Gerygone fusca (Western Gerygone)*			
295.	47962	*Glyciphila melanops (Tawny-crowned Honeyeater)*			
296.	24443	*Grallina cyanoleuca (Magpie-lark)*			
297.		*Gripopterygidae sp.*			
298.		*Gymnapistes marmoratus*			
299.		*Gyrinidae sp.*			
300.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
301.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
302.	24295	*Haliastur sphenurus (Whistling Kite)*			
303.	24689	*Halobaena caerulea (Blue Petrel)*			
304.	24296	*Hamirostra isura (Square-tailed Kite)*			
305.		*Hebridae sp.*			
306.	25409	*Heleioporus barycragus (Hooting Frog)*			

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307.	25410	*Heleioporus eyrei (Moaning Frog)*			
308.	25412	*Heleioporus psammophilus (Sand Frog)*			
309.		*Hemicloea sp.*			Y
310.		*Hemicorduliidae sp.*			
311.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
312.	25115	*Hemiergis initialis subsp. initialis*			
313.	25475	*Hemiergis peronii*			
314.	25119	*Hemiergis quadrilineata*			
315.		*Henicops dentatus*			
316.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
317.	47965	*Hieraaetus morphnoides (Little Eagle)*			
318.	25734	*Himantopus himantopus (Black-winged Stilt)*			
319.	24491	*Hirundo neoxena (Welcome Swallow)*			
320.		*Histrio histrio*			
321.		*Hogna crispipes*			
322.		*Hogna immansueta*			
323.		*Holasteron perth*			
324.		*Holasteron wamuseum*			Y
325.		*Holconia westralia*			
326.		*Holocnemus pluchei*			
327.		*Hydrophilidae sp.*			
328.		*Hydropsychidae sp.*			
329.		*Hydroptilidae sp.*			
330.		*Hypoblemum sp.*			Y
331.		*Hyporhamphus regularis*			
332.		*Idiommata blackwalli*			
333.		*Idiosoma hirsutum*			Y
334.		*Isopeda leishmanni*			
335.		*Isopeda magna*			
336.		*Isopedella cana*			
337.		*Ixodes australiensis*			
338.		*Kangarosa properipes*			
339.		*Karaops ellenae*			
340.		*Karaops jarrit*			
341.	24367	*Lalage tricolor (White-winged Triller)*			
342.		*Lampona brevipes*			
343.		*Lampona cylindrata*			
344.	25637	*Larus novaehollandiae (Silver Gull)*			
345.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
346.		*Latrodectus hasselti*			
347.		*Latrodectus hasseltii*			
348.		*Leptoceridae sp.*			
349.	25131	*Lerista distinguenda*			
350.	25133	*Lerista elegans*			
351.	25148	*Lerista lineopunctulata*			
352.	25165	*Lerista praepedita*			
353.	25005	*Lialis burtonis*			
354.		*Libellulidae sp.*			
355.	25659	*Lichenostomus leucotis (White-eared Honeyeater)*			
356.	25661	*Lichmera indistincta (Brown Honeyeater)*			
357.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
358.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
359.	42413	*Lissolepis luctuosa (Western Swamp Skink)*			
360.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
361.	25388	*Litoria moorei (Motorbike Frog)*			
362.		*Longepi woodman*			
363.		*Lophoictinia isura*			
364.	42414	*Lucasium alboguttatum*			
365.		*Lycosa ariadnae*			
366.		*Lycosa godeffroyi*			
367.		*Lynceus sp.*			
368.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
369.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
370.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
371.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
372.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
373.	25654	*Malurus splendens (Splendid Fairy-wren)*			
374.	24583	*Manorina flavigula (Yellow-throated Miner)*			
375.		*Maratus pavonis*			
376.		*Masasteron maini*			

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377.	25758	*Megalurus gramineus (Little Grassbird)*			
378.	47997	*Melanodryas cucullata (Hooded Robin)*			
379.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
380.	24586	*Melithreptus brevirostris subsp. leucogenys (Brown-headed Honeyeater)*			
381.	24587	*Melithreptus chloropsis (Western White-naped Honeyeater)*			
382.	24736	*Melopsittacus undulatus (Budgerigar)*			
383.	25184	*Menetia greyii*			
384.	24598	*Merops ornatus (Rainbow Bee-eater)*			
385.		*Microcanthus strigatus*			
386.		*Microcarbo melanoleucos*			
387.	25693	*Microeca fascinans (Jacky Winter)*			
388.		*Missulena granulosa*			
389.		*Missulena occatoria*			
390.		*Mituliodon tarantulinus*			
391.		*Mitzoruga insularis*			
392.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
393.	25191	*Morethia lineoocellata*			
394.	25192	*Morethia obscura*			
395.	24223	*Mus musculus (House Mouse)*	Y		
396.	24042	*Mustela putorius (European Polecat, Ferret)*	Y		
397.		*Myandra bicincta*			
398.		*Myandra cambridgei*			
399.	25610	*Myiagra inquieta (Restless Flycatcher)*			
400.	25420	*Myobatrachus gouldii (Turtle Frog)*			
401.		*Nannoperca vittata*			
402.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
403.	25686	*Neochmia temporalis (Red-browed Finch)*	Y		
404.	24738	*Neophema elegans (Elegant Parrot)*			
405.	24739	*Neophema petrophila (Rock Parrot)*			
406.		*Nephila edulis*			
407.		*Nicodamus mainae*			
408.	25747	*Ninox connivens (Barking Owl)*			
409.	25252	*Notechis scutatus (Tiger Snake)*			
410.		*Notiasemus glauerti*			
411.		*Notolabrus parilus*			
412.		*Notonectidae sp.*			
413.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
414.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
415.	24742	*Nymphicus hollandicus (Cockatiel)*			
416.		*Occiperipatoides gilesii*			
417.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
418.		*Oecobius navus*			
419.		*Oligochaeta sp.*			
420.		*Ommatoiulus moreleti*			
421.		*Ommatoiulus moreletii*			
422.		*Ophisurus serpens*			
423.		*Opopaea sp.*			Y
424.		*Oratemnus curtus*			
425.		*Orectolobus ornatus*			
426.		*Orthocladiinae sp.*			
427.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
428.		*Ostearius melanopygius*			
429.		*Oxidus gracilis*			
430.		*Oxyopes gracilipes*			
431.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
432.	24624	*Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)*			
433.	24693	*Pachyptila desolata (Antarctic Prion)*			
434.		*Palaemonidae sp.*			
435.		*Papillogobius punctatus*			
436.		*Paralampona marangaroo*			
437.		*Parastacidae sp.*			
438.	25253	*Parasuta gouldii*			
439.	25255	*Parasuta nigriceps*			
440.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
441.	24625	*Pardalotus punctatus subsp. punctatus (Spotted Pardalote)*			
442.	25682	*Pardalotus striatus (Striated Pardalote)*			
443.	24630	*Pardalotus striatus subsp. westraliensis (Striated Pardalote)*			
444.		*Parma microlepis*			
445.	25687	*Passer domesticus (House Sparrow)*	Y		
446.		*Pediana occidentalis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
447.		*Pegasus volitans*			
448.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
449.		*Pempheris klunzingeri*			
450.	48060	*Petrochelidon ariel (Fairy Martin)*			
451.	48061	*Petrochelidon nigricans (Tree Martin)*			
452.	48066	*Petroica boodang (Scarlet Robin)*			
453.	24659	*Petroica goodenovii (Red-capped Robin)*			
454.	25697	*Phalacrocorax carbo (Great Cormorant)*			
455.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
456.	24666	*Phalacrocorax melanoleucos subsp. melanoleucos (Little Pied Cormorant)*			
457.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
458.	25699	*Phalacrocorax varius (Pied Cormorant)*			
459.		*Phalloceros caudimaculatus*			
460.		*Phalloceros harpagos*			Y
461.	24409	*Phaps chalcoptera (Common Bronzewing)*			
462.	25587	*Phaps elegans (Brush Bronzewing)*			
463.		*Phenasteron longiconductor*			
464.		*Pholcus phalangioides*			
465.		*Phreatoicidae sp.*			
466.		*Phryganoporus candidus*			
467.		*Phryganoporus gausapatus subsp. occidentalis*			Y
468.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
469.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
470.		*Phyllopteryx taeniolatus*			
471.		*Physidae sp.*			
472.		*Physocyclus globosus*			
473.		*Pinkfloydia harveii*			
474.		*Planorbidae sp.*			
475.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
476.	24842	*Platalea regia (Royal Spoonbill)*			
477.		*Platax teira*			
478.	25720	*Platycercus icterotis (Western Rosella)*			
479.	24745	*Platycercus icterotis subsp. icterotis (Western Rosella)*			
480.	24747	*Platycercus spurius (Red-capped Parrot)*			
481.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
482.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
483.	24751	*Platycercus zonarius subsp. zonarius (Port Lincoln Parrot)*			
484.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
485.		*Plotosus unicolor*			Y
486.	25703	*Podargus strigoides (Tawny Frogmouth)*			
487.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
488.	25704	*Podiceps cristatus (Great Crested Grebe)*			
489.	24680	*Podiceps cristatus subsp. australis (Great Crested Grebe)*			
490.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
491.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
492.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
493.		*Poltys laciniosus*			
494.		*Polygonarea repanda*			Y
495.	30854	*Polytelis anthopeplus subsp. westralis (Regent Parrot)*			
496.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
497.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
498.	24769	*Porzana fluminea (Australian Spotted Crake)*			
499.	25732	*Porzana pusilla (Baillon's Crake)*			
500.	24770	*Porzana pusilla subsp. palustris (Baillon's Crake)*			
501.	24771	*Porzana tabuensis (Spotless Crake)*			
502.		*Psephotus dissimilis*			Y
503.	25261	*Pseudechis australis (Mulga Snake)*			
504.		*Pseudocaranx dentex*			
505.		*Pseudogobius olorum*			
506.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
507.	25511	*Pseudonaja affinis (Dugite)*			
508.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
509.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
510.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
511.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
512.		*Psittacus erithacus*			Y
513.	24702	*Pterodroma brevirostris (Kerguelen Petrel)*			
514.	24703	*Pterodroma lessonii (White-headed Petrel)*			
515.	25710	*Pterodroma macroptera (Great-winged Petrel)*			
516.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
517.	24711	*Puffinus assimilis subsp. assimilis (Little Shearwater)*			
518.		*Purpureicephalus spurius*			
519.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
520.	24243	*Rattus fuscipes (Western Bush Rat)*			
521.	24245	*Rattus rattus (Black Rat)*	Y		
522.		*Raveniella cirrata*			
523.		*Raveniella peckorum*			
524.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
525.	48096	*Rhipidura albiscapa (Grey Fantail)*			
526.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
527.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
528.		*Scolopendra laeta*			
529.		*Scolopendra morsitans*			
530.		*Scorpis aequipinnis*			
531.		*Scorpis georgianus*			
532.	24199	*Scotorepens balstoni (Inland Broad-nosed Bat)*			
533.		*Scytodes thoracica*			
534.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
535.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
536.		*Simuliidae sp.*			
537.		*Smeringopus natalensis*			
538.		*Smeringopus natalensis?*			Y
539.	30948	*Smicrornis brevirostris (Weebill)*			
540.		*Sminthopsis murina*			
541.		*Solaenodolichopus pruvoti*			
542.		*Sphaerotrichopus ramosus*			
543.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
544.		*Steatoda capensis*			
545.		*Steatoda grossa*			
546.	24522	*Sterna bergii (Crested Tern)*			
547.	24525	*Sterna fuscata subsp. nubilosa (Sooty Tern)*			
548.	48594	*Sternula nereis (Fairy Tern)*			
549.	24329	*Stictonetta naevosa (Freckled Duck)*			
550.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
551.		*Storena formosa*			
552.		*Storena sinuosa*			
553.	25597	*Strepera versicolor (Grey Currawong)*			
554.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
555.	30951	*Streptopelia chinensis subsp. tigrina (Spotted Turtle-Dove)*	Y		
556.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
557.	30950	*Streptopelia senegalensis subsp. senegalensis (Laughing Turtle-Dove)*	Y		
558.	24943	*Strophurus spinigerus subsp. inornatus*			
559.	24942	*Strophurus spinigerus subsp. spinigerus*			
560.		*Supunna funerea*			
561.		*Supunna picta*			
562.	24259	*Sus scrofa (Pig)*	Y		
563.		*Sutorectus tentaculatus*			
564.		*Synothele durokoppin*			
565.		*Synothele rastelloides*			
566.		*Tabanidae sp.*			
567.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
568.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
569.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
570.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
571.		*Tamopsis facialis*			
572.		*Tamopsis perthensis*			
573.		*Tanypodinae sp.*			
574.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
575.		*Tasmanicosa leuckartii*			
576.		*Tegenaria atrica*			Y
577.		*Tetragnatha demissa*			
578.		*Threpterius maculosus*			
579.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
580.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
581.	25519	*Tiliqua rugosa*			
582.	25204	*Tiliqua rugosa subsp. aspera*			
583.	25207	*Tiliqua rugosa subsp. rugosa*			
584.		*Tilodon sexfasciatum*			
585.		*Tipulidae sp.*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
586.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
587.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
588.		*Torquigener pleurogramma*			
589.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
590.		*Trichocyclus balladong*			
591.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
592.	24755	*Trichoglossus haematodus subsp. moluccanus (Rainbow Lorikeet)*	Y		
593.	25521	*Trichosurus vulpecula (Common Brushtail Possum)*			
594.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
595.		*Trygonoptera ovalis*			
596.	48147	*Turnix varius (Painted Button-quail)*			
597.	24851	*Turnix velox (Little Button-quail)*			
598.	24069	*Tursiops truncatus (Bottlenose Dolphin)*			
599.	25762	*Tyto alba (Barn Owl)*			
600.	24852	*Tyto alba subsp. delicatula (Barn Owl)*			
601.	24983	*Underwoodisaurus milii (Barking Gecko)*			
602.		*Urocampus carinirostris*			
603.		*Urodacus novaehollandiae*			
604.		*Urodacus planimanus*			
605.		*Urodacus woodwardii*			
606.	25577	*Vanellus miles (Masked Lapwing)*			
607.	24386	*Vanellus tricolor (Banded Lapwing)*			
608.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
609.	25225	*Varanus rosenbergi (Heath Monitor)*			
610.	25526	*Varanus tristis (Racehorse Monitor)*			
611.		*Venator immansueta*			
612.		*Venatrix arenaris*			
613.		*Venatrix pullastra*			
614.	24206	*Vespadelus regulus (Southern Forest Bat)*			
615.	24040	*Vulpes vulpes (Red Fox)*	Y		
616.		*Westrarchaea spinosa*			
617.		*Zachria flavicoma*			
618.		*Zebraplatys fractivittata*			
619.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
620.		*unknown unknown*			Y

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

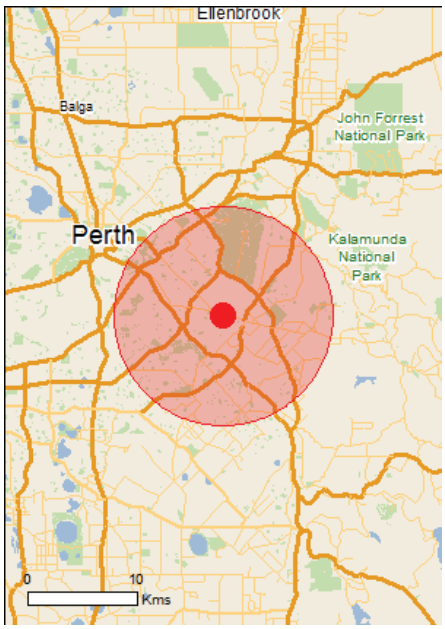
EPBC Act Protected Matters Report

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: 29/06/20 17:42:02



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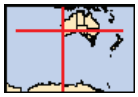

Summary

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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	62
Listed Migratory Species:	25

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:	4
Commonwealth Heritage Places:	1
Listed Marine Species:	32
Whales and Other Cetaceans:	None
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:	15
Regional Forest Agreements:	1
Invasive Species:	46
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 10km of Ramsar

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
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	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 likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely 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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely 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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat 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
Insects		
Leioproctus douglasiellus a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat may occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	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

Name	Status	Type of Presence within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat likely to occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
Acacia anomala Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat known to occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area
Anthocercis gracilis Slender Tailflower [11103]	Vulnerable	Species or species habitat known to occur within area
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area
Banksia mimica Summer Honeypot [82765]	Endangered	Species or species habitat likely to 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
Calytrix breviseta subsp. breviseta Swamp Starflower [23879]	Endangered	Species or species habitat known to occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
Conospermum undulatum Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
Darwinia apiculata Scarp Darwinia [8763]	Endangered	Species or species habitat known to occur within area
Diplolaena andrewsii [6601]	Endangered	Species or species habitat likely to occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved	Endangered	Species or species

Name	Status	Type of Presence
Hammer Orchid, Warty Hammer Orchid [16753]		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 known to occur within area
Eremophila glabra subsp. chlorella [84927]	Endangered	Species or species habitat known to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Goodenia arthrotricha [12448]	Endangered	Species or species habitat likely to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
Grevillea thelemanniana Spider Net Grevillea [32835]	Critically Endangered	Species or species habitat known to occur within area
Lasiopetalum pterocarpum Wing-fruited Lasiopetalum [64922]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
Ptilotus pyramidatus Pyramid Mulla-mulla [18216]	Critically Endangered	Species or species habitat known to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat known to occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat likely to occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to 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		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely 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
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat 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*	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to 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

Name	Threatened	Type of Presence
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to 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
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely 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 -
Defence - AIRTC CANNINGTON
Defence - HOLDFAST BARRACKS
Defence - PALMER BARRACKS - SOUTH GUILDFORD

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Victoria Park Post Office	WA	Listed place

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 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

Name	Threatened	Type of Presence 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
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		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 may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species

Name	Threatened	Type of Presence
		habitat 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*	Species or species habitat likely to occur within area
Thinornis rubricollis		
Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Mammals		
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	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Canning River	WA
Dundas Road	WA
Kenwick Wetlands	WA
Korung	WA
Lesmurdie Falls	WA
Swan River	WA
Unnamed WA23076	WA
Unnamed WA24657	WA
Unnamed WA29815	WA
Unnamed WA36440	WA
Unnamed WA37997	WA
Unnamed WA49079	WA
Unnamed WA49299	WA
Unnamed WA49362	WA
Unnamed WA49363	WA

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

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 Resouces 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 within area
Streptopelia chinensis Spotted Turtle-Dove [780]		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
Capra hircus Goat [2]		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
Feral deer Feral deer species in Australia [85733]		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

Name	Status	Type of Presence
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
Sus scrofa Pig [6]		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 declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		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 habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		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
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		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

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

Nationally Important Wetlands [Resource Information]

Name	State
Brixton Street Swamps	WA
Perth Airport Woodland Swamps	WA
Swan-Canning Estuary	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

-32.0004 115.95698

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.

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Appendix E

Conservation Significant Species and Likelihood of Occurrence Assessment

Species	Common name	Level of		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Birds					
Anous tenuirostris melanops	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** No suitable habitat present.
Apus pacificus	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** Potential habitat present. May opportunistically occur in or fly over the site on commute or while searching for prey.
Botaurus poiciloptilus	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** No suitable habitat present.
Calidris acuminata	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** No suitable habitat present.
Calidris ferruginea	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** No suitable habitat present.
Calidris melanotos	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** No suitable habitat present.

		WA	EPBC Act		
Calidris ruficollis	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** No suitable habitat present.
Calidris subminuta	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** No suitable habitat present.
Calidris tenuirostris	Great knot	CR	CR (MI)	Mud or sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds.	**Unlikely** No suitable habitat present.
Calyptorhynchus banksii naso	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** Suitable foraging and roosting habitat present. Species observed flying over the site during the field survey. Foraging debris attributed to this species was also observed.
Calyptorhynchus baudinii	Baudin's cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding Corymbia calophylla, Banksia spp., Hakea spp., and to fruiting apples and pears (Johnstone and Storr 1998).	**Possible** Potential foraging and roosting habitat present but the site is located at the outer limits of species known distribution range. Opportunsitic occurrence possible.

		WA	EPBC Act		
Calyptorhynchus latirostris	Carnaby's cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Dryandra spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998).	**Recorded** Suitable foraging and roosting habitat present. Foraging debris attributed to this species was also observed. Extensive records located adjacent to and within the wider area of the site.
Diomedea amsterdamensis	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** No suitable habitat present.
Diomedea epomophora	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** No suitable habitat present.
Diomedea exulans	Wandering albatross	VU	VU (MI)	Marine, pelagic and aerial species. It breeds on Macquarie Island and feeds in Australian portions of the Southern Ocean (DoE 2018).	**Unlikely** No suitable habitat present.
Diomedea sanfordi	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** No suitable habitat present.
Falco peregrinus	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	**Possible** Potential habitat present. Opportunistic fly over possible.

		WA	EPBC Act		
Ixobrychus dubius	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** No suitable habitat present.
Leipoa ocellata	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** Species locally extinct.
Limosa lapponica	Bar-tailed godwit	MI	MI	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** No suitable habitat present.
Macronectes giganteus	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** No suitable habitat present.
Macronectes halli	Northern giant petrel	MI	VU (MI)	Breeds on subantarctic islands. May visit Western Australian water from February to September (Johnstone and Storr 1998).	**Unlikely** No suitable habitat present.

		WA	EPBC Act		
Motacilla cinerea	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** Marginal habitat present (perennial lake, flooded gum and marri woodland). The site is located within the species distribution range but it rarely occurs in south-western Australia. Incidental occurrence possible but unlikely.
Numenius madagascariensis	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** No suitable habitat present.
Oxyura australis	Blue-billed duck	P4	-	Mainly deeper freshwater swamps and lakes; occasionally saltlakes and estuaries freshened by flood waters (Johnstone and Storr 1998).	**Unlikely** No suitable habitat present.
Pachyptila turtur subantarctica	Fairy prion	-	VU	Breeds on subantarctic islands and is presumed to frequent subtropical waters during non-breeding period (TSSC 2015).	**Unlikely** No suitable habitat present.
Pandion haliaetus	Osprey	MI	MI	Coasts, estuaries, bays, inlets, islands, and surrounding waters; coral atolls, reefs, lagoons, rock cliffs, stacks (Pizzey & Knight 2012).	**Unlikely** No suitable habitat present.
Plegadis falcinellus	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** No suitable habitat present.
Pluvialis squatarola	Grey Plover	MI	MI	Mudflats, saltmarsh, tidal reefs and estuaries, rarely inland (Pizzey and Knight 2012).	**Unlikely** No suitable habitat present.

		WA	EPBC Act		
Puffinus pacificus	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 2020).	**Unlikely** No suitable habitat present.
Rostratula australis	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** No suitable habitat present.
Sterna bergii	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** No suitable habitat present.
Sterna caspia	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** No suitable habitat present.
Sternula nereis nereis	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** No suitable habitat present.
Thalassarche cauta cauta	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** No suitable habitat present.

		WA	EPBC Act		
Thalassarche cauta steadi	White-capped 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** No suitable habitat present.
Thalassarche melanophris	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** No suitable habitat present.
Thalassarche melanophris impavida	Campbell albatross	VU	VU (MI)	Scarce visitor to south western and western seas. Breeds on Campbell island.	**Unlikely** No suitable habitat present.
Tringa glareola	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** No suitable habitat present.
Tringa hypoleucos	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 wherelow perches are available (Johnstone & Storr 1998).	**Unlikely** No suitable habitat present.
Tringa nebularia	Common greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes, wetlands, claypans (fresh amd saline), commercial saltfields, sewage ponds (Pizzey & Knight 2012).	**Unlikely** No suitable habitat present.

		WA	EPBC Act		
Tringa stagnatilis	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** No suitable habitat present.
Tyto novaehollandiae novaehollandiae	Australian masked owl (southwest)	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** Marginal habitat (marri and flooded gum woodland) present, if any. Species is rarely recorded in the general vacinity of the site.
Invertebrates					
Australotomurus morbidus	Cemetery springtail	P3	-	Unknown.	**Unlikely** Species poorly understood and only known from a few records. The closest known record to the site is associated with native bushland located adjacent to the Perth airport. Species considered unlikely to occur based on occurrence of historical disturbance and poor condition of habitat within the site.

		WA	EPBC Act		
Glossurocolletes bilobatus	a short-tongued bee	P2	-	Unknown.	**Unlikely** Species poorly understood and only known from a few records. The closest known record to the site is located within the Brixton Street Wetlands. Vegetation within the site considered too disturbed to support this species.
Idiosoma sigillatum	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** Potenial habitat present (sandy soils) and mutiple historical records located near the site.
Leioproctus douglasiellus	a short-tongued bee	EN	CR	Life history and habits are poorly documented/ unknown. It has been recorded only on the flowers of Goodenia filiformis and Anthotium junctiforme (Houston 2000).	**Unlikely** Species only known from a few records. The closest known record to the site is located near the Canning river and within Brixton Street Wetlands. No records are known from near the site. Species considered unlikely to occur based on occurrence of historical disturbance and poor condition of habitat within the site.

		WA	EPBC Act		
Neopasiphae simplicior	a short-tongued bee	EN	CR	This species of native bee has been collected on flowers of Goodenia filiformis, Lobelia tenuior, Angianthus preissianus and Velleia sp. (Houston 2000).	**Unlikely** Species only known from a few records. The closest one to the site is located near the Canning river. Species considered unlikely to occur based on occurrence of historical disturbance and poor condition of habitat within the site.
Westralunio carteri	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. Salinity tolerance quite low (Morgan et al. 2011).	**Unlikely** No suitable habitat present.
Mammals					
Bettongia penicillata ogilbyi	Woylie	CR	EN	Woodlands and adjacent heaths with a dense understorey of shrubs, particularly Gastrolobium spp. (TSSC 2018).	**Unlikely** Species locally extinct.
Dasyurus geoffroii	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** Very marginal habitat present (banksia and marri woodland) but too small in extent and no recent records occur near the site. Species now primarily associated with the Jarrah Forest.

		WA	EPBC Act		
Hydromys chrysogaster	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** No suitable habitat present.
Isoodon fusciventer	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	**Possible** Marginal habitat present (perennial lake, marri and banksia woodland) and site located within the species known range. Multiple recent records from near the site.
Myrmecobius fasciatus	Numbat	EN	EN	Generally dominated by Eucalyptus spp. that provide hollow logs and branches for shelter and termites for food (van Dyck & Strahan 2008).	**Unlikely** Species locally extinct.
Notamacropus irma	Western brush wallaby	P4	-	Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	**Unlikely** Very marginal habitat present (banksia and marri woodland) but too small in extent and no historical or recent records occur near the site or wider area.

		WA	EPBC Act		
Phascogale tapoatafa wambenger	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	**Possible** Marginal habitat present (perennial lake, marri and banksia woodland) but very limited in extent. The site is located within the species known range. Recent records located within the wider area of the site.
Setonix brachyurus	Quokka	VU	VU	On the mainland mostly dense streamside vegetation or shrubland and heath areas, particularly around swamps (Cronin 2007).	**Unlikely** Species locally extinct.
Reptiles					
Acanthophis antarcticus	Southern death adder	P3	-	Mostly in woodlands, grasslands and heaths. In the Darling Range this species is typically found within Eucalyptus marginata woodlands adjacent to granite outcrops and along densely vegetated creeks (Bush et al. 2007). Locally confined to an aerea between Mount Helena and Jarrahdale (Bush et al. 1995).	**Unlikely** Very marginal habitat (marri and banksia woodland) present but the site is located outside of the species distribution range.
Ctenotus delli	Dell's skink	P4	-	Jarrah and marri woodland with a shrub dominated understorey, sheltering in dense vegetation, inside grass trees and beneath rocks, sometimes in burrows (Nevill 2005). Species absent from the Swan Coastal Plain (Bush et al. 1995)	**Unlikely** Marginal habitat (marri and banksia woodland) present. Site located outside of the species known distribution range.

		WA	EPBC Act		
Ctenotus ora	Coastal plains skink	P3	-	Sandy substrates with low vegetation (including heath) in open Eucalyptus spp. and Corymbia calophylla woodland over Banksia spp.. Species occurs between Pinjarra and Yallingup in Western Australia (Kay and Keogh 2012).	**Unlikely** Marginal habitat present (marri and banksia woodland) but very limited in extent. The site is located outside of the species known distribution range.
Lerista lineata	Perth slider	P3	-	Sandy coastal heath and low scrubland. Banksia spp. woodland, Eucalyptus gomphocephala open woodland over deep sands, and coastal dunes immediately adjacent to the beach (Wilson and Swan 2017). Occurs from Perths southern suburbs to Mandurah (Bush et al. 1995).	**Possible** Marginal habitat present (marri and banksia woodland) but limited in extent. Site is located on northern limit of the species range.
Neelaps calonotos	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2002).	**Possible** Marginal habitat present (banksia woodland) but very limited in extent. The site is located within the species known distribution range.
Pseudemydura umbrina	Western swamp tortoise	CR	CR	Clay based ephemeral swamps (Bush et al. 2002).	**Unlikely** No suitable habitat present and species locally extinct.

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.

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Appendix F

Species List

Fauna List
State Football Facility

Category	Status	Species name	Common name	Record type
Amphibia				
		Crinia glauerti	Clicking froglet	Call
		Crinia insignifera	Squelching froglet	Call
		Limnodynastes dorsalis	Western banjo frog	Call
Birds				
		Acrocephalus australis	Australian reed warbler	Sight
		Anas superciliosa	Pacific black duck	Sight
		Anthochaera carunculata	Red wattlebird	Sight, call
		Cacatua roseicapilla	Galah	Sight
	VU	*Calyptorhynchus banksii naso*	Forest red-tailed black cockatoo	Sight, call, foraging evidence
	EN	*Calyptorhynchus latirostris*	Carnaby's cockatoo	Foraging evidence
		Chenonetta jubata	Woodduck	Sight
		Corvus coronoides	Australian raven	Sight
		Cracticus tibicen	Australian magpie	Sight
	*	*Dacela novaeguineae*	Laughing kookaburra	Sight, call
	*	*Fulica atra*	Eurasian coot	Sight
		Hirundo neoxena	Welcome swallow	Sight
		Phaps chalcoptera	Common bronzewing	Sight, call
		Phylidonyris novaehollandiae	New Holland honey eater	Sight
		Porphyrio porphyrio	Purple swamphen	Sight
		Rhipidura albiscapa	Grey fantail	Sight
		Rhipidura leucophrys	Willie wagtail	Sight
	* DP	*Trichoglossus moluccanus*	Rainbow lorikeet	Sight, call
Mammals				
	* DP	*Oryctolagus cuniculus*	Rabbit	Scats
Reptiles				
		Chelodina colliei	Ooblong turtle	Turtle shell
		Menetia greyii	Common dwarf skink	Sight

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

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
419	401657.93	6458889.92	52	*Eucalyptus rudis*	No suitable hollows	
421	401706.79	6458887.84	68	*Eucalyptus rudis*	No suitable hollows	
422	401716.22	6458889.81	74	*Eucalyptus rudis*	No suitable hollows	
423	401665.20	6458831.01	119	*Eucalyptus rudis*	No suitable hollows	
424	401716.83	6458894.81	61	*Eucalyptus rudis*	No suitable hollows	
425	401765.72	6459037.07	87	*Corymbia calophylla*	No suitable hollows	
426	401783.45	6459059.41	93	*Corymbia calophylla*	No suitable hollows	
428	401797.05	6459040.36	97	*Corymbia calophylla*	No suitable hollows	
429	401804.61	6459030.57	50	*Corymbia calophylla*	No suitable hollows	
430	401813.99	6459027.34	59	*Corymbia calophylla*	No suitable hollows	
432	401824.48	6459076.21	70	*Corymbia calophylla*	No suitable hollows	
433	401806.59	6459089.46	72	*Corymbia calophylla*	No suitable hollows	
434	401805.07	6459090.99	69	*Corymbia calophylla*	No suitable hollows	
435	401784.44	6459094.79	79	*Corymbia calophylla*	No suitable hollows	
436	401792.54	6459106.17	51	*Corymbia calophylla*	No suitable hollows	
437	401804.92	6459116.05	67	*Corymbia calophylla*	No suitable hollows	
438	401808.74	6459102.34	86	*Corymbia calophylla*	No suitable hollows	
439	401830.09	6459122.17	66	*Corymbia calophylla*	No suitable hollows	
440	401827.23	6459124.24	57	*Corymbia calophylla*	No suitable hollows	
441	401826.48	6459124.02	58	*Corymbia calophylla*	No suitable hollows	
442	401828.75	6459133.24	91	*Corymbia calophylla*	No suitable hollows	
443	401860.43	6459100.62	82	*Corymbia calophylla*	No suitable hollows	
444	401863.52	6459093.22	75	*Corymbia calophylla*	No suitable hollows	
445	401862.94	6459094.54	52	*Corymbia calophylla*	No suitable hollows	
446	401895.10	6459071.02	67	*Corymbia calophylla*	No suitable hollows	
447	401899.36	6459070.50	52	*Corymbia calophylla*	No suitable hollows	
448	401906.01	6459076.55	62	*Corymbia calophylla*	No suitable hollows	
449	401921.15	6459122.49	74	*Corymbia calophylla*	No suitable hollows	Small hollow present but not suitable for breeding by black cockatoos.
450	401874.41	6459130.35	84	*Corymbia calophylla*	No suitable hollows	Small hollow present but not suitable for breeding by black cockatoos.

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
452	401844.62	6459123.08	63	*Corymbia calophylla*	No suitable hollows	
455	401782.46	6459132.68	86	*Corymbia calophylla*	No suitable hollows	
456	401781.79	6459134.01	92	*Corymbia calophylla*	No suitable hollows	
457	401778.22	6459131.75	52	*Corymbia calophylla*	No suitable hollows	
458	401775.19	6459122.41	56	*Corymbia calophylla*	No suitable hollows	
459	401220.78	6459245.22	58	*Corymbia calophylla*	No suitable hollows	
460	401226.50	6459269.00	63	*Corymbia calophylla*	No suitable hollows	
463	401384.84	6459250.02	71	*Corymbia calophylla*	No suitable hollows	
464	401378.24	6459258.38	79	*Corymbia calophylla*	No suitable hollows	
465	401355.67	6459256.95	50	*Corymbia calophylla*	No suitable hollows	
466	401358.09	6459251.31	79	*Corymbia calophylla*	No suitable hollows	
467	401440.01	6459210.64	57	*Corymbia calophylla*	No suitable hollows	
468	401444.34	6459221.55	51	*Corymbia calophylla*	No suitable hollows	
469	401444.43	6459231.86	55	*Corymbia calophylla*	No suitable hollows	
470	401451.05	6459231.92	55	*Corymbia calophylla*	No suitable hollows	
471	401451.01	6459216.07	51	*Corymbia calophylla*	No suitable hollows	
472	401545.79	6459145.15	66	*Corymbia calophylla*	No suitable hollows	

Appendix H

Overall Habitat Quality Assessment

Black Cockatoo Habitat Quality Assessment - Scoring Tool (Baudin's cockatoo)
State Football Centre

		Query		Answer	Potential score	Site score	Sum
Breeding habitat	**Site condition**	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	N/A	2.0	0.0	0.0
			habitat tree(s) without suitable hollow(s)	N/A	1.0	0.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N/A	1.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)	N/A	0.5	0.0	
		1.3	The site is located within 6 km of:				
			>1000 ha of potential foraging habitat	N/A	3.0	0.0	0.0
			100 to 1000 ha of potential foraging habitat	N/A	1.0	0.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)	N/A	1.0	0	0.0
			The site contains:				
			active nest(s)	N/A	3.0	0	
			potential nest(s)	N/A	1.0	0	0.0
			Score	0	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:				
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	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:				
			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	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)	N	2.0	0.0	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:				
			≥50% primary foraging plants	Y	4.0	4.0	4.0
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	1.0
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				
			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:				
			abundant evidence of foraging	N	2.0	0.0	0.0
			limited evidence of foraging	N	1.0	0.0	
			Score	5	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	N/A	N/A
Roosting	2	Low
Foraging	5	Moderate
Overall habitat quality score	**5**	Moderate

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

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

		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)	Y	1.0	1.0	1.0
			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:				
			>1000 ha of potential foraging habitat	N	3.0	0.0	1.0
			100 to 1000 ha of potential foraging habitat	Y	1.0	1.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)	N	1.0	0	0.0
			The site contains:				
			active nest(s)	N	3.0	0	
			potential nest(s)	N	1.0	0	0.0
			Score	3	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:				
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	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:				
			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	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)	N	2.0	0.0	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:				
			≥50% primary foraging plants	Y	4.0	4.0	4.0
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	1.0
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				
			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:				
			abundant evidence of foraging	N	2.0	0.0	1.0
			limited evidence of foraging	Y	1.0	1.0	
			Score	6	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	3	Low
Roosting	2	Low
Foraging	6	Moderate
Overall habitat quality score	**6**	Moderate

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

Black Cockatoo Habitat Quality Assessment - Scoring Tool (forest red-tailed black cockatoo)
State Football Centre

		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)	Y	1.0	1.0	1.0
			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:				
			>1000 ha of potential foraging habitat	N	3.0	0.0	1.0
			100 to 1000 ha of potential foraging habitat	Y	1.0	1.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)	N	1.0	0	0.0
			The site contains:				
			active nest(s)	N	3.0	0	
			potential nest(s)	N	1.0	0	0.0
			Score	3	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:				
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	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:				
			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	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)	N	2.0	0.0	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:				
			≥50% primary foraging plants	Y	4.0	4.0	4.0
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	Y	2.0	2.0	2.0
			6-12 km from a nest(s) (active, historical or potential)	Y	1.00	1.0	
		3.3	The site is located:				
			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:				
			abundant evidence of foraging	N	2.0	0.0	1.0
			limited evidence of foraging	Y	1.0	1.0	
			Score	7	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	3	Low
Roosting	2	Low
Foraging	7	Moderate - High
Overall habitat quality score	**7**	Moderate - High

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