Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment

Lot 107 Godel Road, Nowergup

Prepared for: Coterra Environment

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EXECUTIVE SUMMARY

Coterra Environment on behalf of its client, requested a Black-Cockatoo habitat survey and Basic vertebrate fauna assessment of Lot 107 Godel Road, Nowergup (18.8ha; i.e. project area). The project area is situated ~6.5km from the coast and 13km north of the Joondalup CBD area in an area primarily used for agriculture.

The project area supports two fauna habitats: Eucalypts over grass; and low Eucalypt woodland over grasstree shrubland. In addition, there are disturbed areas that are mostly sand tracks through the project area.

Carnaby's Black-Cockatoo was seen foraging in the project area, and it is probable that Forest Red-tailed Black-Cockatoos would also forage in the area. There are 118 significant Black-Cockatoo habitat trees in the project area. Five of these significant trees have a hollow(s) that when assessed from ground level could potentially support a Black-Cockatoo nest. There are no known Black-Cockatoo nests in the project area. The project area provides reasonable Black-Cockatoo foraging habitat.

It is possible that Quenda (priority 4 species with DBCA) is present in the project area and surrounding areas, and cats, foxes and rabbits are also present. It is possible that the Black-Striped Snake (priority 3 species with DBCA) is present in low abundance in the project area.

It is recommended that:

- if the significant Black-Cockatoo habitat trees and foraging habitat are to be cleared, then the proposed action should be referred to the Commonwealth Government under the *EPBC Act*; and
- active management before and during the vegetation clearing program is implemented to mitigate the potential impact on the vertebrate fauna.

1. INTRODUCTION

1.1 BACKGROUND

Terrestrial Ecosystems was commissioned by Coterra Environment to undertake a Black-Cockatoo habitat survey and Basic vertebrate fauna assessment of Lot 107 Godel Road, Nowergup (total 18.8ha; i.e. project area). The project area is situated ~6.5km from the coast and 13km north of the Joondalup CBD area in an area primarily used for agriculture.

1.2 PROJECT OBJECTIVES AND SCOPE OF WORKS

A Basic vertebrate fauna risk assessment and targeted Black-Cockatoo habitat survey was undertaken for the project area. The methodology adopted broadly follows that described in the Environmental Protection Authority's (EPA; 2020) *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment*. A Basic fauna assessment involves undertaking a desktop review and reconnaissance site visit, and sometimes it is supported by a targeted survey for conservation significant fauna or in this case a Black-Cockatoo habitat assessment. The objectives of this fauna survey were to:

- provide an indication of the vertebrate fauna assemblage (reptiles, amphibians, mammals and birds) in and near the project area, so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- undertake a Black-Cockatoo habitat assessment; and
- describe the major vertebrate fauna habitats present.

To achieve these objectives, Terrestrial Ecosystems:

- reviewed Terrestrial Ecosystems' database [includes Atlas of Living Australia and the Western Australian Museum records] to identify potential vertebrate fauna within the area;
- searched the Commonwealth Governments database of fauna of national environmental significance to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* or international migratory bird agreements (JAMBA/CAMBA);
- undertook a site reconnaissance survey;
- assessed the trees in the project against the Commonwealth Government's (Department of Agriculture Water and the Environment 2022) Black-Cockatoo referral criteria;
- reviewed previous fauna surveys conducted near the project area in similar habitat types; and
- discussed the likelihood of *EPBC Act 1999* and *Biodiversity Conservation (BC) Act 2016* listed species being present in the project area.

2. EXISTING ENVIRONMENT

2.1 LOCATION OF PROJECT AREA

The project area in the Swan Coastal Plain 2 (SWA2) Interim Biogeographic Regionalisation of Australia (IBRA) subregion. This subregion is a low lying coastal plain, once vegetated by Banksia and Tuart on sandy soils, with *Casuarina obesa* on outwash plains and paperbark in swampy areas (Mitchell et al. 2002).

The project area is in an area used for market gardens and agriculture and is east of a string of shallow lakes that run in a north-south direction east of Wanneroo Road.

2.2 LAND USE HISTORY

The dominant land uses in the IBRA subregion are urban, rural residential, industrial, cultivation, forestry plantations, grazing and conservation areas. The greater Perth metropolitan area now extends almost from Mandurah to Alkimos, with towns further north at Yanchep and Two Rocks and east over the Darling Scarp towards Muchea.

In the northern portion of the greater Perth metropolitan region, land clearing is progressively moving in a northerly and easterly direction from the coastal development strip in Jindalee, Bulter, Shorehaven and Alkimos.

The project area is a remnant patch of bushland supporting Banksia, Tuart and Jarrah trees on sandy soils. Review of historical aerial photography indicates that the site was partially cleared prior to 1965 with numerous tracks also historically created within the site (Landgate 2024).

2.3 CLIMATE

The project area is characterised as having a warm Mediterranean climate (Mitchell et al. 2002). Perth Airport, which is ~40km south of the project area, and a similar distance from the coast, has an annual rainfall of ~759mm, although this varies considerably from year-to-year. The highest mean maximum and minimum temperatures in Perth Airport are in January to March (Bureau of Meteorology 2024). The lowest mean daily maximum and minimum temperatures occur in July (Chart 1). Rainfall predominantly occurs between May and August and winter rains result from low pressure cells moving in an easterly direction.

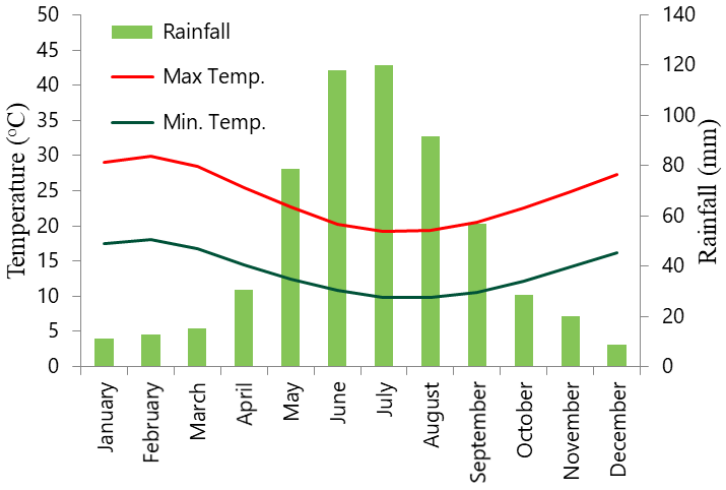


Chart 1. Climatic averages for Perth Airport

2.4 VEGETATION

Botanical surveys undertaken for the project area (PGV Environmental 2014, 2023, EcoEdge Consulting 2024) identify the following vegetation characteristics of the site:

- Vegetation comprises the following:
  - *Eucalyptus gomphocephala* Woodland over *Xanthorrhoea preissii* Shrubland over *Mesomelaena pseudostygia/Phyllanthus calycinus* Open Low Heath (9.77ha)
  - *Eucalyptus marginata* Low Woodland over *Xanthorrhoea preissii* Tall Shrubland (3.83ha)
  - *Corymbia calophylla/Eucalyptus marginata* Low Woodland over *Xanthorrhoea preissii* Shrubland (4.79ha)
- Vegetation condition ranged from Degraded to Completely Degraded (0.53ha).

2.5 REGIONAL BIOLOGICAL FAUNA CONTEXT OF PROJECT AREA

The frogs, reptiles, mammals and birds in the vicinity of the project area have been surveyed for other environmental assessments and research purposes and are therefore known. Fauna surveys and assessments undertaken in the vicinity of the project area that have been reviewed for this assessment include:

- ATA Environmental (2007) *Flora, Vegetation and Vertebrate Fauna Assessment Neerabup Industrial Area (NIA), Neerabup*. Unpublished report for City of Wanneroo, Perth.
- Biota Environmental Sciences (2000) *Lot 52 Burns Beach Road Fauna Survey*. Unpublished report for ATA Environmental, Perth.
- Coffey Environments (2008) *Vertebrate Fauna Assessment, Lot 3 Romeo Road, Alkimos*. Unpublished report for Northern Corridor Developments Limited, Perth.
- Department of Conservation and Land Management (1993) *Fauna Studies in Water Supply Reserve 34537, adjacent to Neerabup National Park*. Unpublished report of Department of Environment and Conservation, Perth.
- Ecoscape (1991) *Biological Survey - Carramar Park*, Unpublished report for City of Wanneroo, Perth.
- GHD (2014) *Neerabup Road Extension Level 2 Fauna Survey*. Unpublished report for Main Roads, Perth.
- GHD (2019) *Mitchell Freeway Extension Hester Avenue to Romeo Road Biological Survey*. Unpublished report for Main Roads WA, Perth.
- Gole, C.A. (2003) *Bird Survey in selected Perth Metropolitan Reserves. A Joint Biodiversity Conservation Project between Birds Australia WA and Perth Biodiversity Project*. Unpublished report Birds Australia and Perth Biodiversity Project, Perth.
- Terrestrial Ecosystems (2012) *Vertebrate fauna relocation outcomes for Trinity*. Unpublished report for Coterra Environment and LWP, Perth.
- Valentine, L.E., Wilson, B.A., Reaveley, A., Huang, N., Johnson, B. and Brown, P. (2009) *Patterns of Ground-dwelling Vertebrate Biodiversity in the Gnangara Sustainability Strategy Study Area*. Department of Environment and Conservation, Perth.
- Western Australian Museum (1978) *Faunal Studies of the Northern Swan Coastal Plain: A Consideration of Past and Future Changes*. Report for the Department of Conservation and Environment, Perth.

Data in the Atlas of Living Australia database and the Department of Biodiversity, Conservation and Attractions' threatened species database have also been added to the information contained in Appendix E, and the compilation of the species lists for the project area.

2.5.1 Fauna species at risk

Mitchell *et al.* (2002) reported multiple vertebrate fauna species at risk in the subregion. However, some of these species have not been recorded near the project area for many years (e.g. *Myrmecobius fasciatus, Pseudocheirus occidentalis, Setonix brachyurus*), although, species such as *Zanda latirostris, Calyptorhynchus banksii naso, Isoodon fusciventer* and *Neelaps calonotos* are still present, and regularly recorded.

3. METHODOLOGY

3.1 DATABASE SEARCHES

A review of the *EPBC* list of protected species was undertaken to identify species of conservation interest to the Commonwealth Government by searching the Commonwealth Government's *EPBC Act* matters of national environmental significance (MNES) online database. In addition, a desktop search of Terrestrial Ecosystems' fauna survey database was used to develop an appreciation of the vertebrate fauna assemblages in relevant sections of the bioregion near the project area.

Other more general texts were also used to provide supplementary information on vertebrate fauna in the bioregion, including Tyler et al. (2000) for frogs; Storr et al. (1983, 1990, 1999, 2002) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals.

Collectively these sources of information were used to create lists of species expected to utilise the project area and broader subregion. It should be noted that these lists will include species that have been recorded in the general region but are possibly vagrants and they will not generally be found in the project area due to a lack of suitable habitat (e.g. shore birds). Vagrants can be recorded almost anywhere. Many of the records are historical and the species is no longer present in the area. Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the project area. Also, the ecology of many of these species is often not well understood and it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the project area. Therefore, many species will be included in the lists produced from database searches but will not be present in the actual project area.

There are errors in most databases, including Atlas of Living Australia and the Western Australian Museum collection. These errors occur because of a misidentification of individuals, taxonomic name changes and incorrect coordinates being entered into the database. Terrestrial Ecosystems was unable to verify the primary records, so it has used the information provided. Obvious errors have been removed but readers should appreciate that species lists and fauna surveys reported in the appendices may include these errors.

3.2 SITE INSPECTION AND FAUNA HABITAT ASSESSMENT

A site visit was undertaken on 11, 12, 15, 17-19 April 2024 to assess fauna habitat types and condition in the project area and to record significant Black-Cockatoo habitat trees. The fauna habitat assessment had two foci:

- assessing fauna habitat types and their condition; and
- assessing the possible presence of and recording evidence of conservation significant fauna.

Simon Pitt, who undertook the fauna habitat assessment, stopped at multiple locations within the project area and recorded a suite of data about the fauna habitat and its condition. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire and is shown in Table 1.

Table 1. Field habitat assessment variables

Observer's Name:	
Coordinates of the location as UTM (GDA94):	
Fire history – options	
☐ > 5 years	
☐ 1-5 years	
☐ < 1 year	
Landform – options	
☐ Beach	☐ Lower slope
☐ Clay plain	☐ Mid slope
☐ Cliff	☐ Ridge
☐ Creek line	☐ River
☐ Dam	☐ Rocky outcrop / breakaway
☐ Drainage line	☐ Salt lake
☐ Dune crest	☐ Sand dune
☐ Dune slope	☐ Sand plain
☐ Dune swale	☐ Stony plain
☐ Escarpment	☐ Swamp
☐ Flat	☐ Undulating
☐ Gorge	☐ Upper slope
☐ Gully	☐ Wetland
☐ Intertidal / mangrove	☐ Water hole
☐ Lake / lake edge	
Habitat quality – options	
☐ *High quality fauna habitat* – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.	
☐ *Very good fauna habitat* - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.	
☐ *Good fauna habitat* – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.	
☐ *Disturbed fauna habitat*– These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, containing weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.	
☐ *Highly degraded fauna habitat* – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Fauna assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.	

Soil Type – options			
☐	Sand	☐	Silty loam
☐	Loamy sand	☐	Sand clay loam
☐	Clayey sand	☐	Clay
☐	Clay loam	☐	Peat / organic
☐	Silty clay loam	☐	Stony
☐	Sandy loam		
Soil colour - options			
☐	Black	☐	Red
☐	Brown	☐	White
☐	Grey	☐	Yellow
☐	Orange		
Surface stones – options			
☐	None	☐	Boulders (>250mm)
☐	Pebbles (0-50mm)	☐	Rocks
☐	Cobbles (51-250)		

3.3 BLACK-COCKATOO HABITAT ANALYSIS

3.3.1 Habitat tree assessment

The Commonwealth Government's (Department of Agriculture Water and the Environment 2022) referral guidelines for Black-Cockatoos in the south-west of Australia indicate that significant habitat trees are those trees that have a potential to develop hollow suitable for breeding purposes or already have a hollow(s). Trees considered as significant black-cockatoo habitat trees are therefore Eucalypts that typically have a diameter at breast height (DBH) of at least 50cm. In addition, the guidelines indicate the vegetation that is typically foraged by the three species. Both breeding and foraging opportunities should be considered when determining whether an action should be referred to the Commonwealth Government under the *EPBC Act*.

The following data for all trees with a diameter at breast height (DBH) ≥50cm were recorded:

- the GPS location;
- the diameter at breast height (DBH);
- the tree's approximate height;
- health of the tree;
- any hollows, the hollow's entrance estimated from ground level, the hollow's height above ground and the orientation of the hollow;
- other notable observable features (historical use for breeding/feeding, presence of bees, etc);
- each recorded tree was numbered with a metal tag;
- recorded current use of tree for breeding from ground level;
- recorded evidence of Black-Cockatoos in the project area; and
- investigated evidence of the trees supporting a roosting site.

Appendix A provides additional information on how habitat trees were assessed.

3.3.2 Foraging habitat assessment

The foraging value of the project area was assessed by calculating the Bamford Consulting Ecologists (BCE; 2020) Black-Cockatoo a foraging score for areas that provide a food resource for Black-Cockatoos. This score provides a numerical value to reflect the significance of vegetation as foraging habitat for Black-Cockatoos and was designed to provide the sort of information requested by the federal Department of Climate Change, Energy, the Environment and Water (DCCEEW), the Department of Water and Environmental Regulation (DWER) and WA Environmental Protection Authority (EPA) to assess impact significance and offset requirements.

The BCE scoring system for value of foraging habitat has three components. Calculating the total score (out of 10) requires the following steps:

- Site condition - Determining a score out of six for the vegetation composition, condition and structure; plus
- Site context - Determining a score out of three for the context of the site; plus
- Species stocking rate - Determining a score out of one for species density.

Determining the total score out of 10, which may require moderation for context and species density with respect to the site condition (vegetation) score. Moderation also includes consideration of pine plantations as a special case for foraging value.

3.4 SURVEY AND REPORTING STAFF

Simon Pitt and Stelleena Mackay undertook the site investigation, fauna habitat assessment, significant tree assessment and habitat mapping. Dr Graham Thompson prepared this report and Dr Scott Thompson reviewed the report before it was sent to the client. Both senior scientists have appropriate relevant post-graduate qualifications, extensive experience in conducting fauna assessments on the Swan Coastal Plain, have published research articles on biodiversity, fauna assemblages, conservation significant species, trapping techniques and temporal variations in trapped fauna assemblages and are therefore appropriately trained and experienced for the task of preparing this assessment.

3.5 TAXONOMY AND NOMENCLATURE

Taxonomy and nomenclature for fauna species used in this report are generally based on the WA Museum species list. Terrestrial Ecosystems has presumed that the identifications referred to in the appendices or in reports used to provide local and regional comparative data are correct and we have only corrected obvious records where the nomenclature was known to be incorrect.

3.6 LIMITATIONS

This Basic fauna risk assessment is based on information contained in the Commonwealth Government MNES database and other published and unpublished fauna survey data for the bioregion and a site visit. It is acknowledged that multiple surveys conducted in different seasons, repeated over several years are necessary to fully appreciate the fauna assemblage in the project area.

The EPA's (2020) *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* suggested that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 2.

Table 2. Fauna survey limitations and constraints

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Availability of data and information	Negligible	There are quantitative vertebrate fauna survey data available for similar habitats near the project area.
Competency/experience of the survey team, including experience in the bioregion surveyed	No	The field zoologists and authors of this report have appropriate qualifications and are suitably experienced to undertake this assessment.
Scope of the survey, e.g. where faunal groups were excluded from the survey	N/A	
Timing, weather and season	No	Weather was suitable for a site survey and assessment.
Disturbance that may have affected results, e.g. fire, flood	No	Disturbances in the project area have been factored into this assessment.
The proportion of fauna identified, recorded or collected	N/A	
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	No	Basic and Targeted survey requirements were met.
Access problems	No	The site was accessible.
Problems with data and analysis, including sampling biases	N/A	

N/A = not applicable, Significant = major impact on outcome of the assessment, Moderate = impacted parts of the assessment, Negligible = almost no impact on the assessment.

4. RESULTS

4.1 FAUNA HABITAT

Twenty-six habitat assessments were completed in the project area (Figure 2: Appendix G). There are the following two broad fauna habitats in the project area:

- Eucalypts over grass; and
- Low Eucalypt woodland over grasstree shrubland.

In addition, there are disturbed areas that are mostly sand tracks through the project area.

Most of the project area is in reasonable to good condition, but the fauna are likely to have been impacted over many years by feral cats and foxes. Plates 1-6 provide representative images of the fauna habitat types and the extent of the disturbance.

Plate 1. Eucalypts over grass

Plate 2. Eucalypts over grass

Plate 3. Low Eucalypt woodland over grasstree shrubland

Plate 4. Low Eucalypt woodland over grasstree shrubland

Plate 5. Disturbed area

Plate 6. Disturbed area

4.2 BLACK-COCKATOO HABITAT TREE ASSESSMENT

One hundred and eighteen Black-Cockatoo habitat trees (i.e. Eucalypts with a diameter at breast height at least 50cm) were recorded in the project area. Five of these trees, when assessed from ground level, had a hollow(s) that could potentially support a Black-Cockatoo nest. Details of these trees are provided in Appendix C and their locations mapped in Figure 2. Carnaby's Black-Cockatoo were seen foraging in the project area (Plates 7 and 8).

Plate 7. Carnaby's Black-Cockatoo foraging in the project area

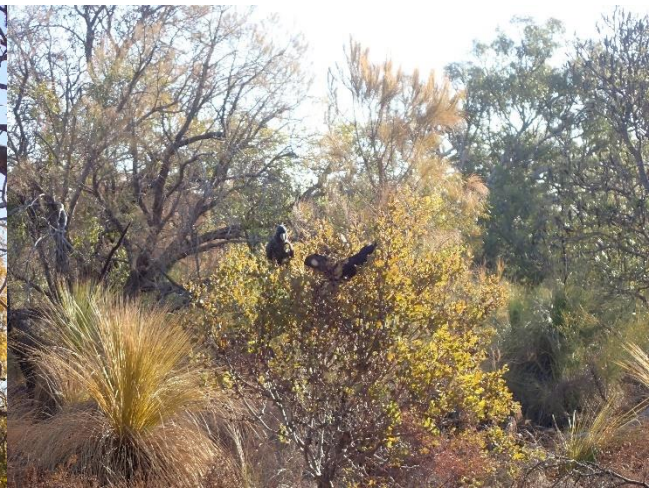


Plate 8. Carnaby's Black-Cockatoo foraging in the project area

4.3 BLACK-COCKATOO FORAGING HABITAT ASSESSMENT

The two broad fauna habitats present within the project area have been assessed for foraging habitat value. There is a significant overlap in the vegetation foraged by Carnaby's and Forest Red-tailed Black-Cockatoos, so the foraging scoring system has been applied to Black-Cockatoo rather than individual species.

Table 3. Black Cockatoo forging scores

Fauna Habitat	Site Condition (out of 6)	Site Context (out of 3)	Species Stocking Rate (0 or 1)	Total (out of 10)
Combined sites	4	0	1	5

Comments on the scoring systems Table 3.

Table 4. Comment on the scoring for Table 3

Site Condition (out of 6)	Site Context (out of 3)	Species Stocking Rate (0 or 1)	Moderation
The project area has a large amount of intact foraging vegetation. However, there are no banksias and the understory vegetation has largely been cleared which has allowed grass to grow.	There is at least one known breeding colony within 15km of the site. The amount of intact foraging vegetation within 15km of the project area is approximately 215km^2. The project area is ~19ha, and this represents <0.1% of foraging habitat availability so it scores 0.	Black-Cockatoos were sighted feeding in the project area during fieldwork and there was evidence of regular foraging in the project area.	The project area scored highly for condition, so there is no need to moderate site context or site density.

Based on the above, the project area contains approximately 17ha of Black-Cockatoo foraging habitat with a score of 5.

4.4 OBVIOUS FAUNA IN THE PROJECT AREA

Tracks of foxes (Plate 9) and cats (Plate 10) were observed in the project, along with kangaroo (Plate 11) and rabbit scats (Plate 12) and rabbit burrows (Plates 13-14).

Plate 9. Fox tracks

Plate 10. Cat tracks

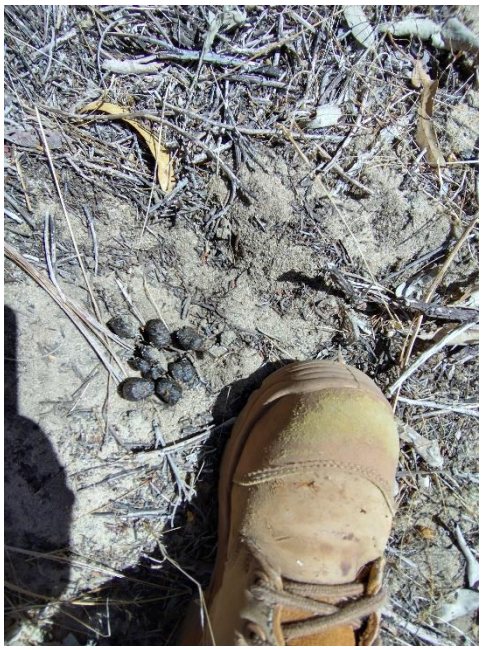


Plate 11. Kangaroo scats

Plate 12. Rabbit scats

Plate 13. Rabbit burrow

Plate 14. Rabbit burrow entrance

4.5 BIOREGIONAL VERTEBRATE FAUNA ASSEMBLAGE

Appendix E provides a summary of the fauna survey data that are available near the project area. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys shown in Appendix E. These differences are partially due to the low survey effort deployed by some of the surveys and they also reflect variations in soils and vegetation as well as temporal variations in the fauna assemblages.

Tables 6-9 provide a list of vertebrate species potentially found near the project area that have been compiled based on the fauna survey report results shown in Appendix E.

Table 5. Birds potentially found near the project area

Family	Species	Common Name
Casuariidae	*Dromaius novaehollandiae*	Emu
Anatidae	*Cygnus atratus*	Black Swan
	Tadorna tadornoides	Australian Shelduck
	Anas superciliosa	Pacific Black Duck
	Biziura lobata	Musk Duck
Phasianidae	*Synoicus ypsilophorus*	Brown Quail
Columbidae	*Columba livia*	Rock Pigeon
	Streptopelia chinensis	Spotted Dove
	Streptopelia senegalensis	Laughing Dove
	Phaps chalcoptera	Common Bronzewing
	Phaps elegans	Brush Bronzewing
	Ocyphaps lophotes	Crested Pigeon
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo
	Chrysococcyx lucidus	Shining Bronze-Cuckoo
	Cacomantis pallidus	Pallid Cuckoo
	Cacomantis flabelliformis	Fan-tailed Cuckoo
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Rallidae	*Fulica atra*	Eurasian Coot
	Porphyrio melanotus	Australasian Swamphen
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper
	Calidris subminuta	Long-toed Stint
Turnicidae	*Turnix varius*	Painted Buttonquail
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull
Ardeidae	*Egretta novaehollandiae*	White-faced Heron
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis
	Threskiornis spinicollis	Straw-necked Ibis
Accipitridae	*Elanus axillaris*	Black-shouldered Kite
	Hieraaetus morphnoides	Little Eagle
	Accipiter fasciatus	Brown Goshawk
	Accipiter cirrocephalus	Collared Sparrowhawk
	Haliastur sphenurus	Whistling Kite
Tytonidae	*Tyto alba*	Barn Owl
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo
Strigidae	*Ninox boobook*	Southern Boobook
Strigidae	*Ninox novaeseelandiae*	Morepork
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Falconidae	*Falco cenchroides*	Nankeen Kestrel
	Falco longipennis	Australian Hobby
	Falco berigora	Brown Falcon
	Falco peregrinus	Peregrine Falcon
Cacatuidae	*Calyptorhynchus banksii naso*	Red-tailed Black-Cockatoo
	Zanda latirostris	Carnaby's Black-Cockatoo
	Eolophus roseicapilla	Galah
	Cacatua pastinator	Western Corella
	Cacatua sanguinea	Little Corella
	Nymphicus hollandicus	Cockatiel
Psittaculidae	*Neophema elegans*	Elegant Parrot
	Barnardius zonarius	Australian Ringneck
	Purpureicephalus spurius	Red-capped Parrot
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet
	Trichoglossus haematodus	Coconut Lorikeet
Maluridae	*Malurus assimilis*	Purple-backed Fairywren
	Malurus lamberti	Variegated Fairywren
	Malurus splendens	Splendid Fairywren
	Malurus leucopterus	White-winged Fairywren
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill
	Manorina flavigula	Yellow-throated Miner
	Anthochaera chrysoptera	Little Wattlebird
	Anthochaera lunulata	Western Wattlebird
	Anthochaera carunculata	Red Wattlebird
	Gavicalis virescens	Singing Honeyeater
	Ptilotula ornata	Yellow-plumed Honeyeater
	Epthianura albifrons	White-fronted Chat
	Gliciphila melanops	Tawny-crowned Honeyeater
	Lichmera indistincta	Brown Honeyeater
	Phylidonyris novaehollandiae	New Holland Honeyeater
	Phylidonyris niger	White-cheeked Honeyeater
	Nesoptilotis leucotis	White-eared Honeyeater
	Melithreptus chloropsis	Gilbert's Honeyeater
	Melithreptus brevirostris	Brown-headed Honeyeater
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren
	Acanthiza inornata	Western Thornbill

Family	Species	Common Name
	Acanthiza apicalis	Inland Thornbill
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Smicrornis brevirostris	Weebill
	Gerygone fusca	Western Gerygone
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike
	Lalage tricolor	White-winged Triller
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush
	Pachycephala pectoralis	Golden Whistler
	Pachycephala occidentalis	Western Whistler
	Pachycephala rufiventris	Rufous Whistler
Artamidae	*Artamus cinereus*	Black-faced Woodswallow
	Artamus cyanopterus	Dusky Woodswallow
	Cracticus torquatus	Grey Butcherbird
	Cracticus nigrogularis	Pied Butcherbird
	Gymnorhina tibicen	Australian Magpie
	Strepera versicolor	Grey Currawong
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail
	Rhipidura albiscapa	Grey Fantail
	Rhipidura fuliginosa	New Zealand Fantail
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
	Myiagra inquieta	Restless Flycatcher
Corvidae	*Corvus coronoides*	Australian Raven
Petroicidae	*Microeca fascinans*	Jacky Winter
	Petroica boodang	Scarlet Robin
	Petroica multicolor	Norfolk Robin
	Eopsaltria griseogularis	Western Yellow Robin
	Eopsaltria georgiana	White-breasted Robin
Acrocephalidae	*Acrocephalus australis*	Australian Reed Warbler
Locustellidae	*Poodytes gramineus*	Little Grassbird
	Cincloramphus mathewsi	Rufous Songlark
Hirundinidae	*Hirundo neoxena*	Welcome Swallow
	Petrochelidon nigricans	Tree Martin
	Cheramoeca leucosterna	White-backed Swallow
Zosteropidae	*Zosterops lateralis*	Silvereye
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit

Table 6. Amphibians potentially found near the project area

Family	Species	Common Name
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog
	Limnodynastes dorsalis	Western Banjo Frog
Myobatrachidae	*Crinia georgiana*	Quacking Frog
	Crinia insignifera	Sin-bearing Froglet
	Myobatrachus gouldii	Turtle Frog
	Pseudophryne guentheri	Gunther's Toadlet
Pelodryadidae	*Litoria adelaidensis*	Slender Tree Frog
	Litoria moorei	Motorbike Frog

Table 7. Mammals potentially found near the project area

Family	Species	Common Name
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna
	Vulpes vulpes	Red Fox
Felidae	*Felis catus*	Cat
Molossidae	*Austronomus australis*	White-striped Freetail Bat
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat
	Nyctophilus geoffroyi	Lesser Long-eared Bat
	Vespadelus regulus	Southern Forest Bat
Dasyuridae	*Dasyurus geoffroii*	Chuditch
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo
	Notamacropus irma	Western Brush Wallaby
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum
Tarsipedidae	*Tarsipes rostratus*	Honey Possum
Leporidae	*Oryctolagus cuniculus*	Rabbit
Peramelidae	*Isoodon fusciventer*	Quenda
Muridae	*Mus musculus*	House Mouse
	Pseudomys albocinereus	Ash-grey Mouse
	Rattus fuscipes	Bush Rat
	Rattus rattus	Black Rat

Table 8. Reptiles potentially found near the project area

Family	Species	Common Name
Agamidae	*Ctenophorus adelaidensis*	Western Heath Dragon
	Pogona minor	Western Bearded Dragon
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko
	Diplodactylus polyophthalmus	Spotted Sand Plain Gecko
	Oedura marmorata	Marbled Velvet Gecko
	Strophurus elderi	Jewelled Gecko
	Strophurus spinigerus	South-western Spiny-tailed Gecko
Elapidae	*Brachyurophis semifasciata*	Half-girdled Snake
	Demansia psammophis	Yellow-faced Whipsnake
	Echiopsis curta	Bardick
	Narophis bimaculatus	Black-naped Burrowing Snake
	Neelaps calonotos	Black-striped Snake
	Notechis scutatus	Tiger Snake
	Suta gouldii	Gould's Snake
	Pseudechis australis	Mulga Snake
	Pseudonaja affinis	Dugite
	Pseudonaja mengdeni	Gwardar
	Simoselaps bertholdi	Jan's Banded Snake
Gekkonidae	*Christinus marmoratus*	Marbled Gecko
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard
	Delma concinna	Javelin Lizard
	Delma fraseri	Fraser's Delma
	Delma grayii	Side-barred Delma
	Lialis burtonis	Burton's Legless Lizard
	Pletholax gracilis	West Coast Keeled Legless Lizard
	Pygopus lepidopodus	Common Scaly-foot
Pythonidae	*Morelia spilota*	Carpet Python
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink
	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink
	Ctenotus australis	Western Limestone Ctenotus
	Ctenotus fallens	West-coast Laterite Ctenotus
	Cyclodomorphus celatus	Western Slender Bluetongue
	Egernia kingii	King's Skink
	Egernia napoleonis	Southwestern Crevice Skink
	Hemiergis initialis	South-western Earless Skink
	Hemiergis quadrilineata	Two-toed Earless Skink
	Lerista distinguenda	South-western Orange-tailed Slider
	Lerista elegans	West Coast Four-toed Lerista
	Lerista elongata	Wide-striped Mulch Slider
	Lerista lineopunctulata	Dotted-line Robust Slider
	Lerista praepedita	Blunt-tailed West-coast Slider
	Menetia greyii	Common Dwarf Skink
	Morethia lineoocellata	Pale-flecked Morethia
	Morethia obscura	Shrubland Pale-flecked Morethia
	Tiliqua occipitalis	Western Blue-tongued Lizard
	Tiliqua rugosa	Bobtail
Typhlopidae	*Anilios australis*	Austral Blind Snake
	Anilios pinguis	Rotund Blind Snake
Varanidae	*Varanus gouldii*	Gould's Goanna
	Varanus tristis	Black-headed Monitor
Chelidae	*Chelodina oblonga*	South-western Snake-necked Turtle

4.6 CONSERVATION SIGNIFICANT FAUNA

Conservation significant fauna are protected by the Commonwealth *EPBC Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the Western Australia (WA) *BC Act 2016*. The *BC Act 2016* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, DBCA maintains a list of fauna that require monitoring under four priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *BC Act 2016* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory

protection, other than the DBCA's interest in monitoring potential impacts on these species. Avoidance and minimisation of impacts on these species is encouraged. Definitions of the significant fauna under the *BC Act 2016* are provided in Appendix F.

The fauna species that have special status in either State or Commonwealth government legislation or are on the DBCA Priority species list and are potentially present in the vicinity of the project area are listed in Table 9. Although they were recorded in the search of the MNES online database, wetland and shorebirds that typically would be found around the edge of salt lakes, clay pans, estuaries, coastal shores and marshes have been excluded from Table 9 as there is no suitable habitat nearby.

Four threatened species of fauna and one migratory species of birds were identified under the *EPBC Act 1999* and *Biodiversity Conservation Act 2016* as potentially occurring in the project area or surrounds. The following is an assessment of the likelihood of each of the species listed in Table 9 being found in the project area.

Table 9. Assessment of the potential presence of a conservation significant fauna species in the project

Species	DBCA Schedule / Priority	Status under Commonwealth EPBC Act	Comment on the potential presence of a species
Western Ringtail Possum *Pseudocheirus occidentalis*	Critically Endangered	Critically Endangered	Not previously recorded in the project area and there is no suitable habitat.
Woylie *Bettongia penicillata ogilbyi*	Critically Endangered	Endangered	Not previously recorded in the project area and there is no suitable habitat.
Black-striped Dwarf Galaxias *Galaxiella nigrostriata*	Endangered	Endangered	Not previously recorded in the project area and there is no suitable habitat.
Australasian Bittern *Botaurus poiciloptilus*	Endangered	Endangered	Not previously recorded in the project area and there is no suitable habitat.
Carnaby's Black-Cockatoo *Zanda latirostris*	Endangered	Endangered	This cockatoo was recorded foraging in the project area.
Baudin's Black-Cockatoo *Zanda baudinii*	Endangered	Endangered	May infrequently fly over the project area but would be considered a vagrant.
Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso*	Vulnerable	Vulnerable	This cockatoo potentially forages in the project area.
Malleefowl *Leipoa ocellata*	Vulnerable	Vulnerable	Locally extinct from the area.
Chuditch *Dasyurus geoffroii*	Vulnerable	Vulnerable	Not recently recorded in the project area and there is no suitable habitat.
Fork-tailed Swift *Apus pacificus*	Migratory	Migratory	May infrequently be seen flying in the region.
Grey Wagtail *Motacilla cinerea*	Migratory	Migratory	Highly unlikely to be seen in the project area.
Quenda *Isoodon fusciventer*	P3		Potentially in the project area.
Black-striped Snake *Neelaps calonotos*	P4		Potentially in the project area.
Peregrine Falcon *Falco peregrinus*	OS*		May very infrequently be seen in the project area.

*OS - Other specially protected fauna

Results of the Commonwealth *EPBC Act 1999* protected matters database search are provided in Appendix B.

Western Ringtail Possum (*Pseudocheirus occidentalis*) - Critically endangered under the *BC Act* 2016 and endangered under the *EPBC Act 1999*

The Western Ringtail Possum is found on the southern Swan Coastal Plain dominated by Peppermint woodlands from Dawesville to Albany, with some patchy inland populations in the Upper Warren and Manjimup area, around Walpole, Denmark and in other State Forests (Department of Parks and Wildlife 2017).

Its diurnal retreats including dreys, platforms, tree hollows, hollow logs, balga (*Xanthorrhoea* spp.) skirts, under sedges, forest debris and disused rabbit warrens (Department of Parks and Wildlife 2017). Dreys range from rough platforms to more elaborate roughly spherical arboreal nests constructed from vegetation and are generally built where hollows are absent.

Western Ringtail Possum has not been recorded north of the Swan River for many decades and is not likely to be present in the project area.

Woylie (*Bettongia penicillata*) – Critically endangered under the *BC Act* 2016 and endangered under the *EPBC Act 1999*

The Brush-tailed Bettong or Woylie is a small (1-1.6kg) mammal that has a preference for open forests and woodlands, with clumped low understorey of tussock grasses or clumped low woody scrub (Christensen 2000). Woinarski et al. (2014) reported a population reduction of greater than 90% in the last 10 years.

The Woylie has not been recorded near the project area for many years, so it is not considered likely to be present in the project area.

Black-striped Dwarf Galaxias (*Galaxiella nigrostriata*) - Endangered under the *BC Act* 2016 and endangered under the *EPBC Act 1999*

The Black-striped Dwarf Galaxia is a small (maximum 48mm TL), scaleless freshwater fish. It is characterised by two black longitudinal bands separated with a yellow/orange to red stripe. This species is restricted to ephemeral peat wetlands of the south-west of WA, with two localities nearer the project area – Melaleuca Park and Lake Chandala (Threatened Species Scientific Committee 2018).

As there is no permanent freshwater in the project area, so the Black-striped Dwarf Galaxia is not present.

Australasian Bittern (*Botaurus poiciloptilus*) – Endangered under the *BC Act* 2016 and *EPBC Act 1999*

The Australasian Bittern has a distribution from Moora through much of the south-west and east to Mt Arid; however, it is rarely recorded. It is almost always found in dense *Typha*, *Baumea* and sedges in freshwater or brackish swamps (Johnstone and Storr 1998). Garnett *et al*. (2011) reported its population across Australia as less than 2,000 and in decline. Most of the Western Australian records come from Lake Muir.

There is no suitable habitat for the Australasian Bittern in the project area.

Carnaby's Black-Cockatoo (*Zanda latirostris*) - Endangered under the BC Act 2016 and EPBC Act 1999

Carnaby's Black-Cockatoo (*Zanda latirostris*) is a large, pied, cockatoo. Garnett *et al*. (2011) and the DSEWPaC (2011) reported that Carnaby's Black-Cockatoo inhabits the south-west of Western Australia, from Kalbarri to as east on the south coast as Esperance. It breeds inland and moves to the coastal areas when chicks have fledged (Saunders et al. 1985). Carnaby's Black-Cockatoos are highly gregarious, usually seen in trios, small parties or large flocks (up to 5000 birds)(Perry 1948). These flocks usually contain males, females and immature birds.

Carnaby's Black-Cockatoos are partly migratory and partly sedentary (Higgins 1999). In the drier regions of their geographic range where most of the native vegetation has been cleared (e.g. wheatbelt), Carnaby's Black-Cockatoos are postnuptial migrants (Saunders 1980, Saunders and Ingram 1995). After breeding, individuals in these areas migrate to feed in higher rainfall areas including the Swan Coastal Plain, and to a lesser extent,

forests dominated by *E. marginata* (Jarrah), *C. calophylla* (Marri) and *E. diversicolor* (Karri; Saunders 1980). On the Swan Coastal Plain, Carnaby's Black-Cockatoos have been recorded foraging in most suburbs and in pine plantations within the greater Perth metropolitan area (Perry 1948). Vagrants have been recorded on Rottnest Island (Winnett 1989) and Garden Island (Wykes et al. 1999). These later two sightings clearly indicate that Carnaby's Black-Cockatoo will fly considerable distances over non-vegetated areas to forage.

Garnett *et al*. (2011) estimated there were between 10,000 and 60,000 birds in the population. Data presented by Saunders (1980) suggest that Carnaby's Black-Cockatoo move from areas where there is little food to southern and western coastal areas where food is presumably more plentiful during summer and autumn (Davies 1966, Saunders 1980).

Carnaby's Black-Cockatoo breed between July and November mostly in eucalypt woodland (Saunders 1980, 1986). Carnaby's Black-Cockatoo nest in tree hollows that are created by fire, fungi, termites or old age, with hollows between 2.5 and 12m above the ground (Saunders 1979, Higgins 1999). Hollows are large, ranging from 10 to over 250cm in depth (Higgins 1999). These hollows are usually in live or dead smooth-barked *Eucalyptus salmonophloia* (Salmon Gum) or *Eucalyptus wandoo* (Wandoo). However, Carnaby's Black-Cockatoo will also nest in *E. longicornis* (Red Morrell)*, E. loxophleba* (York Gum)*, E. gomphocephala* (Tuart), *E. rudis* (Flooded Gum)*, E. salubris* (Gimlet)*, E. occidentalis* (Swamp Yate) and *C. calophylla* (Higgins 1999, Cale 2003). When breeding, they most often forage in the surrounding shrubland and kwongan heath (Higgins 1999). On the Swan Coastal Plain, breeding could occur in *E. gomphocephala*, *E. rudis*, *E. occidentalis* and *C. calophylla*. Adults return to the same breeding area each year (Saunders 1977) and some use the same tree hollow for many years in succession to raise their chicks, others shift their nests among a number of trees in the same area (Saunders and Ingram 1998).

Foraging habitat of Carnaby's Black-Cockatoo has been reported to include woodlands dominated by *Eucaly*ptus, particularly *E. wandoo* and *E. salmonophloia* and often in shrubland or kwongan heathland dominated by Hakea, Dryandra, Banksia and Grevillea and seasonally in Pinus plantations and less often in *C. calophylla*, *E. diversicolor* or *E. marginata* (Saunders 1980, Higgins 1999).

The project area has an abundance of Black-Cockatoo foraging plants, and Carnaby's Black-Cockatoo was observed foraging in the project area during the site visit. The extent of foraging habitat onsite is estimated to be approximately 17ha.

There are 118 significant habitat trees in the project area. Five of these trees had one or more hollows, when assessed from the ground level, which could potentially support a Black-Cockatoo nest, although there were no active nests recorded during the site assessment. DBCA mapping indicates that the closest known breeding site to the project area is ~26km to the east.

Peck et al.'s (2019) Great Cocky Count records indicate that there is one white-tailed Black-Cockatoo roost site within 5km of the project area. The closest confirmed Carnaby's Black Cockatoo nesting site is ~15km south of the project area in the Edith Cowan Joondalup Campus.

Baudin's Black-Cockatoo (*Zanda baudinii*) - Endangered under the *BC Act* 2016 and *EPBC Act 1999*

Baudin's Black-Cockatoo occurs in the humid and sub-humid forests of Western Australia, an area within the 750mm isohyet (Chapman 2007). It range extends from Gidgegannup and Clackline in the north to about 50km east of Albany and all the forest to the south-west coast (Chapman 2007).

Baudin's Black-Cockatoo is typically found in vagrant flocks and utilises the taller, more open *E. marginata*, *C. calophylla* and *E. diversicolor* forests, where it feeds mainly on *C. calophylla* seeds and various Proteaceous species. Johnstone and Kirkby (2008) reported Baudin's Black-Cockatoo feeding on the seeds of *C. calophylla, E. marginata, A. fraseriana, Banksia grandis, B. quercifolia, B. littoralis, B. ilicifolia, Hakea erinacea, H. prostrata, H. stenocarpa, H. trifurcata, H. lasianthoides, H. ruscifolia, H. lissocarpha, H. varia, H. cristata, H. marginata, Dryandra sessilis, D. squarrosa, D. praemorsa, Grevillea wilsonii, Xanthorrhoea preissii, Kingia australis, Reedia spathacea, Pinus radiata, Erodium* spp. *Jacaranda* spp.*, Macadamia* spp.*, Carya illinoinensis, Malus* spp., *Pyrus* spp., *Diospyros* spp. and *Quercus* spp.; and the nectar, buds and flowers of *C. calophylla,, C. citridora, E.*

marginata, E. wandoo, B. grandis, D. sessilis, D. lindleyana, D. squarrosa, Darwinia citriodora and *Callistemom* spp. They also eat insect larvae and insects from under the bark.

Johnstone and Kirkby (2008) suggested that once chicks had fledged, birds leave the nesting area and family groups amalgamate to form larger flocks. These large flocks arrive in the non-breeding central and northern parts of the Darling Scarp in early February and March. This postnuptial nomad is seen in Collie, Bannister, North Dandalup, Serpentine, Jarrahdale, Wungong, Mundaring and Chidlow, and sometimes venture on to the adjacent coastal plain at Maida Vale, Kelmscott, Armadale, Byford, Mundijong, Lake Clifton, Bunbury, Capel, Busselton and Dunsborough (Johnstone and Kirkby 2008, Johnstone et al. 2011). During the non-breeding period, Baudin's Black-Cockatoo utilises a number of roosts on a regular basis. Johnstone and Kirkby (2008) have recorded some of the larger roosts at Gidgegannup, Piesse Brook, Nganguring and Mundaring,. Other roosts are at Chidlow, Parkerville, Kalamunda, Kelmscott, Roleystone, Bedfordale, Gleneagle, Mundijong, Jarrahdale, Bannister and Crossman. Most of these roost sites are tall emergent eucalypts or Blackbutt and they are often near watercourses and in sheltered gullies. They seldom venture as far west as the project area.

The species is known to breed in the southern forests north to Collie and east to near Kojonup in large vertical hollows of *E. diversicolor*, *C. calophylla* and *E. wandoo* (Johnstone and Kirkby 2008). Johnstone and Storr (1998) reported eggs are laid in August to December, with a clutch of 1-2, but normally only a single chick is fledged. Only the female incubates and broods.

Garnett et al. (2011) estimated the population to be around 10,00-15,000, with only 10% breeding in any year.

Garnett et al. (2011) reported the primary threat to this species is a lack of suitable hollows. Competition for hollows comes from other cockatoos, Galahs, Australian Shelducks, Wood Ducks and feral Honey Bees (Johnstone and Kirkby 2008, Garnett et al. 2011). Inadequate feeding resources in the vicinity of nesting hollows to enable adults to feed chicks are also a threat.

It is unlikely that Baudin's Black-Cockatoo will forage this far west of the Darling Range, although they are occasionally mixed in with a flock of Carnaby's Black-Cockatoos, so any individuals recorded in the project area are likely to be vagrants. There are 118 significant habitat trees in the project area. Five of these trees had one or more hollows, when assessed from the ground level, which could potentially support a Black-Cockatoo nest, although breeding by this species is not known to occur in this location.

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) - Vulnerable under the *BC Act* 2016 and *EPBC Act 1999*

The Forest Red-tailed Black-Cockatoo is one of three large black-cockatoos found in Western Australia. *Calyptorhynchus banksii naso* frequents the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (Department of Sustainability Environment Water Population and Communities 2011). It was mostly seen in the hills, but small numbers of birds were seen at Mundijong, Baldivis, Karnup, Stakehill, Pinjarra, Coolup and in the Lake Clifton area (Johnstone et al. 2011). In 2011, there was an increase in the number of Forest Red-tailed Black-Cockatoo on the coastal strip north from Rockingham to the northern metropolitan suburbs. The reason for the recent increase in abundance is unknown.

Forest Red-tailed Black-Cockatoo nest hollows have been recorded between 6.5 and 33m above the ground, with entrance sizes ranging from 10 x 12cm to 44 x 150cm and a depth of 0.3-8.2m (Johnstone et al. 2013a, b). Breeding occurs in all months, but peaks in April-June and August-October with an incubation period of 29-31 days. A female broods her hatchling for the first 3-10 days after hatching and then leaves the nest each day at dawn and returns to feed the chick at dusk. Hatchlings are fully feathered at about 48 days. The majority of nests are in Marri, but they have also been recorded in Jarrah, Blackbutt, Bullich and Wandoo. Nest sites are often clustered in an area.

Johnstone et al., (2011) reported the Forest Red-tailed Black-Cockatoo to feed mostly on seeds from *C. calophylla*, *E. marginata*, but also on *Allocasuarina fraseriana* (Sheoak), *Persoonia longifolia* (Snottygobble),

Eucalyptus patens (Blackbutt) and introduced species such as *M. azedarach* (Cape Lilac) and *Corymbia citriodora* (Lemon-scented Gum).

The Forest Red-tailed Black-Cockatoo is likely to be recorded in the project area, given that potential foraging plant species that are present.

There are 118 significant habitat trees in the project area. Five of these trees have had one or more hollows, when assessed from the ground level, which could potentially support a Black-Cockatoo nest. However, there were no active nests recorded during the site survey. The closest confirmed Forest Red-tailed Black Cockatoo nesting site is ~50km south of the project area in the Murdoch University Campus.

Peck et al.'s (2019) Great Cocky Count did not record Red-tailed Black-Cockatoos roosting sites near the project area. The closest Forest Red-tailed Black Cockatoo confirmed roosting site is ~10km south of the project area in Wanneroo.

Malleefowl (*Leipoa ocellata*) – Vulnerable under the *BC Act* 2016 and *EPBC Act 1999*

Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed or are perching for the night. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Prior to vegetation clearing for agriculture, Malleefowl were abundant in the WA Wheatbelt. Vegetation clearing for agriculture also opened adjacent bushland to predators, and in the south-west of WA, Malleefowl often only persist in isolated remnant patches of native vegetation. Sheep and other herbivores (e.g. goats, kangaroos) grazing in remnant vegetation removes or thins the undergrowth, and they also compete with Malleefowl for herbaceous foods and can cause changes to the structure and floristic diversity of foraging habitats (Benshemesh 2007).

Malleefowl and their eggs are vulnerable to predation by foxes, and newly hatched chicks are vulnerable to foxes, cats and raptors (Priddel and Wheeler 1990, 1997, Benshemesh and Burton 1999, Benshemesh 2007, Lewis and Hines 2014). Malleefowl are no longer present on the Swan Coastal Plain. Their remaining abundance in the Midwest and Goldfields is low and they are sparsely distributed, favouring those areas that are more densely vegetated. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but can span more than five metres and may be up to one metre high. Malleefowl are generally monogamous and once breeding commences, they pair for life. The presence of nest mounds provides an indication of the presence of Malleefowl in the area.

Malleefowl has not been observed in the bioregion for many decades and the species is not expected to be present in or near the project area.

Chuditch (*Dasyurus geoffroii*) – Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

The Chuditch is the largest extant carnivorous marsupial in WA. It is usually active from dusk to dawn. Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west WA and other isolated areas. Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc. and have also been recorded in tree hollows and rock cavities. Chuditch are opportunistic feeders, and forage primarily on the ground at night. Their diet can include other mammals, birds, lizards, bird and reptile eggs but the majority is a mixture of large invertebrates (e.g. spiders, scorpions and crickets).

Chuditch have not been recorded in or near the project area for many years, so it is highly unlikely to be present.

Fork-tailed Swift (*Apus pacificus*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This species breeds in the northeast and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara in November and in the southwest land division in mid-December, and leaving by late April. The Fork-

tailed Swift is an almost exclusively aerial species, foraging and sleeping on the wing. It rarely comes to ground, usually only for breeding. It is common in the Kimberley, uncommon to moderately common near northwest, west and southeast coasts and rare to scarce elsewhere.

Terrestrial Ecosystems' assessment is that the Fork-tailed Swift may very infrequently be seen flying over the project area, however, the Fork-tailed Swift is essentially an aerial species and would be highly unlikely to land in the project area.

Grey Wagtail (*Motacilla cinerea*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

The Grey Wagtail is a small yellow breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species as breeding in Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water including rivers, streams and creeks where it feeds on insects. The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project area.

It is highly unlikely to be seen in the project area due to a lack of records and suitable habitat.

Quenda (*Isoodon fusciventer*) – Priority 4 species with the DBCA

Quenda prefer dense scrub (up to one metre high), often in swampy vegetation but they are found in a variety of other habitats. They will often feed in adjacent forest and woodland that is open grassland, pasture and crop land lying close to dense cover. This ground dwelling medium-sized mammal is found throughout the greater Perth metropolitan area, and in the south-west of WA.

There is suitable habitat in the project area and surrounds to support Quenda, so it is potentially present.

Black-striped Snake (*Neelaps calonotos*) – Priority 3 with DBCA

The Black-striped Snake occurs on dunes and sand-plains vegetated with heaths and eucalypt/banksia woodlands. It feeds largely on skinks and its distribution is restricted and threatened by urban development. In its natural undisturbed state. The Atlas of Living Australia has records of this snake around the project area, so it is feasible that they were in the project area and suitable habitat is present.

Peregrine Falcon (*Falco peregrinus*) – Other specially protected fauna under the *BC Act 2016*

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It favours hilly or mountainous country and open woodlands and may be an occasional visitor to the project area. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years.

The Atlas of Living Australia contains records of this species around the project area, so it is possible that they are infrequently seen in the project area. The Peregrine Falcon will not rely on this site for continued survival in the region.

5. DISCUSSION

5.1 ADEQUACY OF THE FAUNA SURVEY DATA FOR FAUNA HABITATS REPRESENTED IN THE PROJECT AREA

Detailed vertebrate fauna surveys are rarely undertaken on the Swan Coastal Plain as the vertebrate fauna in this IBRA subregion is relatively well known. Even if such a survey was undertaken, it is unlikely to provide new species, in particular a conservation significant species that has not previously been identified for this area that would alter the assessment of potential impacts.

5.2 AMPHIBIANS

Amphibians typically found on the Swan Coastal Plain are listed in Table 6. The lack of permanent freshwater in the project area means that only those species able to survive away from permanent water on very porous sandy soil (e.g. potentially *Heleioporus eyrei*, *Limnodynastes dorsalis* and *Myobatrachus gouldii*) are potentially present in the project area.

Given the project area has a substantial amount of relatively undisturbed native vegetation a small number of amphibians could be present in the project area and would only come to the surface after heavy rain. None of these species are of conservation significance.

5.3 REPTILES

Reptile species found in the vicinity of the project area are shown in Table 8. Reptile species richness in the project area will have been reduced by the presence of foxes and feral cats over many decades, however, there still could be 10-15 species present. Many of the commonly recorded reptiles on the Swan Coastal Plain are potentially present in the project area [e.g. Bobtails (*Tiliqua rugosa*), Dugites (*Pseudonaja affinis*), Western Spiny-tailed Gecko (*Strophurus spinigerus*), Fence Skinks (*Cryptoblepharus buchananii*), Western Limestone Ctenotus (*Ctenotus australis*), Common Dwarf Skink (*Menetia greyii*)].

The project area provides suitable habitat for the Black-striped Snake (*Neelaps calonotos*; Priority 3), so it is potentially present albeit in low numbers.

5.4 BIRDS

Avian species richness on the Swan Coastal Plain are influenced by rainfall, urban disturbance and vegetation clearing. The list provided in Table 5 represents species likely to be found over a large area of diverse habitat types. Jarrah, Tuart and Banksia woodlands were once widespread on the northern Swan Coastal Plain, so there are many species that could be present.

Carnaby's Black-Cockatoo was recorded foraging in the project area and the Forest Red-tailed Black-Cockatoo could also forage in the project area. There are five trees with hollows that were assessed from ground level, that potentially have one or more hollows that could provide a nesting site for Black-C ockatoos. The Peregrine Falcon is very occasionally recorded in the region, but it has a large home range, and would not be significantly impacted by vegetation clearing.

5.5 MAMMALS

It is possible that Quenda are present in the sections of dense vegetation in the project area. The project area is part of a larger area of similar vegetation, which almost certainly supports Quenda. The abundance of Quenda in the project area is likely to be largely determined by the abundance of foxes and the extent to which

the denser ground vegetation disappear at the end of summer, as this reduces the available protection for this species.

Evidence of foxes, feral cats and rabbits were recorded in the project area.

5.6 BIODIVERSITY VALUE

From a fauna perspective, the project area is Jarrah, Tuart and Banksia woodland, and therefore would support a vertebrate fauna assemblage that occurs on large section of the Swan Coastal Plain. However, the project area has been subject to the presence of foxes and cats over decades, with the consequence that the vertebrate fauna assemblage has been depleted, however, it will still contain a reasonable fauna assemblage.

In addition, fauna habitat on the northern Swan Coastal Plain has been cleared over many years for agriculture, housing and industrial developments, and pristine, relatively large remnant sites are now rare in the urban and peri-urban area, so loss of this type of habitat should be considered in the context of cumulative impacts.

5.6.1 Ecological functional value at the ecosystem level

Although the project area does not support a near-natural functional ecosystem, it will contain the remnants of the vertebrate fauna assemblage found in Jarrah, Tuart and Banksia woodlands on the northern Swan Coastal Plain.

5.6.2 Maintenance of threatened ecological communities

No threatened ecological fauna communities were identified in the project area.

5.6.3 Condition of fauna habitat

Fauna habitats present in the project area have been disturbed. There are multiple cleared tracks, and it is likely that parts of the vegetation have been removed, and foxes and cats will have been in the area for decades. The available habitat will support a depleted fauna assemblage, compared with what once existed.

5.6.4 Ecological linkages

The project area does not provide an important ecological linkage or fauna movement corridor.

5.6.5 Size and scale of the proposed disturbance

The assessed project area is ~18.8ha in an IBRA region where much of the similar fauna habitat has already been cleared for agriculture or other forms of land development, so as clearing of the vegetation continues, the remaining remnants becomes more important.

6. POTENTIAL ENVIRONMENTAL IMPACTS

Vegetation clearing in the project area, will remove the vertebrate fauna assemblage from the project area. All small terrestrial vertebrate fauna, without an active management/relocation program, will be lost. Birds, and larger vertebrates (large snakes and kangaroos) will move to adjacent areas. Cumulative impacts require consideration in an environmental impact assessment context.

6.1 CONSERVATION SIGNIFICANT SPECIES

There is a low possibility that some Quenda (Priority 4 species) are in the project area. Many of these mammals will move to adjacent areas once vegetation clearing commences, but some will be lost without active management/fauna relocation.

Although it is improbable that Carnaby's or Forest Red-tailed Black-Cockatoos would be injured or killed in the vegetation clearing program, there will be a loss of foraging habitat, and significant trees, that may in the distant future provide nesting sites for these birds should appropriately sized hollows form.

The Black-Striped Snake (Priority 3 species) is potentially in the project area in low abundance. If it is present, then it is likely to be present in similar habitat in adjacent areas. It would almost certainly be lost during vegetation clearing without active management.

7. VERTEBRATE FAUNA RISK ASSESSMENT

7.1 RISK ASSESSMENT

Fauna surveys to support Environmental Impact Assessments (EIA) are part of the environmental risk assessment undertaken to consider what potential impacts a development might have on the biodiversity on a particular area and region. Potential impacts on fauna from the proposed development are identified and briefly described above. Tables 10, 11 and 12 provide a summary of the risk assessment associated with this project.

Any risk assessment is a product of the likelihood of an impact occurring and the consequences of that impact. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood x consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risk associated with each of the impacts. Disturbances and vegetation clearing have an impact on the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 12.

Table 10. Fauna impact risk assessment descriptors

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur, or one or more conservation significant species may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur, or one or more conservation significant species could be present at some time.
C	Moderate	The environmental event should occur, or one or more conservation significant species should be present at some time.
D	Likely	The environmental event will probably occur, or one or more conservation significant species will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur, or one or more conservation significant species is expected be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	Impact on fauna localised and no significant impact on species of conservation significance in the project area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the project area.
4	Major	Significant impact on conservation significant fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as 'vulnerable' or 'endangered' under the *EPBC Act (1999)* at a regional scale.
Acceptability of risk		
Level of risk		Management Action Required
Low		No action required.
Moderate		Avoid if possible, routine management with internal audit and review of monitoring results annually.
High		Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. May a referral to the Commonwealth under the *EPBC Act 1999*.
Extreme		Unacceptable, project should be redesigned or not proceed.

Table 11. Risk assessment matrix

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequences	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

Table 12. Assessed risk of potential impacts on the vertebrate fauna assemblage

			Before management			Management	With management		
			Inherent risk				Residual risk		
Factors	Potential impacts		Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Fauna survey data	Inadequate survey data to adequately assess the risks	Unknown loss of fauna, fauna of conservation significance, and fauna assemblages, and an incomplete fauna assessment.	B	2	Low				
	Inadequacy of comparative data	Limits on the availability of comparative data reduced the capacity to assess the uniqueness of the fauna assemblages in the project area.	B	2	Low				
Clearing vegetation	Loss of fauna habitat – local scale	Loss of terrestrial fauna in the project area.	E	1	Low				
	Loss of fauna habitat – landscape scale	Loss of some fauna during vegetation clearing.	A	1	Low				
	Loss of fauna habitat – regional scale	Small loss of some fauna from the region.	A	1	Low				
	Loss of a threatened ecological fauna community	Loss of an undetected threatened ecological fauna community.	A	3	Low				
	Habitat fragmentation	Fauna movement restricted resulting in the death of fauna and a loss of biodiversity.	A	2	Low				
	Loss of a unique terrestrial fauna ecosystem	Loss of an ecosystem containing fauna with high species richness, high abundance and numerous top of the food chain predators.	A	2	Low				

			Before management			Management	With management		
Death or loss of conservation significant fauna	Carnaby's Black-Cockatoo	Death or reduced viability of Carnaby's Black-Cockatoo.	B	3	Mod				
	Forest Red-tailed Black-Cockatoo	Death or reduced viability of Forest Red-tailed Black-Cockatoos.	B	3	Mod				
	Quenda	Death or the reduced viability of Quenda.	C	2	Low				
	Black-striped Snake	Death or the reduced viability of Black-striped Snake.	C	2	Low				
Human impacts	Spread of weeds	Changed vegetation and a resulting loss of fauna habitat.	B	2	Low				

7.2 NATIVE VEGETATION CLEARING PRINCIPLES AS THEY PERTAIN TO VERTEBRATE FAUNA

The *Environmental Protection Act (1986)* outlines 10 principles that are to be used in the assessment of native vegetation clearing permit applications which are also applicable for other assessments and approvals (Table 13). Where possible, native vegetation should not be cleared if any of the following principles are compromised.

Table 13. Assessment of impact using the native vegetation clearing principles

Principle	Response
It comprises a high level of biological diversity.	Clearing vegetation will not compromise a high level of biodiversity. Carnaby's Black-Cockatoo was recorded foraging in the project area, and it is likely that the Forest Red-tailed Black-Cockatoo also forages in the area. The project area could support a small population of Quenda, and a smaller population of the Black-striped Snake, both of which are likely to be found in similar habitat in adjacent areas.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Clearing the vegetation will not result in the loss of significant habitat for indigenous fauna. The project area contains foraging habitat for Carnaby's and Forest Red-tailed Black-Cockatoos, however, similar habitat exists in the region. The loss of vegetation in the project area is unlikely to significantly impact the population of either species, however, it would trigger a referral under the *EPBC Act* and there will be a cumulative impact.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The area does not contain a threatened ecological fauna community.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The area is not a remnant, although there is an on-going and progressive loss of Jarrah, Tuart and Banksia woodlands on the northern Swan Coastal Plain.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	The area does not contain a wetland.
The clearing of the vegetation is likely to cause appreciable land degradation.	N/A
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Some of the vertebrate fauna in the project area will have home ranges that extend into the adjacent properties (e.g. Quenda) and the clearing of the vegetation in the project area will alter home ranges and may expose some individuals to higher predation pressure.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	N/A

7.2.1 Is a referral required?

Table 14 details the threshold for referring a proposed action to the Commonwealth Government as a potential significant impact (Department of Agriculture Water and the Environment 2022) on Black-Cockatoos. In our assessment, we have assumed that the entire project area is planned for development (i.e. clear of vegetation and significant trees).

Table 14. Referral threshold for Carnaby's and Forest Red-tailed Black-Cockatoos

Attribute	Referral threshold	Carnaby's Black-Cockatoo	Forest Red-tailed Black-Cockatoo
Breeding	Any loss of / impact upon known, suitable or potential nesting trees, and the habitat around these trees, is highly likely to require a referral to the minister. Loss of any potential nesting habitat is likely to require a referral to the minister.	There are no known nesting trees in the project area, but five trees have a hollow(s) that could potentially be used as a nesting site in the future. Overall, there are 118 trees that exceed the 500mm DBH criterion that could potentially form hollows in the future and if this occurred could possibly be used as nesting trees.	There are no known nesting trees in the project area, but five trees have a hollow(s) that could potentially be used as a nesting site in the future. There are 118 trees that exceed the 500mm DBH criterion that could potentially form hollows in the future and if this occurred could possibly be used as nesting trees.
High-quality native foraging habitat	Loss of greater than or equal to 1 ha of foraging habitat scoring 5-10 using the foraging quality scoring tool is likely to require referral to the minister. Foraging habitat quality is determined using the foraging quality scoring tool (see Appendix A) and takes into account context i.e. proximity of the impact site to important attributes.	Carnaby's Black-Cockatoo was recorded foraging in the project area. The site contains approximately 17ha of potential Black-Cockatoo foraging habitat with a foraging habitat score of 5.	It is likely that the Forest Red-tailed Black-Cockatoo will forage on Jarrah and Tuart trees in the project area. The site contains approximately 17ha of potential Black-Cockatoo foraging habitat with a foraging habitat score of 5.
Lower-quality native foraging habitat	Loss of greater than or equal to 10 ha of foraging habitat scoring 0-4 using the foraging quality scoring tool is likely to require referral to the minister. Foraging habitat quality is determined using the foraging quality scoring tool (see Appendix A) and takes into account context i.e. proximity of the impact site to important attributes.	The site contains approximately 17ha of potential Black-Cockatoo foraging habitat with a foraging habitat score of 5.	The site contains approximately 17ha of potential Black-Cockatoo foraging habitat with a foraging habitat score of 5.
Exotic foraging habitat	Loss of greater than or equal to 1 ha of predominantly exotic habitat (e.g. Cape Lilac trees and pine trees) known to be utilised by black cockatoos is likely to require a referral to the minister.	No exotic habitat is present onsite.	No exotic habitat is present onsite.
Night roosting Habitat	Removal of any part of a known night roosting site is likely to require referral to the minister.	There was no evidence to suggest that the project area is a Black-Cockatoo roosting site. Peck et al. (2019) indicated there is a white-tailed Black-Cockatoo roosting sites within 5km of the project area, however none within the project area.	There was no evidence to suggest that the project area is a Black-Cockatoo roosting site. Peck et al. (2019) did not indicated there were roosting sites nearby.

The Commonwealth Government's *Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo (*Zanda latirostris*), Baudin's Cockatoo (*Zanda baudinii*) and the Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*)* indicates that the criteria in the *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment 2013) should be used to determine whether a referral under the *EPBC Act*.

Table 15. Referral guidelines for a significant impact guidelines 1.1

Criteria	Response
• lead to a long-term decrease in the size of a population	The removal of trees and foraging vegetation in the project area by itself is unlikely to lead to a significant long-term decline in the population. However, there is an on-going and progressive cumulative impact of vegetation clearing on foraging habitat for Black-Cockatoos on the Swan Coastal Plain.
• reduce the area of occupancy of the species	The removal of trees and foraging vegetation in the project area is unlikely to lead to a reduction in the area of occupancy, as there is similar habitat in the adjacent areas.
• fragment an existing population into two or more populations	The removal of trees and foraging vegetation in the project area is unlikely to lead to the fragmentation of the population.
• adversely affect habitat critical to the survival of a species	The removal of trees and foraging vegetation in the project area is unlikely to adversely affect habitat critical to the survival of the species, as there are other foraging trees in the general area and the trees do not currently support breeding hollows. However, there is an on-going and progressive cumulative impact of vegetation clearing on foraging habitat for Black-Cockatoos on the Swan Coastal Plain.
• disrupt the breeding cycle of a population	There are no identified active nesting trees in the project area. The removal of trees in the project area is unlikely to disrupt the breeding cycle of Black-Cockatoos.
• modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of trees and foraging vegetation in the project area will remove foraging habitat, but not to the extent that there will likely result in a measurable decline of a Black-Cockatoo species.
• result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The removal of trees and foraging vegetation in the project area is unlikely to result in an invasive species impacting on Black-Cockatoos.
• introduce disease that may cause the species to decline	The removal of trees and foraging vegetation in the project area is unlikely to introduce disease that could cause a decline in the Black-Cockatoo population.
• interfere with the recovery of the species	The removal of trees and foraging vegetation in the project area may interfere with the recovery of Carnaby's and Forest Red-tailed Black-Cockatoo recovery plans through additional habitat loss.

8. SUMMARY

Terrestrial Ecosystems has undertaken a site assessment, recorded Black-Cockatoo significant habitat trees and foraging areas, and mapped fauna habitats for the project area.

The project area supports two fauna habitats:

- Eucalypts over grass; and
- Low Eucalypt woodland over grasstree shrubland.

In addition, there are disturbed areas that are mostly sand tracks through the project area.

Carnaby's Black-Cockatoo was seen foraging in the project area, and it is probable that Forest Red-tailed Black-Cockatoos would also forage in the area. There are 118 significant Black-Cockatoo habitat trees in the project area. Five of these significant trees have hollows that when assessed from ground level could support a Black-Cockatoo nest. There are no known Black-Cockatoo nests in the project area.

It is possible that Quenda are present in the project area and surrounding areas, and cats, foxes and rabbits are also present. It is possible that the Black-Striped Snake is present in low abundance in the project area.

8.1 RECOMMENDATIONS

If the project area is to be cleared of vegetation and developed, then the proposed action should be referred to the Commonwealth Government under the *EPBC Act* as the removal of significant habitat trees and foraging habitat could be deemed a significant impact on two Black-Cockatoo species.

Active management/fauna translocation before and during the vegetation clearing program should also be implemented to mitigate the potential impact on the vertebrate fauna.

9. REFERENCES

ATA Environmental. 2007. Flora, Vegetation and Vertebrate Fauna Assessment Neerabup Industrial Area (NIA), Neerabup. Perth.

ATA Environmental. 2008. Vertebrate Fauna Assessment Lot 3 Romeo Road, Alkimos.

Bamford Consulting Ecologists. 2020. Scoring system for the assessment of foraging value of vegetation for Black-Cockatoos. Perth.

Benshemesh, J. 2007. National Recovery Plan for Malleefowl. South Australia.

Benshemesh, J., and P. Burton. 1999. Fox predation on Malleefowl three years after the spread of RCD in Victoria. Unpublished report for Parks Victoria and Department of Natural Resources and Environment, Mildura.

Biota Environmental Sciences. 2000. Lot 52 Burns Beach Road Fauna Survey. Perth.

Cale, B. 2003. Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan. Department of Conservation and Land Management, Perth.

Chapman, T. 2007. Forest Black Cockatoo (Baudin's Cockatoo *Calyptorhynchus baudinii* and Forest Red Tailed Black Cockatoo *Calyptorhynchus banksii naso*) Recovery Plan 2007 - 2016. Perth.

Christensen, P. 2000. Brush-tailed Bettong. Pages 292-293 *in* R. Strahan, editor. Mammals of Australia. Reed, Sydney.

Davies, S. J. J. F. 1966. The movements of the White-tailed Black Cockatoo (*Calyptorhynchus baudinii*) in south-western Australia. The Western Australian Naturalist **10**:33-42.

Department of Agriculture Water and the Environment. 2022. Referral guideline for 3 WA threatened black cockatoo species Carnaby's Cockatoo *(Zanda latirostris*), Baudin's Cockatoo (*Zanda baudinii*) and the Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*). Canberra.

Department of Conservation and Land Management. 1993. Fauna studies in water supply Reserve 34537, adjacent to Neerabup National Park. Perth.

Department of Parks and Wildlife. 2017. Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan. Perth.

Department of Sustainability Environment Water Population and Communities. 2011. Environment Protection and Biodiversity Conservation Act 1999 draft referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus latirostris* Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii* Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus banksii naso*. Canberra.

Department of the Environment. 2013. Matters of National Environmental Significance Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*. Canberra.

EcoEdge Consulting. 2024. Detailed Flora and Vegetation Survey for Lot 107 Godel Road, Nowergup. Perth.

Ecoscape. 1991. Biological Survey - Carramar Park. Perth.

Environmental Protection Authority. 2020. Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment. Western Australia.

Garnett, S. T., J. K. Szabo, and G. Dutson. 2011. The Action Plan for Australian Birds 2010. CSIRO, Collingwood, Melbourne.

GHD. 2014. Neerabup Road Extension Level 2 Fauna Survey. Perth.

GHD Pty Ltd. 2019. Mitchell Freeway extension Hester Avenue to Romeo Road biological survey. Perth, WA.

Gole, C. A. 2003. Bird Survey in selected Perth Metropolitan Reserves. A Joint Biodiversity Conservation Project between Birds Australia WA and Perth Biodiversity Project. Perth.

Higgins, P. J. 1999. Handbook of Australian, New Zealand and Antarctic Birds Volume 4 Parrots to Dollardbird.

Johnstone, R. E., C. Johnstone, and T. Kirkby. 2011. Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Baudin's Cockatoo (*Calyptorhynchus baudinii*) and the Forest Red-tail Black Cockatoo (*Calyptorhynchus banksii naso*) on the Swan Coastal Plain (Lancelin-Dunsborough), Western Australia. Studies on distribution, status, breeding, food, movement and historical changes. Perth.

Johnstone, R. E., and T. Kirkby. 2008. Distribution, status, social organisation, movements and conservation of Baudin's Cockatoo (*Calyptorhynchus baudinii*) in the south-west Western Australia. Records of the Western Australian Museum **25**:107-118.

Johnstone, R. E., T. Kirkby, and K. Sarti. 2013a. The breeding biology of the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* Gould in South-western Australia. I. Characteristics of nest trees and nest hollows. Pacific Conservation Biology **19**:121-142.

Johnstone, R. E., T. Kirkby, and K. Sarti. 2013b. The breeding biology of the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* Gould in South-western Australia. II. Breeding behaviour and diet. Pacific Conservation Biology **19**:143-155.

Johnstone, R. E., and G. M. Storr. 1998. Handbook of Western Australian Birds. Volume I - Non-Passerines (Emu to Dollarbird). Western Australian Museum, Perth.

Johnstone, R. E., and G. M. Storr. 2004. Handbook of Western Australian Birds. Volume II - Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth.

Landgate. 2024. Landgate Map Viewer Plus.

Lewis, M., and M. Hines. 2014. Malleefowl activity at nesting sites increase fox and other feral animal visitation rates. Pages 242-247 Proceedings of the 5th National Malleefowl Forum 2014.

Mitchell, D., K. Williams, and A. Desmond. 2002. Swan Coastal Plain 2 (SWA2 - Swan Coastal Plain subregion). Pages 606-623 A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Department of Conservation and Land Management, Perth.

Peck, A., G. Barrett, and M. Williams. 2019. The 2019 Great Cocky Count: A community-based survey for Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*). Perth.

Perry, D. H. 1948. Black Cockatoos and pine plantations. The Western Australian Naturalist **1**:133-135.

PGV Environmental. 2014. Lot 105 & 107 McLennan Drive, Nowergup - Flora and Vegetation Survey. Perth.

PGV Environmental. 2023. Carabooda Rezoning Project Flora and Vegetation Survey. Perth.

Priddel, D., and R. Wheeler. 1990. Survival of Malleefowl *Leipoa ocellata* chicks in the absence of ground-dwelling predators. Emu **90**:81-87.

Priddel, D., and R. Wheeler. 1997. Efficacy of fox control in reducing the mortality of released captive-reared Malleefowl, *Leipoa ocellata*. Wildlife Research **24**:469-482.

Saunders, D. A. 1979. The availability of tree hollows for use as nest sites by White-tailed Black Cockatoos. Australian Wildlife Research **6**:205-216.

Saunders, D. A. 1980. Food and movement of the Short-billed form of the White-tailed Black Cockatoo. Australian Wildlife Research **7**:257-269.

Saunders, D. A. 1986. Breeding season, nesting success and nestling growth in Carnaby's Cockatoo, *Calyptorhynchus funereus latirostris*, over 16 years at Coomallo Creek, and a method for assessing the viability of populations in other areas. Australian Wildlife Research **13**:261-273.

Saunders, D. A., and J. A. Ingram. 1995. Birds of Southwestern Australia: An Atlas of Changes in the Distribution and Abundance of the Wheatbelt avifauna. Surrey Beatty, Sydney.

Saunders, D. A., and J. A. Ingram. 1998. Twenty-eight years of monitoring a breeding population of Carnaby's Cockatoo. Pacific Conservation Biology **4**:261-270.

Saunders, D. A., I. Rowley, and G. T. Smith. 1985. The effects of clearing for agriculture on the distribution of cockatoos in the southwest of Western Australia.*in* A. Keast, H. F. Recher, H. A. Ford, and D. A. Saunders, editors. Birds of Eucalypt Forest and Woodlands: Ecology, Conservation, Management. RAOU and Surrey Beatty and Sons, Melbourne and Chipping North.

Storr, G. M., L. A. Smith, and R. E. Johnstone. 1983. Lizards of Western Australia. II: Dragons and Monitors. Western Australian Museum, Perth, Western Australia.

Storr, G. M., L. A. Smith, and R. E. Johnstone. 1990. Lizards of Western Australia. III: Geckos and Pygopods. Western Australian Museum, Perth.

Storr, G. M., L. A. Smith, and R. E. Johnstone. 1999. Lizards of Western Australia. I: Skinks. Western Australian Museum, Perth.

Storr, G. M., L. A. Smith, and R. E. Johnstone. 2002. Snakes of Western Australia. Western Australian Museum, Perth.

Terrestrial Ecosystems. 2012. Vertebrate fauna relocation outcomes for Trinity. Perth.

Threatened Species Scientific Committee. 2018. Conservation Advice *Galaxiella nigrostriata* black-striped minnow. Canberra.

Tyler, M. J., L. A. Smith, and R. E. Johnstone. 2000. Frogs of Western Australia. Western Australian Museum, Perth.

Valentine, I. E., B. A. Wilson, A. Reaveley, N. Huang, B. Johnson, and P. R. Brown. 2009. Patterns of Ground-dwelling Vertebrate Biodiversity in the Gnangara Sustainability Strategy Study Area. Perth.

Van Dyck, S., and R. Strahan. 2008. The Mammals of Australia. Reed New Holland, Sydney.

Western Australian Museum. 1978. Faunal Studies of the Northern Swan Coastal Plain. Western Australian Museum, Perth.

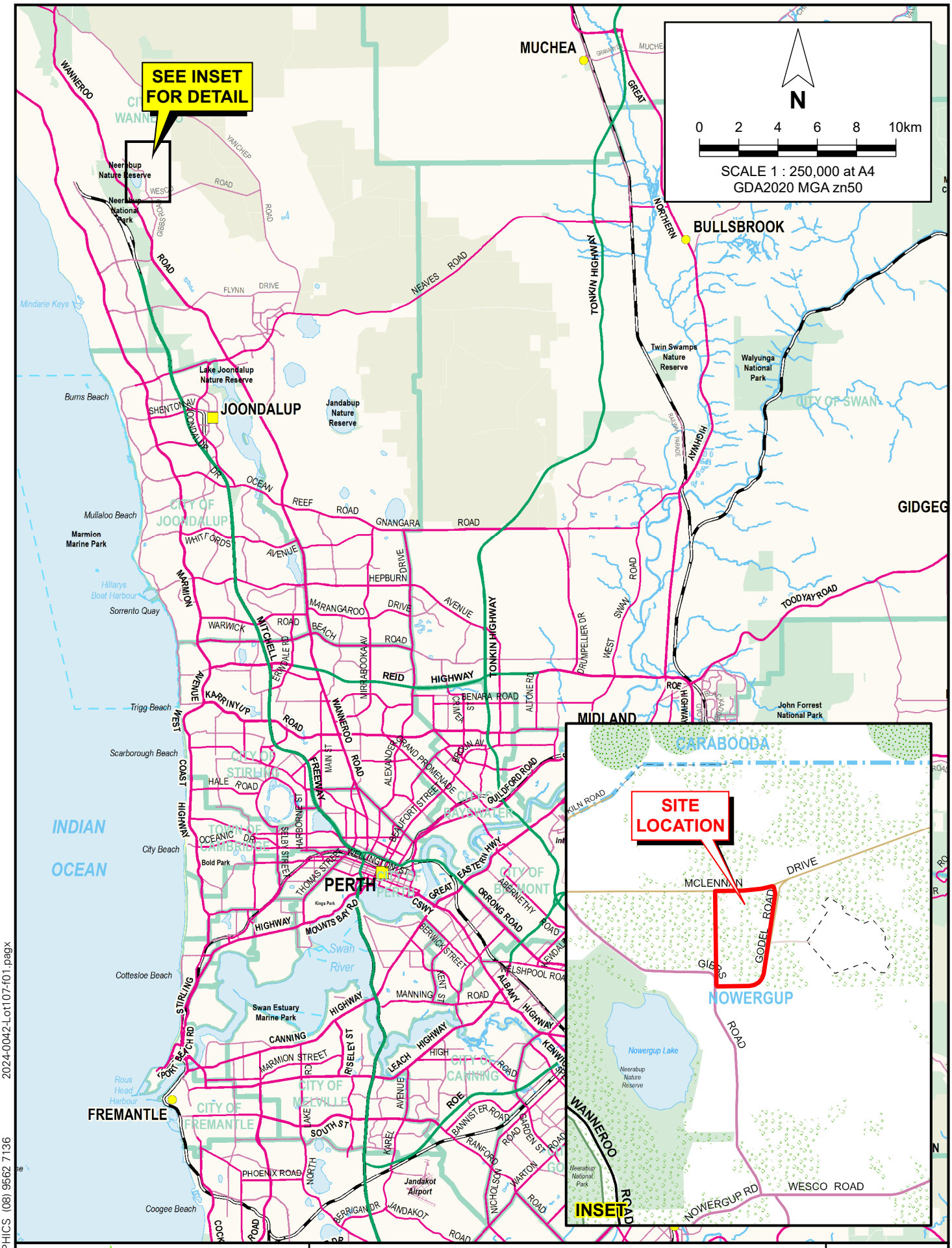
Winnett, S. 1989. White-tailed Black Cockatoos on Rottnest Island. The Western Australian Naturalist **18**:64.

Woinarski, J. C. Z., A. A. Burbidge, and P. L. Harrison. 2014. The Action Plan for Australian Mammals 2012. CSRIO Publishing, Melbourne.

Wykes, B. J., D. Pearson, and J. Majer. 1999. Fauna Survey of Garden Island, WA, 1996-1997. HMAS Stirling, Environmental Working Paper No. 12, Perth.

Figures

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup



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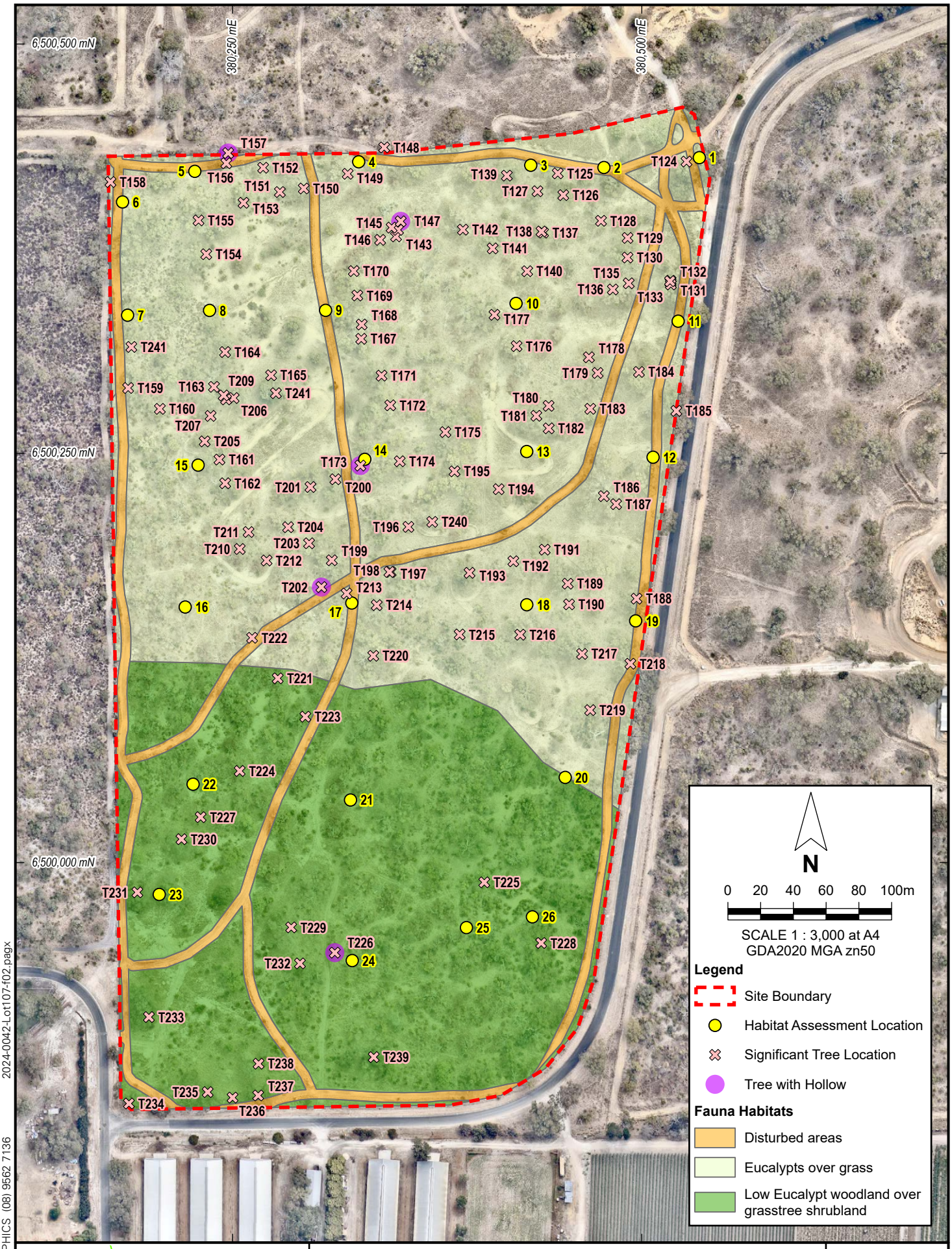
TERRESTRIAL ECOSYSTEMS

Coterra Environments
BASIC VERTEBRATE FAUNA SURVEY AND TARGETED BLACK-COCKATOO ASSESSMENT FOR LOT 107 GODEL ROAD, NOWERGUP

Figure 1

REGIONAL CONTEXT

Drawn: G. Thompson | Date: 28 May 2024 | Job: 2024-0042



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TERRESTRIAL ECOSYSTEMS

Coterra Environments
BASIC VERTEBRATE FAUNA SURVEY AND TARGETED BLACK-COCKATOO ASSESSMENT FOR LOT 107 GODEL ROAD, NOWERGUP

PROJECT AREA SHOWING FAUNA HABITAT, FAUNA HABITAT ASSESSMENT LOCATIONS AND SIGNIFICANT TREES

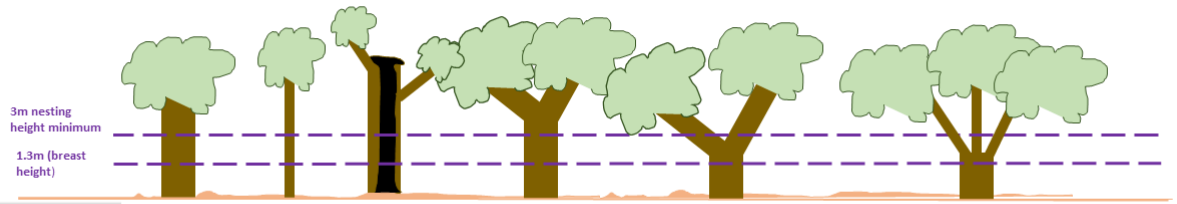
Figure 2

Drawn: G. Thompson | Date: 12 Aug 2024 | Job: 2024-0042

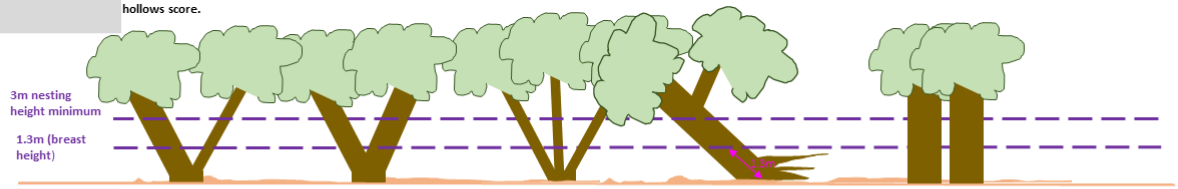
Appendix A.
Black-Cockatoo habitat tree assessment protocol

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

Black Cockatoo Field Assessment for Nesting Trees



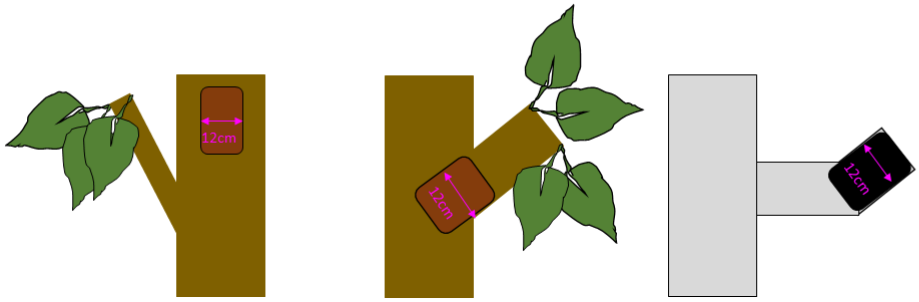
Tree trunk description:	Straight (large) DBH > 500mm*	Straight (thin) DBH < 500mm*	Burnt out, inside of trunk is open DBH < 500mm*	Forked (above 3m) DBH > 500mm*	Forked (between 1.3m - 3m above ground). Above fork at least one trunk DBH > 500mm*	Forked (between 1.3m - 3m above ground). No trunks above fork DBH > 500mm*
Action to take:	Waypoint tree. Record tree type, DBH, life status, hollows score.	Record not required**	Record not required**	Waypoint tree. Record tree type, DBH, life status, hollows score.	Waypoint tree. Record tree type, diameter of widest trunk above fork, life status, hollows score.	Record not required**



Tree trunk description:	Forked (below 1.3m) One trunk above fork diameter > 500mm*	Forked (below 1.3m) Multiple trunks above fork diameter > 500mm*	Forked (below 1.3m) All trunks DBH < 500mm*	Leaning, DBH > 500mm*	Two closely growing but separate trees each with DBH >500mm*
Action to take:	Waypoint tree. Record tree type, DBH of relevant trunk (above fork), number of trunks, life status, hollows score.	Waypoint tree. Record tree type, DBH of widest trunk (above fork), number of trunks, life status, hollows score.	Record not required**	Waypoint tree. Record tree type, DBH at 1.3m from the central base point along trunk midline, life status and hollows score.	Create separate records for each tree. Waypoint each tree. Record tree type, DBH, life status, hollows score.

Lower DBH threshold for Salmon Gum or Wandoo trees (300mm)
**Not suitable for nesting cockatoos*

Black Cockatoo Hollows Field Assessment



Hollow description:	Hollow in trunk (alive or dead tree) > 12cm opening diameter	Hollow at branch base (alive or dead tree) > 12cm opening diameter	Hollow at branch end (alive or dead tree) > 12cm opening diameter
Action to take:	Waypoint hollow. Record tree type, hollow dimensions (*length x width x depth*), orientation, shape, evidence of chewing around hollow opening, droppings, feathers, scattered or broken nuts or flowers, presence of nesting material or birds.	Waypoint hollow. Record tree type, hollow dimensions (*length x width x depth*), orientation, shape, evidence of chewing around hollow opening, droppings, feathers, scattered or broken nuts or flowers, presence of nesting material or birds.	Not suitable for a nesting Black Cockatoo. Record not required.

Appendix B.
Results of the EPBC Act Protected Matters Search

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

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. Please see the caveat for interpretation of information provided here.

Report created: 07-May-2024

Summary

Matters of National Environment 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 (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	43
Listed Migratory Species:	18

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 https://www.dcceew.gov.au/parks-heritage/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 Lands:	92
Commonwealth Heritage Places:	None
Listed Marine Species:	26
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	15
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	83
Key Ecological Features (Marine):	None
Biologically Important Areas:	1
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

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.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Aquatic Root Mat Community in Caves of the Swan Coastal Plain	Endangered	Community known to occur within area
Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain	Endangered	Community known to occur within area
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Empodisma peatlands of southwestern Australia	Endangered	Community may occur within area
Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion	Critically Endangered	Community likely to occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known 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]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	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 known 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

Scientific Name	Threatened Category	Presence Text
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area
[Zanda latirostris listed as Calyptorhynchus latirostris](#) Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area
FISH		
[Galaxiella nigrostriata](#) Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat likely to occur within area
INSECT		
[Hesperocolletes douglasi](#) Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat known to occur within area
MAMMAL		
[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
[Macroderma gigas](#) Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
OTHER		
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
PLANT		
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Anigozanthos viridis subsp. terraspectans		
Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat likely to occur within area
Banksia mimica		
Summer Honeypot [82765]	Endangered	Species or species habitat may occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Caleana dixonii listed as Paracaleana dixonii		
Sandplain Duck Orchid [87944]	Endangered	Species or species habitat may occur within area
Chamelaucium lullfitzii listed as Chamelaucium sp. Gingin (N.G.Marchant 6)		
Gingin Wax [92777]	Endangered (listed as Chamelaucium sp. Gingin	Species or species habitat may occur within area
Darwinia foetida		
Muchea Bell [83190]	Critically Endangered	Species or species habitat likely 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 may occur within area
Drakaea elastica		
Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Eleocharis keigheryi		
Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Eucalyptus argutifolia Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat known to occur within area
Grevillea christineae Christine's Grevillea [64520]	Endangered	Species or species habitat likely to occur within area
Grevillea curviloba subsp. curviloba Curved-leaf Grevillea [64908]	Endangered	Species or species habitat known to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat may occur within area
Marianthus paralius [83925]	Endangered	Species or species habitat known to occur within area
Melaleuca sp. Wanneroo (G.J. Keighery 16705) [89456]	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 may occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area
SHARK		
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		

Scientific Name	Threatened Category	Presence Text
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
[Sterna dougallii](#) Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
[Pristis pristis](#) Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		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
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [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.

Commonwealth Land Name	State
Defence	
Defence - GIN GIN SATELLITE AIRFIELD [50112]	WA
Defence - MUCHEA ARMAMENT RANGE [50088]	WA
Defence - MUCHEA ARMAMENT RANGE [50089]	WA

Commonwealth Land Name	State
Defence - MUCHEA ARMAMENT RANGE [50083]	WA
Defence - MUCHEA ARMAMENT RANGE [50081]	WA
Defence - MUCHEA ARMAMENT RANGE [50094]	WA
Defence - MUCHEA ARMAMENT RANGE [50085]	WA
Defence - MUCHEA ARMAMENT RANGE [50087]	WA
Defence - MUCHEA ARMAMENT RANGE [50056]	WA
Defence - MUCHEA ARMAMENT RANGE [50070]	WA
Defence - MUCHEA ARMAMENT RANGE [50068]	WA
Defence - MUCHEA ARMAMENT RANGE [50062]	WA
Defence - MUCHEA ARMAMENT RANGE [50073]	WA
Defence - MUCHEA ARMAMENT RANGE [50063]	WA
Defence - MUCHEA ARMAMENT RANGE [50058]	WA
Defence - MUCHEA ARMAMENT RANGE [50061]	WA
Defence - MUCHEA ARMAMENT RANGE [50080]	WA
Defence - MUCHEA ARMAMENT RANGE [50092]	WA
Defence - MUCHEA ARMAMENT RANGE [50093]	WA
Defence - MUCHEA ARMAMENT RANGE [50090]	WA
Defence - MUCHEA ARMAMENT RANGE [50086]	WA
Defence - MUCHEA ARMAMENT RANGE [50084]	WA
Defence - MUCHEA ARMAMENT RANGE [50091]	WA
Defence - MUCHEA ARMAMENT RANGE [50069]	WA
Defence - MUCHEA ARMAMENT RANGE [50060]	WA
Defence - MUCHEA ARMAMENT RANGE [50067]	WA
Defence - MUCHEA ARMAMENT RANGE [50066]	WA
Defence - MUCHEA ARMAMENT RANGE [50064]	WA
Defence - MUCHEA ARMAMENT RANGE [50095]	WA
Defence - MUCHEA ARMAMENT RANGE [50074]	WA

Commonwealth Land Name	State
Defence - MUCHEA ARMAMENT RANGE [50075]	WA
Defence - MUCHEA ARMAMENT RANGE [50076]	WA
Defence - MUCHEA ARMAMENT RANGE [50077]	WA
Defence - MUCHEA ARMAMENT RANGE [50082]	WA
Defence - MUCHEA ARMAMENT RANGE [50078]	WA
Defence - MUCHEA ARMAMENT RANGE [50072]	WA
Defence - MUCHEA ARMAMENT RANGE [50071]	WA
Defence - MUCHEA ARMAMENT RANGE [50079]	WA
Defence - MUCHEA ARMAMENT RANGE [50057]	WA
Defence - MUCHEA ARMAMENT RANGE [50065]	WA
Defence - MUCHEA ARMAMENT RANGE [50059]	WA
Defence - PEARCE - AP19 HF RECEIVER STATION BULLSBROOK [50038]	WA
Defence - PEARCE - AP19 HF RECEIVER STATION BULLSBROOK [50020]	WA
Defence - PEARCE - AP19 HF RECEIVER STATION BULLSBROOK [50019]	WA
Defence - PEARCE - AP19 HF RECEIVER STATION BULLSBROOK [50043]	WA
Unknown	
Commonwealth Land - [50711]	WA
Commonwealth Land - [50583]	WA
Commonwealth Land - [50553]	WA
Commonwealth Land - [50312]	WA
Commonwealth Land - [50713]	WA
Commonwealth Land - [50575]	WA
Commonwealth Land - [50562]	WA
Commonwealth Land - [50680]	WA
Commonwealth Land - [50668]	WA
Commonwealth Land - [51120]	WA

Commonwealth Land Name	State
Commonwealth Land - [50705]	WA
Commonwealth Land - [50701]	WA
Commonwealth Land - [50586]	WA
Commonwealth Land - [50560]	WA
Commonwealth Land - [50747]	WA
Commonwealth Land - [50561]	WA
Commonwealth Land - [50271]	WA
Commonwealth Land - [51118]	WA
Commonwealth Land - [50682]	WA
Commonwealth Land - [50563]	WA
Commonwealth Land - [50703]	WA
Commonwealth Land - [50316]	WA
Commonwealth Land - [50702]	WA
Commonwealth Land - [50594]	WA
Commonwealth Land - [50402]	WA
Commonwealth Land - [50706]	WA
Commonwealth Land - [50704]	WA
Commonwealth Land - [50315]	WA
Commonwealth Land - [50489]	WA
Commonwealth Land - [50689]	WA
Commonwealth Land - [50559]	WA
Commonwealth Land - [50588]	WA
Commonwealth Land - [50355]	WA
Commonwealth Land - [50592]	WA
Commonwealth Land - [50593]	WA
Commonwealth Land - [50598]	WA
Commonwealth Land - [50700]	WA

Commonwealth Land Name	State
Commonwealth Land - [50667]	WA
Commonwealth Land - [51130]	WA
Commonwealth Land - [50606]	WA
Commonwealth Land - [50576]	WA
Commonwealth Land - [50574]	WA
Commonwealth Land - [50587]	WA
Commonwealth Land - [50585]	WA
Commonwealth Land - [50584]	WA
Commonwealth Land - [50582]	WA
Commonwealth Land - [50508]	WA

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Bubulcus ibis as Ardea ibis		
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine 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 known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Jandabup	Nature Reserve	WA
Lake Joondalup	Nature Reserve	WA
Neaves Road	Nature Reserve	WA
Neerabup	Nature Reserve	WA
Neerabup	National Park	WA
Unnamed WA21176	5(1)(h) Reserve	WA
Unnamed WA43290	Conservation Park	WA
Unnamed WA46756	Conservation Park	WA
Unnamed WA46920	Nature Reserve	WA
Unnamed WA46926	5(1)(h) Reserve	WA
Unnamed WA49994	Conservation Park	WA
Unnamed WA50514	5(1)(h) Reserve	WA
Woodvale	5(1)(h) Reserve	WA
Yanchep	National Park	WA
Yeal	Nature Reserve	WA

Nationally Important Wetlands	[Resource Information]
Wetland Name	State
Joondalup Lake	WA
Loch McNess System	WA

EPBC Act Referrals	[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Alkimos Seawater Desalination	2019/8453		Completed
Carabooda Quarry	2023/09554		Referral Decision
Expansion of Limestone Extraction	2022/09324		Assessment
Land clearing for timber storage	2022/09367		Assessment
Land Development, James Street and Well Street, East Wanneroo, Elberton Property	2021/9106		Assessment
Mariginiup Residential Development	2023/09675		Assessment
Muchea Silica Sand Project	2022/09370		Referral Decision
Rangedale Landholdings	2023/09612		Assessment
Residential Subdivision development	2011/6040		Post-Approval
Samphire Offshore Wind Farm	2022/09306		Assessment
Wanneroo Shooting Complex - Public shooting range	2023/09630		Referral Decision
Wattle Avenue East Quarry	2022/09326		Referral Decision
Yanchep Rail Extension, WA	2018/8262		Post-Approval
Controlled action			
Alkimos city centre and central development, WA	2015/7561	Controlled Action	Post-Approval
Alkimos Coastal Node	2020/8861	Controlled Action	Further Information Request
Butler North District Open Space playing fields development, Wanneroo, WA	2017/8053	Controlled Action	Post-Approval
Catalina Residential Development	2010/5785	Controlled Action	Post-Approval
East Wanneroo Cell 9 residential subdivision - Lots 50,51,52,154 & 404	2010/5772	Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Eglinton/South Yanchep Residential Development	2011/6021	Controlled Action	Post-Approval
Eglinton Estates - Clearing of native vegetation from Lot 1007 & part Lot 1008	2010/5777	Controlled Action	Post-Approval
Ellenbrook Reliable Water Storage Project, WA	2015/7421	Controlled Action	Post-Approval
Excavate sand and limestone resources	2010/5621	Controlled Action	Completed
Jindee Residential Development	2012/6631	Controlled Action	Post-Approval
Limestone extraction on Lot 8 Wattle Avenue, Nowergup	2013/6767	Controlled Action	Post-Approval
Lot 1665 Wanneroo Road, Sinagra.	2017/7921	Controlled Action	Post-Approval
Lot 9000 Wanneroo Road Sinagra Mixed Use Development, Western Australia	2020/8798	Controlled Action	Proposed Decision
Meridian Business Park Industrial Development	2007/3479	Controlled Action	Post-Approval
Mitchell Freeway Extension and Wanneroo Road Upgrade, WA	2018/8367	Controlled Action	Post-Approval
Mitchell Freeway Extension between Burns Beach Rd and Hester Av, Neerabup, WA	2013/7091	Controlled Action	Post-Approval
Mitchell Freeway Principal Shared Path Gaps Project Ocean Reef Road to Hepburn Avenue	2020/8833	Controlled Action	Post-Approval
National Lifestyle Villages Development	2011/6020	Controlled Action	Post-Approval
Natural Gas Pipeline Expansion	2006/2813	Controlled Action	Post-Approval
Neerabup Industrial Area, WA	2021/8917	Controlled Action	Assessment Approach
Neerabup Industrial Estate, Lot 701 Flynn Drive Neerabup WA	2012/6424	Controlled Action	Post-Approval
Perth-Darwin National Highway alignment (Swan Valley Section), WA	2013/7042	Controlled Action	Post-Approval
Proposed Urban Development of Lots 1005 & 1006	2008/4638	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Residential and commercial development on part 19 (Lot 6) Taronga Place, Eglinton, WA	2017/7872	Controlled Action	Post-Approval
Residential development,Lot 609, Yanchep Beach Road, Yanchep, WA	2014/7146	Controlled Action	Post-Approval
Residential development Lot 1004 Alkimos WA	2011/5902	Controlled Action	Post-Approval
Subdivision of Lot 902 Flynn Drive Neerabup for Industrial Development	2021/8977	Controlled Action	Assessment Approach
Urban development in accordance with the Local Structure Plan	2008/4601	Controlled Action	Post-Approval
Urban Residential Development at Lot 9049 Marmoin Avenue	2009/5155	Controlled Action	Post-Approval
Vegetation Clearing, Wannaroo Rd and Nowergup Rd	2011/5955	Controlled Action	Completed
Vegetation clearing for future agricultural use, Bullsbrook, WA	2014/7120	Controlled Action	Post-Approval
Not controlled action			
Amberton West urban development - Part lot 9005 Eglington WA	2013/7068	Not Controlled Action	Completed
Butler Railway Extension Project - Nowergup Depot Eastern Alignment	2011/5989	Not Controlled Action	Completed
Commercial development of Lot 9004 Hodges Drive, Joondalup, WA	2016/7844	Not Controlled Action	Completed
Connect Joondalup - Lot 9000 McLarty Ave and Lot 999 Piccadilly Circus, Joondalup, WA	2016/7758	Not Controlled Action	Completed
Construction of an International Rifle Range	2011/6068	Not Controlled Action	Completed
Container Deposit Scheme Project	2019/8517	Not Controlled Action	Completed
Development of ECU Engineering Annex, Joondalup Campus, WA	2017/7995	Not Controlled Action	Completed
Development of new Alkimos Wastwater Treatment Plant	2007/3259	Not Controlled Action	Completed
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Extension of 7.5km of the Joondalup Line electrified passenger railway from Cla	2010/5632	Not Controlled Action	Completed
Flynn Drive / Pinjar Road Intersection Works, Lot 9000 Flynn Drive, Neerabup, WA	2017/7983	Not Controlled Action	Completed
Groundwater Replenishment Scheme (GWRS) Stage 2	2016/7786	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Lot 594 Wanneroo Road development, Hocking	2020/8621	Not Controlled Action	Completed
Nowergup Strawberry Farm McLennan Drive, Nowergup, WA	2017/8042	Not Controlled Action	Completed
Pearsall Primary School, Lots 62, 269, 1008, 1009 & Part Lot 23, Pearsall, WA	2012/6405	Not Controlled Action	Completed
Pinjar Motorcycle Park Raceway Development	2012/6419	Not Controlled Action	Completed
Quinns Main sewer extension, Clarkson - Neerabup, WA	2018/8215	Not Controlled Action	Completed
Realignment of Flynn Drive	2011/6170	Not Controlled Action	Completed
Residential and commercial development, Lot 1981 Alexander Drive & Lot 152 Gnangara Road, Landsdale,	2013/6982	Not Controlled Action	Completed
Residential Development, 50 Lot 2 Driver Road, Darch, Western Australia	2020/8677	Not Controlled Action	Completed
Residential Development, Lot 4 Coogee Road, Mariginiup, WA	2019/8452	Not Controlled Action	Completed
Residential development, Lot 55 Alexander Drive, Landsdale, WA	2013/6971	Not Controlled Action	Completed
Residential Development, Lots 10 Dundebar Road and 28 and 29 Belgrade Road, East Wanneroo, WA	2019/8521	Not Controlled Action	Completed
Residential development, Lots 9010 and 9031, Yanchep Beach Rd, Yanchep	2016/7642	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Residential Development Eglinton West, Lot 5000 & part Lot 5001, Pipidinny Road, Eglinton	2014/7137	Not Controlled Action	Completed
Residential development of 118 Coogee Road, Mariginiup, WA	2017/8011	Not Controlled Action	Completed
residential subdivision	2005/1965	Not Controlled Action	Completed
Residential Subdivision - Lots 12, 36 & 38 Capron St, Wanneroo	2012/6409	Not Controlled Action	Completed
Wangara Industrial Extension Area, WA	2012/6501	Not Controlled Action	Completed
Wanneroo Road/Ocean Reef Road Grade Separation, Pearsall, WA	2017/8110	Not Controlled Action	Completed
Wanneroo Road Duplication, WA	2015/7632	Not Controlled Action	Completed
Not controlled action (particular manner)			
Ocean Reef Road Extension Works in Wangara	2010/5388	Not Controlled Action (Particular Manner)	Post-Approval
Road realignment and widening	2009/4926	Not Controlled Action (Particular Manner)	Post-Approval
Subdivision Lot 4 Flynn Drive and earthworks for industrial development, 240 Fl	2009/5028	Not Controlled Action (Particular Manner)	Post-Approval
Transmission Line Rebuild and Extension	2009/5105	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Boundary Road Sand Quarry	2019/8560	Referral Decision	Completed
Residential Subdivision of 60ha, Swan Location 2424	2004/1928	Referral Decision	Completed
Transmission Line Rebuild and Extension	2009/4972	Referral Decision	Completed

Biologically Important Areas		[Resource Information]
Scientific Name	Behaviour	Presence

Scientific Name	Behaviour	Presence
Seabirds		
Sterna dougallii		
Roseate Tern [817]	Foraging	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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 C.
Significant tree data

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

Tree data							Hollow					
Tree #	**UTM**	**UTM easting**	**UTM Northing**	**Tree Type**	**DBH (cm)**	**Height (m)**	**Ent size (cm)**	**Orientation**	**Height above ground (m)**	**Type**	**Health**	**Comment**
T124	50	380527	6500428	Tuart	58	20					Healthy	
T125	50	380449	6500421	Jarrah	85	20					Healthy	
T126	50	380452	6500408	Jarrah	57	15					Healthy	
T127	50	380436	6500410	Jarrah	94	20					Healthy	
T128	50	380475	6500392	Jarrah	63	15					Dead	
T129	50	380491	6500382	Tuart	74	20					Healthy	
T130	50	380491	6500370	Tuart	67	20					Healthy	
T131	50	380518	6500354	Tuart	68	15					Healthy	Split at 4m
T132	50	380518	6500355	Tuart	53	20					Healthy	
T133	50	380518	6500353	Tuart	62	20					Healthy	Splits at 4 and 6m
T134	50	380517	6500355	Tuart	50	20					Healthy	splits in 3 at base, middle trunk measured
T135	50	380492	6500354	Jarrah	65	15					Healthy	Splits at 4m
T136	50	380482	6500350	Jarrah	56	15					Healthy with crown damage	Multi stems all split below 6m
T137	50	380440	6500385	Tuart	73	20					Healthy	Splits at 3m
T138	50	380439	6500385	Jarrah	62	10					Healthy	Splits at 4m

Tree data							Hollow					
T139	50	380418	6500420	Jarrah	86	20					Healthy with crown damage	One of three trunks that are regrowth from the base
T140	50	380430	6500361	Jarrah	51	20					Dead	Splits at 4m
T141	50	380409	6500375	Tuart	165	20					Healthy	Splits at 2m
T142	50	380391	6500387	Tuart	131	20					Healthy	Ssplits at 1.5m
T143	50	380350	6500382	Tuart	56	20					Severe Crown Damage	
T144	50	380351	6500386	Tuart	50	20					Healthy	
T145	50	380347	6500388	Tuart	52	20					Healthy	
T146	50	380340	6500380	Jarrah	97	15					Dead	
T147	50	380353	6500392	Jarrah	150	20	10	east	6	Trunk	Dead	
T148	50	380343	6500437	Tuart	62	20					Healthy	
T149	50	380320	6500421	Tuart	94	20					Healthy	
T150	50	380293	6500412	Tuart	162	20					Healthy	Splits at 2m
T151	50	380279	6500410	Tuart	54	15					Healthy	
T152	50	380269	6500424	Tuart	87	15					Healthy	
T153	50	380257	6500403	Tuart	55	20					Healthy	
T154	50	380234	6500372	Tuart	53	20					Healthy	
T155	50	380229	6500392	Tuart	139	25					Healthy	
T156	50	380246	6500427	Tuart	74	20					Healthy	
T157	50	380247	6500433	Tuart	158	20	15	East	8m	Trunk	Healthy with crown damage	

Tree data							Hollow					
T158	50	380175	6500416	Tuart	130	20					Healthy	
T159	50	380186	6500290	Tuart	119	20					Healthy with crown damage	
T160	50	380206	6500277	Jarrah	69	15					Healthy with crown damage	
T161	50	380242	6500246	Jarrah	54	15					Healthy	
T162	50	380245	6500232	Jarrah	54	15					Severe Crown Damage	
T163	50	380239	6500291	Tuart	99	20					Healthy with crown damage	
T164	50	380245	6500312	Tuart	60	20					Healthy	
T165	50	380274	6500298	Tuart	76	15					Healthy	
T166	50	380276	6500287	Jarrah	128	20					Healthy	
T167	50	380329	6500320	Jarrah	54	15					Healthy	
T168	50	380329	6500329	Tuart	113	20					Healthy with crown damage	
T169	50	380326	6500346	Jarrah	80	15					Healthy	
T170	50	380324	6500361	Jarrah	60	15					Dead	
T171	50	380341	6500297	Tuart	132	20					Healthy	
T172	50	380346	6500279	Jarrah	69	15					Severe crown damage	
T173	50	380328	6500243	Jarrah	78	10	10	North	10m	Brunch/trunk junction	Dead	
T174	50	380352	6500245	Jarrah	79	15					Healthy with crown damage	
T175	50	380380	6500263	Jarrah	127	10					Healthy with crown damage	

Tree data							Hollow					
T176	50	380424	6500315	Tuart	77	20					Healthy	Split at 2m
T177	50	380410	6500335	Tuart	114	20					Healthy	
T178	50	380468	6500309	Tuart	101	20					Healthy	
T179	50	380473	6500299	Tuart	74	20					Healthy	
T180	50	380443	6500279	Tuart	70	20					Healthy	
T181	50	380436	6500273	Tuart	105	20					Healthy	
T182	50	380443	6500265	Tuart	66	20					Healthy	
T183	50	380469	6500277	Tuart	53	25					Healthy	
T184	50	380498	6500300	Tuart	102	25					Healthy	
T185	50	380521	6500276	Tuart	159	25					Healthy	
T186	50	380477	6500224	Tuart	136	25					Healthy with crown damage	
T187	50	380484	6500219	Tuart	58	20					Healthy	
T188	50	380497	6500161	Tuart	143	25					Healthy	
T189	50	380455	6500170	Tuart	146	20					Healthy with crown damage	
T190	50	380456	6500158	Tuart	73	20					Healthy	
T191	50	380441	6500191	Tuart	107	25					Healthy	
T192	50	380422	6500184	Tuart	120	20					Healthy	
T193	50	380395	6500177	Tuart	96	25					Healthy	
T194	50	380413	6500228	Tuart	66	20					Healthy	
T195	50	380386	6500239	Jarrah	70	15					Healthy with crown damage	

Tree data							Hollow					
T196	50	380357	6500205	Jarrah	60	15					Severe Crown Damage	
T197	50	380347	6500178	Jarrah	71	15					Healthy	
T198	50	380346	6500178	Tuart	69	20					Healthy	
T199	50	380311	6500185	Tuart	124	25					Healthy	
T200	50	380313	6500234	Jarrah	67	15					Healthy	
T201	50	380298	6500229	Jarrah	60	20					Healthy	
T202	50	380304	6500168	Tuart	92	12	10	South	4.5	Trunk	Severe Crown Damage	
T203	50	380297	6500195	Tuart	65	15					Healthy	
T204	50	380284	6500205	Jarrah	97	15					Severe Crown Damage	
T205	50	380233	6500257	Jarrah	99	12					Healthy	
T206	50	380251	6500284	Tuart	101	20					Healthy	
T207	50	380237	6500273	Jarrah	64	10					Healthy with crown damage	
T208	50	380246	6500283	Jarrah	101	10					Healthy with crown damage	
T209	50	380245	6500285	Tuart	75	15					Healthy	
T210	50	380254	6500192	Tuart	75	20					Healthy	
T211	50	380260	6500202	Jarrah	76	12					Severe Crown Damage	
T212	50	380271	6500185	Tuart	69	15					Healthy	
T213	50	380320	6500164	Tuart	86	20					Healthy with crown damage	
T214	50	380338	6500157	Tuart	128	20					Severe Crown Damage	

Tree data							Hollow					
T215	50	380389	6500139	Tuart	90	20					Healthy with crown damage	
T216	50	380426	6500139	Tuart	132	20					Healthy	
T217	50	380464	6500127	Tuart	97	20					Healthy	
T218	50	380493	6500121	Tuart	126	25					Healthy	
T219	50	380468	6500093	Tuart	76	20					Healthy	
T220	50	380336	6500126	Tuart	108	20					Healthy	
T221	50	380278	6500113	Jarrah	83	20					Dead	
T222	50	380262	6500137	Jarrah	99	15					Severe Crown Damage	
T223	50	380294	6500089	Jarrah	78	15					Severe Crown Damage	
T224	50	380254	6500056	Tuart	104	15					Severe Crown Damage	
T225	50	380404	6499988	Jarrah	78	20					Healthy with crown damage	
T226	50	380312	6499945	Jarrah	112	15	15	North	5.25	End of Branch	Severe Crown Damage	
T227	50	380230	6500028	Jarrah	114	15					Severe Crown Damage	
T228	50	380439	6499951	Jarrah	58	15					Healthy	
T229	50	380286	6499960	Jarrah	85	20					Dead	
T230	50	380219	6500014	Tuart	57	15					Healthy	
T231	50	380192	6499982	Jarrah	124	15					Healthy	
T232	50	380291	6499938	Tuart	74	15					Dead	
T233	50	380199	6499906	Tuart	125	20					Healthy	
T234	50	380187	6499853	Tuart	90	20					Dead	

Tree data							Hollow					
T235	50	380235	6499860	Tuart	95	15					Healthy	
T236	50	380250	6499856	Tuart	92	15					Healthy	
T237	50	380266	6499858	Tuart	83	15					Healthy with crown damage	
T238	50	380266	6499877	Tuart	71	15					Healthy	
T239	50	380336	6499881	Marri	92	15					Healthy	
T240	50	380188	6500315	Jarrah	75	15					Healthy with crown damage	
T241	50	380372	6500208	Tuart	125	20					Healthy with crown damage	

Appendix D.
Significant tree images

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

Tree 124

Tree 125

Tree 126

Tree 127

Tree 128

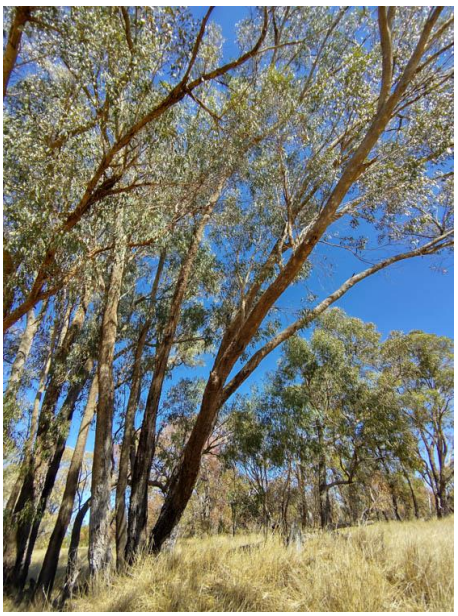
Tree 129

Tree 130

Tree 131

Tree 132

Tree 133



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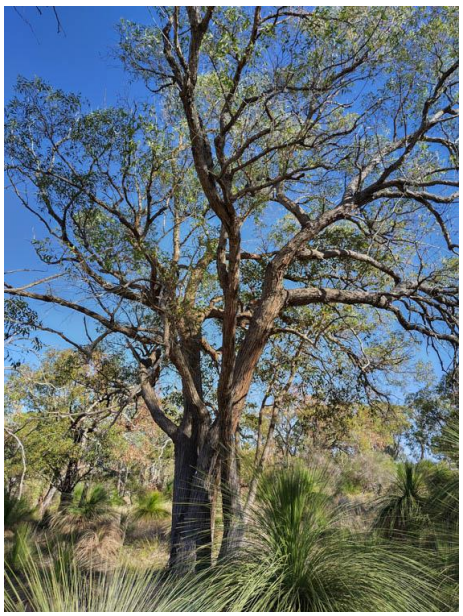

Tree 161

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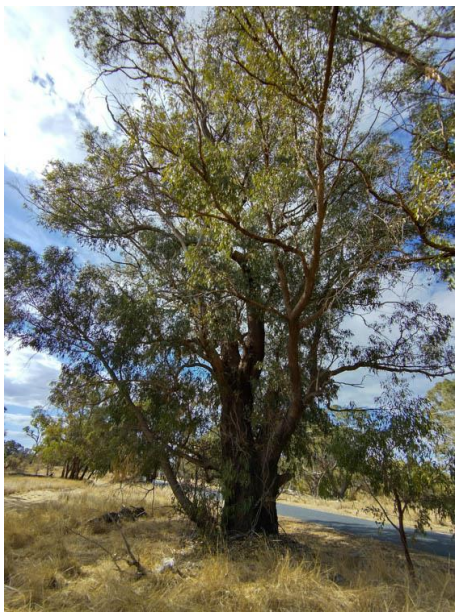

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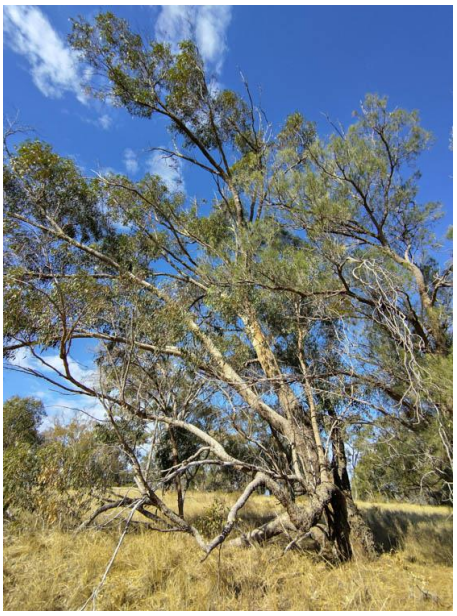

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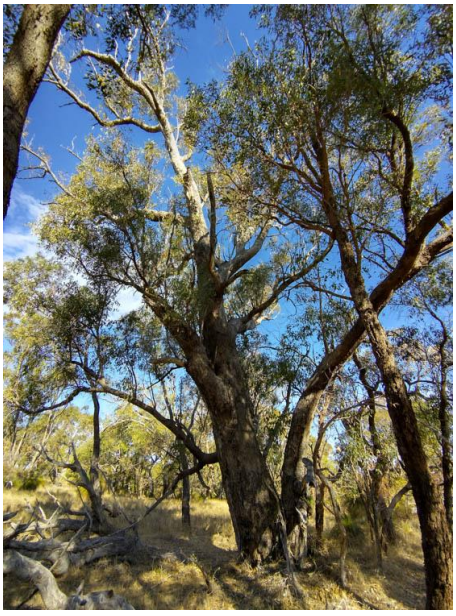

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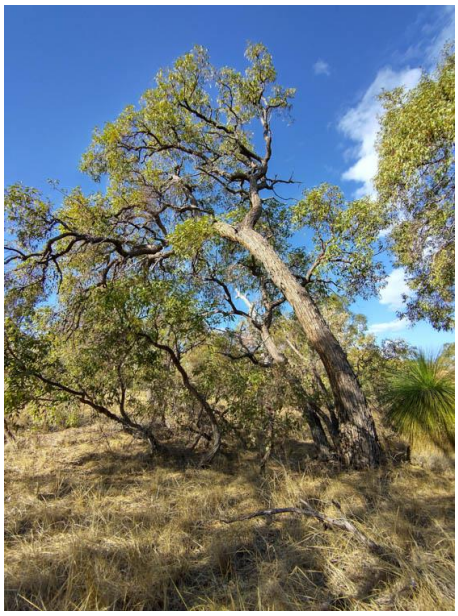

Tree 200

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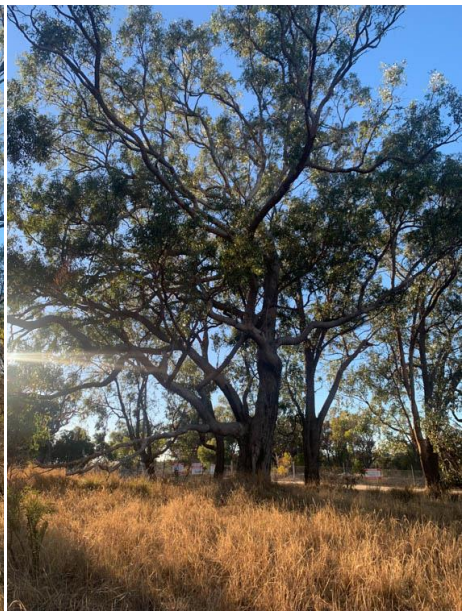

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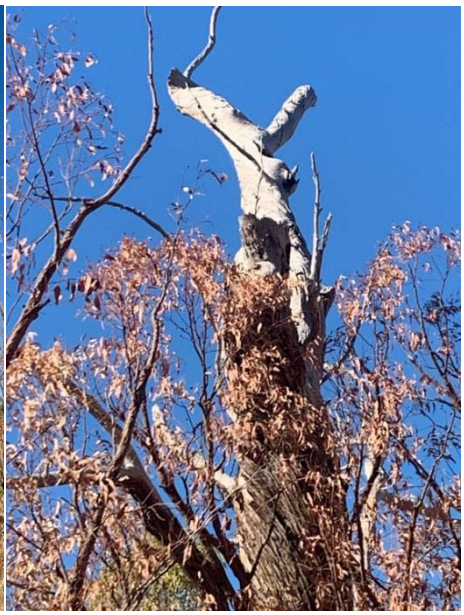

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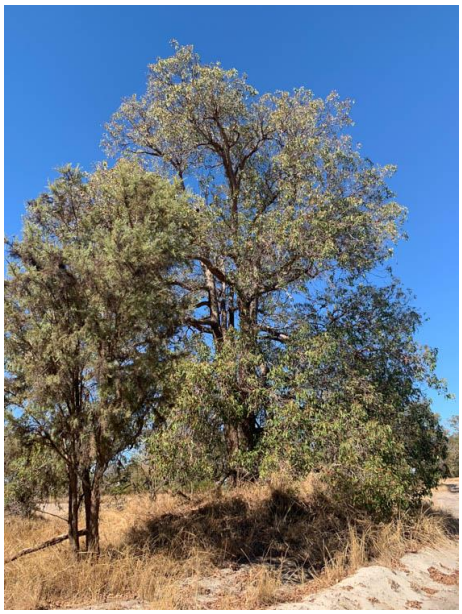
Tree 228

Tree 229

Tree 230



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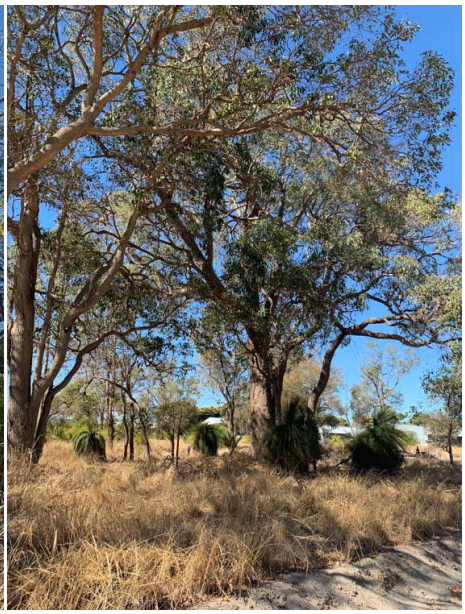
Tree 232



Tree 233

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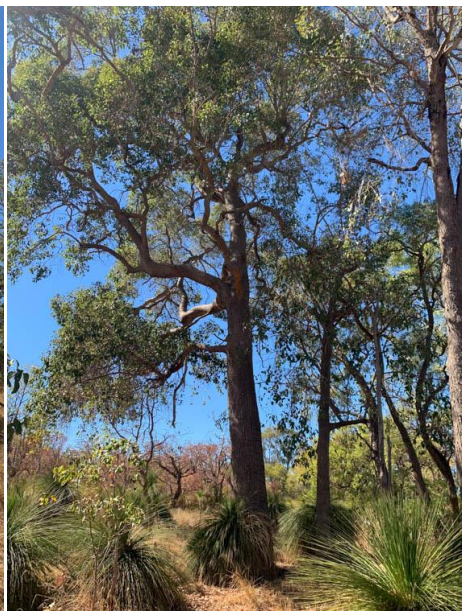

Tree 239

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Appendix E.
Vertebrate Fauna Recorded in Biological Surveys in the Region

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

E.1 VERTEBRATE FAUNA ASSESSMENTS

		Surveys	A	B						C							D			E											
Family	Species	Common name		Lot 1002	Lot 4	Lot 1	Lot 5	Lot 2477	Opportunis	Site 4	Site 1	Site 6	Site 5	Site 2	Site 3	Opportunis	Site B	Site D	Site N	Site 15B	Site 14B	Site 11B	Site 10B	Site 11A	Site 15A	Site 10A	Site 14A	Site 15	Site 11
Amphibians																															
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog	X	109	37	1	1	120	1	27	5	12	13	9	24		7	12		2	2	2	1								
	Limnodynastes dorsalis	Western Banjo Frog	X		4			6		4								3				1	2	1						
Myobatrachidae	*Crinia georgiana*	Quacking Frog	X							4																				
	Crinia insignifera	Sin-bearing Froglet	X							1																				
	Myobatrachus gouldii	Turtle Frog	X																											
	Pseudophryne guentheri	Gunther's Toadlet	X							1																				
Pelodryadidae	*Litoria adelaidensis*	Slender Tree Frog	X																											
	Litoria moorei	Motorbike Frog	X																											
Reptiles																															
Agamidae	*Ctenophorus adelaidensis*	Western Heath Dragon	X																											
	Ctenophorus ornatus	Ornate Crevice Dragon	X																											
	Pogona minor	Western Bearded Dragon	X		2			2			1	1	2	1			1	2	2			1		1						
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko	X																											
	Diplodactylus polyophthalmus	Spotted Sand Plain Gecko	X																											
	Oedura marmorata	Marbled Velvet Gecko									1			1																
	Strophurus spinigerus	South-western Spiny-tailed Gecko	X																											
Elapidae	*Brachyurophis semifasciata*	Half-girdled Snake	X																											
	Echiopsis curta	Bardick	X			1																								
	Narophis bimaculatus	Black-naped Burrowing Snake	X				1								1															
	Neelaps calonotos	Black-striped Burrowing Snake	X																											
	Notechis scutatus	Tiger Snake	X																											
	Suta gouldii	Gould's Snake	X		1																									
	Pseudonaja affinis	Dugite	X					4						1	1				2											
	Simoselaps bertholdi	Jan's Banded Snake	X		3		2	2	1					1							1								
Gekkonidae	*Christinus marmoratus*	Marbled Gecko	X																		1								
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard	X							1	2	4			1				1											
	Delma fraseri	Fraser's Delma	X																1											
	Delma grayii	Side-barred Delma	X																											
	Lialis burtonis	Burton's Legless Lizard	X		3			5			13	2	9	10	4		2		7	1			1						
	Pletholax gracilis	West Coast Keeled Legless Lizard	X		1			1			1																		

		Surveys	A	B						C							D			E										
Family	Species	Common name		Lot 1002	Lot 4	Lot 1	Lot 5	Lot 2477	Opportunis	Site 4	Site 1	Site 6	Site 5	Site 2	Site 3	Opportunis	Site B	Site D	Site N	Site 15B	Site 14B	Site 11B	Site 10B	Site 11A	Site 15A	Site 10A	Site 14A	Site 15	Site 11
	Pygopus lepidopodus	Common Scaly-foot	X																											
Pythonidae	*Antaresia stimsoni*	Stimson's Python	X																											
	Morelia spilota	Carpet Python	X											2																
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink	X							3		1								1					3					
	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink	X	9	8	1					3	8	5	7	4		1		2	2				1	1	1				
	Ctenotus australis	Western Limestone Ctenotus	X	1	9	1	4				2		2	1																
	Ctenotus fallens	West-coast Laterite Ctenotus	X	27	41	10	12				8		1	7					2			9		8	1					
	Cyclodomorphus celatus	Western Slender Bluetongue	X											1																
	Egernia kingii	King's Skink																							2					
	Egernia napoleonis	Southwestern Crevice Skink	X															1							1					
	Hemiergis initialis	South-western Earless Skink			10	1		7																						
	Hemiergis quadrilineata	Two-toed Earless Skink	X		13	9	1	18		4	28	15	9	37	14		3	3	8	4	11	2	7	4		5				
	Lerista elegans	West Coast Four-toed Lerista	X		4		1	2			1	7	6	5	18		1		6	1	1	2		2	3					
	Lerista praepedita	Blunt-tailed West-coast Slider	X								1		1				1													
	Menetia greyii	Common Dwarf Skink	X		12	1	2	2		20	3	6	2	1	18		2	4	3	2			2	4	4	2				
	Morethia lineoocellata	Pale-flecked Morethia									2	3	1	4																
	Morethia obscura	Shrubland Pale-flecked Morethia	X		30	5	1	6			1	3	3	2	5		5	15	9	1	6	7		1		2				
	Tiliqua occipitalis	Western Blue-tongued Lizard			2			2																						
	Tiliqua rugosa	Bobtail	X		9	8	3	1		4	7	3	3	7	3		1	1			5	1	1	1	1		3	2	2	
Typhlopidae	*Anilios australis*	Austral Blind Snake	X					1							1															
Varanidae	*Varanus gouldii*	Gould's Goanna			1				1																					
	Varanus tristis	Black-headed Monitor	X												1		1													
Chelidae	*Chelodina oblonga*	South-western Snake-necked Turtle	X																											
Birds																														
Anatidae	*Anas superciliosa*	Pacific Black Duck								2																				
Columbidae	*Streptopelia senegalensis*	Laughing Dove							1	2																				
	Phaps chalcoptera	Common Bronzewing							9	1					1															
	Ocyphaps lophotes	Crested Pigeon							2																					
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo							5					1																
	Chrysococcyx lucidus	Shining Bronze-Cuckoo										3						1												
Podargidae	*Podargus strigoides*	Tawny Frogmouth							1																					
Turnicidae	*Turnix varius*	Painted Buttonquail							1																					
Ardeidae	*Egretta novaehollandiae*	White-faced Heron													1	1														

		Surveys	A	B						C							D			E										
Family	Species	Common name		Lot 1002	Lot 4	Lot 1	Lot 5	Lot 2477	Opportunis	Site 4	Site 1	Site 6	Site 5	Site 2	Site 3	Opportunis	Site B	Site D	Site N	Site 15B	Site 14B	Site 11B	Site 10B	Site 11A	Site 15A	Site 10A	Site 14A	Site 15	Site 11
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican																											
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis							1																				
Accipitridae	*Elanus axillaris*	Black-shouldered Kite													1														
	Hieraaetus morphnoides	Little Eagle												1															
	Accipiter fasciatus	Brown Goshawk							1						1														
	Accipiter cirrocephalus	Collared Sparrowhawk							1																				
Tytonidae	*Tyto alba*	Barn Owl							2																				
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo									1																		
Strigidae	*Ninox boobook*	Southern Boobook							1					1				1											
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra							4	7		1		2				1											
	Todiramphus sanctus	Sacred Kingfisher							2	6	1	1	1	3			1												
Meropidae	*Merops ornatus*	Rainbow Bee-eater							16	1	1			8		1	1												
Falconidae	*Falco berigora*	Brown Falcon										1																	
	Falco peregrinus	Peregrine Falcon							1																				
Cacatuidae	*Zanda latirostris*	Carnaby's Black-Cockatoo							22				2	6	3				1										
	Eolophus roseicapilla	Galah							78	2	15	5	6	13					1										
	Cacatua sanguinea	Little Corella							18					5															
	Nymphicus hollandicus	Cockatiel							1																				
Psittaculidae	*Neophema elegans*	Elegant Parrot							10																				
	Barnardius zonarius	Australian Ringneck							60	33	36	7	26	33	3	1	1	1	1										
	Purpureicephalus spurius	Red-capped Parrot							48	1		1					1	1	1										
	Trichoglossus haematodus	Coconut Lorikeet							24		10			4															
Maluridae	*Malurus assimilis*	Purple-backed Fairywren	X																										
	Malurus lamberti	Variegated Fairywren	X																										
	Malurus splendens	Splendid Fairywren	X						72	5				14			1	1											
	Malurus leucopterus	White-winged Fairywren	X																										
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill	X						4								1		1										
	Manorina flavigula	Yellow-throated Miner	X																										
	Anthochaera chrysoptera	Little Wattlebird															1	1											
	Anthochaera lunulata	Western Wattlebird	X																										
	Anthochaera carunculata	Red Wattlebird	X						120	14	12	4	10	13	2	1	1	1	1										
	Gavicalis virescens	Singing Honeyeater	X							4	6	6	7	7															
	Ptilotula ornata	Yellow-plumed Honeyeater	X																										
	Epthianura albifrons	White-fronted Chat	X																										

		Surveys	A	B						C							D			E										
Family	Species	Common name		Lot 1002	Lot 4	Lot 1	Lot 5	Lot 2477	Opportunis	Site 4	Site 1	Site 6	Site 5	Site 2	Site 3	Opportunis	Site B	Site D	Site N	Site 15B	Site 14B	Site 11B	Site 10B	Site 11A	Site 15A	Site 10A	Site 14A	Site 15	Site 11
	Gliciphila melanops	Tawny-crowned Honeyeater	X																										
	Lichmera indistincta	Brown Honeyeater	X						719	3	9			5			1	1	1										
	Phylidonyris novaehollandiae	New Holland Honeyeater	X															1											
	Phylidonyris niger	White-cheeked Honeyeater	X						165	3	1		6	4															
	Nesoptilotis leucotis	White-eared Honeyeater	X																										
	Melithreptus chloropsis	Gilbert's Honeyeater	X																										
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	X																										
	Pardalotus striatus	Striated Pardalote	X						9		4		4	3	1		1	1											
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	X																										
	Acanthiza inornata	Western Thornbill	X						84			9		17			1		1										
	Acanthiza apicalis	Inland Thornbill	X						11	4																			
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X							25	9	10		4															
	Smicrornis brevirostris	Weebill	X						21		3	14	1	12	8														
	Gerygone fusca	Western Gerygone	X						69	6	25	24	10	47	20	2	1	1	1										
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike	X						16	1	11	7	2	5		1	1		1										
	Lalage tricolor	White-winged Triller	X																										
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	X						19																				
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush	X						36					2				1											
	Pachycephala pectoralis	Golden Whistler	X									1			2			1											
	Pachycephala rufiventris	Rufous Whistler	X						6	3	1	6	1	5	2	1	1	1											
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	X																										
	Artamus cyanopterus	Dusky Woodswallow	X																										
	Cracticus torquatus	Grey Butcherbird	X						26	7	2	8	8	4	2	1	1	1	1										
	Cracticus nigrogularis	Pied Butcherbird	X																										
	Gymnorhina tibicen	Australian Magpie	X						69	21	11		6	6	9	3	1	1	1										
	Strepera versicolor	Grey Currawong	X																										
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	X						5																				
	Rhipidura albiscapa	Grey Fantail	X						63	50	3	2	1	11	2	1	1	1											
	Rhipidura fuliginosa	New Zealand Fantail	X																										
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	X							3	1	2	2	1															
	Myiagra inquieta	Restless Flycatcher	X																										
Corvidae	*Corvus coronoides*	Australian Raven	X						53	6	22	5	8	14	3	1	1	1	1										
Petroicidae	*Microeca fascinans*	Jacky Winter	X																										
	Petroica boodang	Scarlet Robin	X											1			1	1											

		Surveys	A	B						C								D			E											
Family	Species	Common name		Lot 1002	Lot 4	Lot 1	Lot 5	Lot 2477	Opportunis	Site 4	Site 1	Site 6	Site 5	Site 2	Site 3	Opportunis	Site B	Site D	Site N	Site 15B	Site 14B	Site 11B	Site 10B	Site 11A	Site 15A	Site 10A	Site 14A	Site 15	Site 11
	Petroica multicolor	Norfolk Robin							3																						
	Eopsaltria griseogularis	Western Yellow Robin	X																												
	Eopsaltria georgiana	White-breasted Robin	X																												
Acrocephalidae	*Acrocephalus australis*	Australian Reed Warbler	X																												
Locustellidae	*Poodytes gramineus*	Little Grassbird	X																												
	Cincloramphus mathewsi	Rufous Songlark	X																												
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	X																												
	Petrochelidon nigricans	Tree Martin	X																												
	Cheramoeca leucosterna	White-backed Swallow	X																												
Zosteropidae	*Zosterops lateralis*	Silvereye	X						219	34	26	8	15	90	4		1	1	1												
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	X																												
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit	X																												
Mammals																															
Bovidae	*Bos taurus*	Cow	X																												
	Ovis aries	Sheep	X																												
Molossidae	*Austronomus australis*	White-striped Freetail Bat											1					1													
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat										1																			
Dasyuridae	*Dasyurus geoffroii*	Chuditch	X																												
	Phascogale calura	Red-tailed Phascogale	X																												
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	X					7	1	11	2	1	1	5	2		1	1	1												
	Notamacropus irma	Western Brush Wallaby	X																												
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	X									1		4	4																
Tarsipedidae	*Tarsipes rostratus*	Honey Possum	X		2												1	2	3	1		1			2						
Leporidae	*Oryctolagus cuniculus*	Rabbit							1	1				1			1	1	1												
Peramelidae	*Isoodon fusciventer*	Quenda	X										1																		
Equidae	*Equus caballus*	Horse									1																				
Muridae	*Mus musculus*	House Mouse	X		6	4	4	21			8		3	1				1		5	3	3	2	2	2	5	1	1			
	Rattus fuscipes	Bush Rat	X																							1					
	Rattus rattus	Black Rat																			1										

A Atlas of Living Australia

B ATA Environmental (2007) *Flora, Vegetation and Vertebrate Fauna Assessment Neerabup Industrial Area (NIA), Neerabup*. Unpublished report for City of Wanneroo, Perth.

C Biota Environmental Sciences (2000) *Lot 52 Burns Beach Road Fauna Survey*. Unpublished report for ATA Environmental, Perth.

D Department of Conservation and Land Management (1993) *Fauna Studies in Water Supply Reserve 34537, adjacent to Neerabup National Park*. Unpublished report of Department of Environment and Conservation, Perth.

E Valentine, L.E., Wilson, B.A., Reaveley, A., Huang, N., Johnson, B. and Brown, P. (2009) *Patterns of Ground-dwelling Vertebrate Biodiversity in the Gnangara Sustainability Strategy Study Area*. Department of Environment and Conservation, Perth.

		Surveys	A				B	C														D	E				F	G		H	
Family	Species	Common name	Banksia	Eucalypt & Banksia	Dryandra	Acacia	Trinity	Trap Site 4	Trap Site 5	Active 10	Trap Site 3	Trap Site 1	Trap Site 6	Trap Site 2	Trap Site 7	Trap Site 9	Trap Site 8	Cage Line 11	Cage Line 10	Active searches	Bats	Carramar Park	Site 6	Site 5	Site 4	Opportunistic	Unknown	Naturaliste Park	Brighton	Burns Beach	Neerabup National
Amphibians																															
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog	17	1			1																								
	Limnodynastes dorsalis	Western Banjo Frog	2	1	23	4		1	1													1									
Myobatrachidae	*Myobatrachus gouldii*	Turtle Frog																				1									
Pelodryadidae	*Litoria adelaidensis*	Slender Tree Frog								1																					
Reptiles																															
Agamidae	*Pogona minor*	Western Bearded Dragon	3	1		2	35	1			2	2	4	1		1				4		1									
Diplodactylidae	*Strophurus elderi*	Jewelled Gecko				1																									
	Strophurus spinigerus	South-western Spiny-tailed Gecko			4	8	81	4			4		3		1	3				1			3								
Elapidae	*Brachyurophis semifasciata*	Half-girdled Snake	2				12									1								1							
	Demansia psammophis	Yellow-faced Whipsnake	2	1	2	7	15									1															
	Echiopsis curta	Bardick				1	8	3							1																
	Narophis bimaculatus	Black-naped Burrowing Snake					3	1												1											
	Neelaps calonotos	Black-striped Burrowing Snake																									1				
	Suta gouldii	Gould's Snake				1	12		3																						
	Pseudechis australis	Mulga Snake																		1											
	Pseudonaja affinis	Dugite		2	1		9	1				3	2		1	1				1			3								
	Pseudonaja mengdeni	Western Brown Snake					1																								
	Simoselaps bertholdi	Jan's Banded Snake	6		2	2	38	1			1					2				2											
Gekkonidae	*Christinus marmoratus*	Marbled Gecko					10		1					2						1				1							
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard																					3	3	2						
	Delma concinna	Javelin Lizard					6	1																							
	Delma fraseri	Fraser's Delma	1				7		3		2	1		1		1				1											
	Delma grayii	Side-barred Delma					22	2								1															
	Lialis burtonis	Burton's Legless Lizard	1	1			57	2	2			3	12	1	3		4			1			2	3	6						
	Pletholax gracilis	West Coast Keeled Legless Lizard					6																								
	Pygopus lepidopodus	Common Scaly-foot			1		22						2			1															
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink	5	2	2		19	3				7								4		1		4	5						
	Ctenotus australis	Western Limestone Ctenotus	5	1	11	3	73	1						1		12															
	Ctenotus fallens	West-coast Laterite Ctenotus	16	22	20	6	57	9	7		12	6	11	4	8	3	11			2			7	4	2						
	Cyclodomorphus celatus	Western Slender Bluetongue		1	2			4	2		7	6	8	2	4	1	1			2											

		Surveys	A				B	C														D	E				F	G		H	
Family	Species	Common name	Banksia	Eucalypt & Banksia	Dryandra	Acacia	Trinity	Trap Site 4	Trap Site 5	Active 10	Trap Site 3	Trap Site 1	Trap Site 6	Trap Site 2	Trap Site 7	Trap Site 9	Trap Site 8	Cage Line 11	Cage Line 10	Active searches	Bats	Carramar Park	Site 6	Site 5	Site 4	Opportunistic	Unknown	Naturaliste Park	Brighton	Burns Beach	Neerabup National
	Egernia kingii	King's Skink						1																							
	Egernia napoleonis	Southwestern Crevice Skink		3			20													1											
	Hemiergis quadrilineata	Two-toed Earless Skink	43	32	9	18	123	5	20		6	8	13	23	1	6	17			18			28	58	63						
	Lerista distinguenda	South-western Orange-tailed Slider					1																1	1	4						
	Lerista elegans	West Coast Four-toed Lerista						2	3		9	3	2	3	4	4				4				1	2						
	Lerista elongata	Wide-striped Mulch Slider																				1									
	Lerista lineopunctulata	Dotted-line Robust Slider					2													1											
	Lerista praepedita	Blunt-tailed West-coast Slider					11	4	4		3		1		1	2				6				2	2						
	Menetia greyii	Common Dwarf Skink	3	4	2	2	17	5	8		3	5	7	3	2	4	8			1		1	6	3	5						
	Morethia lineoocellata	Pale-flecked Morethia					8						3							1		1	2	1	1						
	Morethia obscura	Shrubland Pale-flecked Morethia	4	3	3		40						7	1						2		1	13	12	8						
	Tiliqua occipitalis	Western Blue-tongued Lizard	2				7		1															1		4					
	Tiliqua rugosa	Bobtail	10	3	3	2	46	6	5		3	3	7	7	2	6	2	3		11		1		1	1	51					
Typhlopidae	*Anilios australis*	Austral Blind Snake	1				4	1				2					2							1							
	Anilios pinguis	Rotund Blind Snake					2																								
Varanidae	*Varanus gouldii*	Gould's Goanna					1	1					1		1	1				1						9					
	Varanus tristis	Black-headed Monitor					1									1				2											
Chelidae	*Chelodina oblonga*	South-western Snake-necked Turtle								1																					
Birds																															
Casuariidae	*Dromaius novaehollandiae*	Emu						1								3										12					
Anatidae	*Cygnus atratus*	Black Swan								1										1											
	Tadorna tadornoides	Australian Shelduck																		12											
	Anas superciliosa	Pacific Black Duck																		4											
	Biziura lobata	Musk Duck																		1											
Phasianidae	*Synoicus ypsilophorus*	Brown Quail																								1					
Columbidae	*Columba livia*	Rock Pigeon							1				2		2											12					
	Streptopelia chinensis	Spotted Dove							4																						
	Streptopelia senegalensis	Laughing Dove			4	6			1				2	2														1			
	Phaps chalcoptera	Common Bronzewing		1	2						3	1		5						5					2	1					
	Phaps elegans	Brush Bronzewing					75																								
	Ocyphaps lophotes	Crested Pigeon			7	3						1														1					

		Surveys	A				B	C														D	E				F	G		H	
Family	Species	Common name	Banksia	Eucalypt & Banksia	Dryandra	Acacia	Trinity	Trap Site 4	Trap Site 5	Active 10	Trap Site 3	Trap Site 1	Trap Site 6	Trap Site 2	Trap Site 7	Trap Site 9	Trap Site 8	Cage Line 11	Cage Line 10	Active searches	Bats	Carramar Park	Site 6	Site 5	Site 4	Opportunistic	Unknown	Naturaliste Park	Brighton	Burns Beach	Neerabup National
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo			1	1					1			1												1					
	Chrysococcyx lucidus	Shining Bronze-Cuckoo							1		1		3									1									
	Cacomantis pallidus	Pallid Cuckoo													1	1															
	Cacomantis flabelliformis	Fan-tailed Cuckoo																							1						
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar																								1					
Podargidae	*Podargus strigoides*	Tawny Frogmouth						1						4	1											1					
Rallidae	*Fulica atra*	Eurasian Coot								20										2											
	Porphyrio melanotus	Australasian Swamphen								1																					
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper																								1					
	Calidris subminuta	Long-toed Stint																								1					
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull																									1				
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican								1										1											
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis																		4											
	Threskiornis spinicollis	Straw-necked Ibis																		2											
Accipitridae	*Elanus axillaris*	Black-shouldered Kite				1																1									
	Hieraaetus morphnoides	Little Eagle						1					1																		
	Accipiter fasciatus	Brown Goshawk		1	1	1								1						1						1					
	Accipiter cirrocephalus	Collared Sparrowhawk																													
	Haliastur sphenurus	Whistling Kite				1											1			4											
Tytonidae	*Tyto alba*	Barn Owl																								1					
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo																				1									
Strigidae	*Ninox boobook*	Southern Boobook							1		1	1	1	1			1														
	Ninox novaeseelandiae	Morepork																						1		2					
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra		6					3	2				5	1	1	1			2		1				1					
	Todiramphus sanctus	Sacred Kingfisher	1	2																			2		1	1		1			
Meropidae	*Merops ornatus*	Rainbow Bee-eater						18				2	2	5	2		4			1					2	1					
Falconidae	*Falco cenchroides*	Nankeen Kestrel	1											1								1									
	Falco longipennis	Australian Hobby																								1					
	Falco berigora	Brown Falcon									1									1											
	Falco peregrinus	Peregrine Falcon											1																		
Cacatuidae	*Zanda sp.*	Black-Cockatoo sp.																								1					
	Calyptorhynchus banksii	Red-tailed Black-Cockatoo															4			1											

		Surveys	A				B	C														D	E				F	G		H	
Family	Species	Common name	Banksia	Eucalypt & Banksia	Dryandra	Acacia	Trinity	Trap Site 4	Trap Site 5	Active 10	Trap Site 3	Trap Site 1	Trap Site 6	Trap Site 2	Trap Site 7	Trap Site 9	Trap Site 8	Cage Line 11	Cage Line 10	Active searches	Bats	Carramar Park	Site 6	Site 5	Site 4	Opportunistic	Unknown	Naturaliste Park	Brighton	Burns Beach	Neerabup National
	Zanda latirostris	Carnaby's Black-Cockatoo	8	1	2			6	17		9	11	9	1	1	3	4			11		1	12	19	3	1	9963				
	Eolophus roseicapilla	Galah	4	12	2			4	6		2	11		15	8	5	8			1		1	10	8	8	1		1			
	Cacatua sanguinea	Little Corella				2									29					4			8	4	2	1					
Psittaculidae	*Neophema elegans*	Elegant Parrot						3	4		5	2	4			2	2			1											
	Barnardius zonarius	Australian Ringneck		14	2				6			3	6	6	1		6			2		1	2	7	4	1		1			
	Purpureicephalus spurius	Red-capped Parrot						4	2			2			1		2					1				1					
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet													2																
	Trichoglossus haematodus	Coconut Lorikeet						1							16	4	7			2					2	1					
Maluridae	*Malurus splendens*	Splendid Fairywren	18	22	30	12		17	4		2					10	3			18		1	6	3	4	1					
	Malurus leucopterus	White-winged Fairywren									10									9											
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill									1											1						1			
	Manorina flavigula	Yellow-throated Miner																				1						1	1		
	Anthochaera chrysoptera	Little Wattlebird																				1						1			
	Anthochaera lunulata	Western Wattlebird						1			1	2											2								
	Anthochaera carunculata	Red Wattlebird	15	11	11	1			3		2	11		11	1	1	2			3		1	1	2	5			1			
	Gavicalis virescens	Singing Honeyeater	10		4	7					11	3	2	1			3			1			1			1		1			
	Lichmera indistincta	Brown Honeyeater	11	44		3		3	55		28	2	7			21	21			27		1	6			1		1			
	Phylidonyris novaehollandiae	New Holland Honeyeater						2	34		56		10		8	2				37											
	Phylidonyris niger	White-cheeked Honeyeater		10	230	30					38		1		4					1						1		1			
	Melithreptus brevirostris	Brown-headed Honeyeater						4			2				11					21						1					
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		1					4			1		4			1			3		1	7	7	5	1		1			
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren			3				8				2										2		2	1					
	Acanthiza inornata	Western Thornbill				7		18														1				1					
	Acanthiza apicalis	Inland Thornbill																		4											
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	3																			1	9	8	4	1					
	Smicrornis brevirostris	Weebill		11										15						14						1					
	Gerygone fusca	Western Gerygone	6	10		1			3			1		7	1					3			10	12	6	1					
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike	3	1	3	1		2			8				2					4			2	1		1		1			
	Lalage tricolor	White-winged Triller			1																					1					
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella						8	4														4	6							
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush		8	5				1			1	1			1	1			2		1			2	1					
	Pachycephala pectoralis	Golden Whistler	9	5																			2		1						

		Surveys	A				B	C														D	E				F	G		H	
Family	Species	Common name	Banksia	Eucalypt & Banksia	Dryandra	Acacia	Trinity	Trap Site 4	Trap Site 5	Active 10	Trap Site 3	Trap Site 1	Trap Site 6	Trap Site 2	Trap Site 7	Trap Site 9	Trap Site 8	Cage Line 11	Cage Line 10	Active searches	Bats	Carramar Park	Site 6	Site 5	Site 4	Opportunistic	Unknown	Naturaliste Park	Brighton	Burns Beach	Neerabup National
	Pachycephala occidentalis	Western Whistler																		2											
	Pachycephala rufiventris	Rufous Whistler						1						1		1	2			6		1	4	4	10	1					
Artamidae	*Artamus cinereus*	Black-faced Woodswallow			11			2																							
	Cracticus torquatus	Grey Butcherbird	3	3	6	2						1		3			2					1	1			1		1	1		
	Gymnorhina tibicen	Australian Magpie	6	7		1								12	5							1			4	15		1	1		
	Strepera versicolor	Grey Currawong																								1					
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	1		1							1	2		1											3		1			
	Rhipidura albiscapa	Grey Fantail	1	4							1			1						2		1	3		2	1					
Monarchidae	*Grallina cyanoleuca*	Magpie-lark												1								1				1		1	1		
Corvidae	*Corvus coronoides*	Australian Raven	1			2		4	5	2	2	8		3	9					2		1	1	4	4	14		1			
Petroicidae	*Microeca fascinans*	Jacky Winter																								2					
	Petroica boodang	Scarlet Robin						1														1				1					
	Eopsaltria griseogularis	Western Yellow Robin																								1					
Acrocephalidae	*Acrocephalus australis*	Australian Reed Warbler								2										1											
Hirundinidae	*Hirundo neoxena*	Welcome Swallow				4									1											1		1			
	Petrochelidon nigricans	Tree Martin									2	4	4							4		1				5					
	Cheramoeca leucosterna	White-backed Swallow									2									4											
Zosteropidae	*Zosterops lateralis*	Silvereye	11	45	70	62		8		1	12		1		1	1	1			17		1	9			1		1	1		
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird																								1					
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit				2														1											
Mammals																															
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna																								1				1	
Canidae	*Canis lupus*	Dingo																								4					
	Vulpes vulpes	Red Fox	1				1	1			4	2	1	1		1	1			2						58				1	2
Felidae	*Felis catus*	Cat						2								1										5				1	1
Balaenidae	*Eubalaena australis*	Southern Right Whale																									1				
Molossidae	*Austronomus australis*	White-striped Freetail Bat								4										23	9					X					
	Mormopterus sp. 4	South-western Free-tail Bat								6										12	8										
Vespertilionidae	*Nyctophilus sp.*	Long-eared Bat sp..																		9	5										
	Chalinolobus gouldii	Gould's Wattled Bat								17										8	9					X					
	Nyctophilus geoffroyi	Lesser Long-eared Bat																								X					
	Vespadelus regulus	Southern Forest Bat																		16											

		Surveys	A				B	C														D	E				F	G		H	
Family	Species	Common name	Banksia	Eucalypt & Banksia	Dryandra	Acacia	Trinity	Trap Site 4	Trap Site 5	Active 10	Trap Site 3	Trap Site 1	Trap Site 6	Trap Site 2	Trap Site 7	Trap Site 9	Trap Site 8	Cage Line 11	Cage Line 10	Active searches	Bats	Carramar Park	Site 6	Site 5	Site 4	Opportunistic	Unknown	Naturaliste Park	Brighton	Burns Beach	Neerabup National
Dasyuridae	*Dasyurus geoffroii*	Chuditch																								2					
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo		3	1	6		14	2		1	1	2	3		3	1			1						86					
	Notamacropus irma	Western Brush Wallaby						1																							14
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum																								9					
Tarsipedidae	*Tarsipes rostratus*	Honey Possum			16								1																	1	
Leporidae	*Oryctolagus cuniculus*	Rabbit						2	2				4			2										6					
Peramelidae	*Isoodon fusciventer*	Quenda					1	4	3		1		4		8	1	2	2	2	3							21				
Muridae	*Mus musculus*	House Mouse	4	7	17	13	98					1	1		3		2			2											
	Pseudomys albocinereus	Ash-grey Mouse																												2	
	Rattus fuscipes	Bush Rat			1		6																								
	Rattus rattus	Black Rat					2																		1					5	

A Coffey Environments (2008) *Vertebrate Fauna Assessment, Lot 3 Romeo Road, Alkimos*. Unpublished report for Northern Corridor Developments Limited, Perth.

B Terrestrial Ecosystems (2012) *Vertebrate fauna relocation outcomes for Trinity*, Unpublished report for Coterra Environment and LWP, Perth.

C GHD (2019) *Mitchell Freeway Extension Hester Avenue to Romeo Road Biological Survey*. Unpublished report for Main Roads WA, Perth.

D Ecoscape (1991) *Biological Survey - Carramar Park*, Unpublished report for City of Wanneroo, Perth.

E GHD (2014) *Neerabup Road Extension Level 2 Fauna Survey*. Unpublished report for Main Roads, Perth.

F DBCA threatened species database

G Gole, C.A. (2003) *Bird Survey in selected Perth Metropolitan Reserves. A Joint Biodiversity Conservation Project between Birds Australia WA and Perth Biodiversity Project*. Unpublished report Birds Australia and Perth Biodiversity Project; Perth.

H Western Australian Museum (1978) *Faunal Studies of the Northern Swan Coastal Plain: A Consideration of Past and Future Changes*. Report for the Department of Conservation and Environment, Perth.

Appendix F.
Definitions of Significant Fauna under the WA Biodiversity Conservation Act 2016 and Priority Species

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

APPENDIX F
DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE WA BIODIVERSITY CONSERVATION ACT 2016

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*. Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened Species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

[1] The definition of flora includes algae, fungi and lichens

[2] Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

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*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the pwild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially Protected Species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory birds protected under an international agreement

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; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependant fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species 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, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations

P1 Priority 1: Poorly-known species

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

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

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 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. 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) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix G.
Fauna habitat assessment results

Basic Vertebrate Fauna Survey and Targeted Black Cockatoo Assessment
Lot 107 Godel Road, Nowergup

Date: 12/04/2024 Habitat Assessment #: 1 Observer: Simon Pitt

GDA94 50; 380534 mE 6500429 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 2 Observer: Simon Pitt

GDA94 50; 380476 mE 6500423 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

TERRESTRIAL ECOSYSTEMS

Date: 12/04/2024 Habitat Assessment #: 3 Observer: Simon Pitt

GDA94 50; 380431 mE 6500424 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 4 Observer: Simon Pitt

GDA94 50; 380326 mE 6500426 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 5 Observer: Simon Pitt

GDA94 50; 380226 mE 6500421 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 6 Observer: Simon Pitt

GDA94 50; 380182 mE 6500402 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

TERRESTRIAL ECOSYSTEMS

Date: 12/04/2024 Habitat Assessment #: 7 Observer: Simon Pitt

GDA94 50; 380185 mE 6500333 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 8 Observer: Simon Pitt

GDA94 50; 380235 mE 6500336 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 9 Observer: Simon Pitt

GDA94 50; 380306 mE 6500336 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 10 Observer: Simon Pitt

GDA94 50; 380422 mE 6500340 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 11 Observer: Simon Pitt

GDA94 50; 380521 mE 6500329 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 12 Observer: Simon Pitt

GDA94 50; 380506 mE 6500246 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 13 Observer: Simon Pitt

GDA94 50; 380429 mE 6500250 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 14 Observer: Simon Pitt

GDA94 50; 380330 mE 6500245 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 15 Observer: Simon Pitt

GDA94 50; 380228 mE 6500241 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 16 Observer: Simon Pitt

GDA94 50; 380220 mE 6500155 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 17 Observer: Simon Pitt

GDA94 50; 380322 mE 6500157 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 18 Observer: Simon Pitt

GDA94 50; 380429 mE 6500156 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 19 Observer: Simon Pitt

GDA94 50; 380495 mE 6500146 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Disturbed Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 20 Observer: Simon Pitt

GDA94 50; 380452 mE 6500051 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Eucalypt woodlands over grass

Date: 12/04/2024 Habitat Assessment #: 21 Observer: Simon Pitt

GDA94 50; 380321 mE 6500037 mN Fire History: > 5yrs Landform: slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Low Eucalypt woodlands over grass tree shurbland

Date: 12/04/2024 Habitat Assessment #: 22 Observer: Simon Pitt

GDA94 50; 380225 mE 6500046 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Low Eucalypt woodlands over grass tree shurbland

TERRESTRIAL ECOSYSTEMS

Date: 12/04/2024 Habitat Assessment #: 23 Observer: Simon Pitt

GDA94 50; 380204 mE 6499979 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Low Eucalypt woodlands over grass tree shurbland

Date: 12/04/2024 Habitat Assessment #: 24 Observer: Simon Pitt

GDA94 50; 380322 mE 6499939 mN Fire History: > 5yrs Landform: Flat

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Low Eucalypt woodlands over grass tree shurbland

Date: 12/04/2024 Habitat Assessment #: 25 Observer: Simon Pitt

GDA94 50; 380392 mE 6499959 mN Fire History: > 5yrs Landform: slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Low Eucalypt woodlands over grass tree shurbland

Date: 12/04/2024 Habitat Assessment #: 26 Observer: Simon Pitt

GDA94 50; 380432 mE 6499965 mN Fire History: > 5yrs Landform: Slope

Soil Type: Sand Habitat Quality: Very Good Surface: Sand

Habitat Type: Low Eucalypt woodlands over grass tree shurbland

TERRESTRIAL ECOSYSTEMS


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