Basic Vertebrate Fauna Survey and Risk Assessment

Cocanarup Timber Reserve

Prepared for: Tetris Environmental

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EXECUTIVE SUMMARY

Tetris Environmental on behalf of Bulletin Resources requested a Basic vertebrate fauna risk assessment of two areas in and near the Cocanarup Timber Reserve, Western Australia to enable exploration drilling activities to occur. The smaller, northern area is 6.71ha and the larger southern area is 214.2ha. Bulletin Resources are proposing to clear tracks for a drilling rig to access exploration drilling sites, so the vegetation clearing footprint will be very much smaller than the assessed areas. The drill rig access tracks will be 3.5m wide and the drill pads 20m x 20m.

The northern area is mostly regrowth, and the southern area is mostly good to excellent quality native vegetation. Fauna habitats in these two project areas are:

- Acacia shrubland;
- Allocasuarina woodland;
- Eucalypt woodland; and
- Melaleuca woodland.

In addition, there are small areas that have been disturbed, but there is regrowth in these areas. There are ephemeral creek tributaries of the Phillips River passing through the southern area.

Carnaby's Black-Cockatoo was recorded breeding in the southern area and foraging in the northern project area. The project area is within an area designated by Department of Biodiversity, Conservation and Attractions (DBCA) as Carnaby's Black-Cockatoo breeding area. Disturbance of 2.50ha of Eucalypt woodland in the southern area triggers one of the criteria in the Commonwealth Government's EPBC referral guidelines for Black-Cockatoos. Three Malleefowl mounds were recorded in the southern area, none of which were active, but they could be reused again in future.

The vegetation in the project areas, in particular the southern project area, is connected via remnant habitat to the Fitzgerald National Park, which is a high value conservation area, and conservation significant species in this park have the potential to be in the project area. The continuous native vegetation linkage to this national park adds to the ecological value of the southern project area, as it enables park animals to access a much larger area, reducing potential impacts from threats such as wildfires and predator species.

The project area has the potential to support Bristlebird (Endangered), Heath Mouse (Endangered), Dibbler (Endangered), Red-tailed Phascogales (Vulnerable), Chuditch (Vulnerable), Quenda (Priority 4), Western Mouse (Priority 4), Tammar (Priority 4), Western Whipbird (Priority 4) and Western Brush Wallaby (Priority 4).

1. INTRODUCTION

1.1 BACKGROUND

Tetris Environmental on behalf of Bulletin Resources requested a Basic vertebrate fauna risk assessment of two areas in and near the Cocanarup Timber Reserve, Western Australia to enable exploration drilling activities to occur (i.e. project area; Figures 1 and 2). The smaller, northern area is 6.71ha and the larger southern area is 214.2ha. Bulletin Resources are proposing to clear tracks for a drilling rig to access exploration drilling sites, so the vegetation clearing footprint will be very much smaller than the areas assessed (i.e. ~7ha in the southern section). The drill rig access tracks will be 3.5m wide and the drill pads 20m x 20m.

The two project areas are in the Fitzgerald IBRA subregion (ESP1) and are 13-15km south-west of Ravensthorpe and south of the South Coast Highway. The most north-easterly section of the southern project area includes a small part of the Phillips River, and a tributary of the Phillips River runs through the southern project area.

1.2 PROJECT OBJECTIVES AND SCOPE OF WORKS

The purpose of this vertebrate fauna risk assessment was to provide information to the proponent on the potential impacts that vegetation clearing, and exploration activity might have on the vertebrate fauna assemblage in the project area to enable the proposed development to be adequately assessed. The methodology generally follows that described in the Environmental Protection Authority (2020) *Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*.

This Basic vertebrate fauna risk assessment involved a desktop review and a site visit. The assessment objectives were to:

- provide an indication of the vertebrate fauna assemblage (reptiles, amphibians, mammals, birds and fish) on and near the project area, so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- identify the presence and/or potential risk of impacts on species of conservation significance that are present or likely to be present in the project area;
- assess the impact and environmental risks associated with the proposed development on the vertebrate fauna assemblage; and
- determine if any additional surveys are required to assess the potential impact on vertebrate fauna assemblage in the project area including impacts on species of conservation significance.

To achieve these objectives, Terrestrial Ecosystems:

- reviewed Terrestrial Ecosystems' database [includes Atlas of Living Australia and Western Australian Museum records] to identify potential vertebrate fauna within the area;
- searched the DBCA's Threatened and Priority Species database;
- 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 Act 1999* (*EPBC Act 1999*) or international migratory bird agreements (JAMBA/CAMBA);
- reviewed previous fauna surveys conducted near the project area and in similar habitat;
- undertook a site visit to assess fauna habitat type and condition near the proposed access track routes, undertake a preliminary search for evidence of Malleefowl near the proposed access track routes and to survey significant black-cockatoo habitat trees near the proposed access track routes; and
- discussed the likelihood of *EPBC Act 1999* and *Biodiversity Conservation Act 2016* (*BC Act 2016*) listed species being present in the project area and potentially impacted by vegetation clearing and exploration drilling activities.

2. EXISTING ENVIRONMENT

2.1 LOCATION OF PROJECT AREA

The project area is in the Esperance 1 (EPS1 – Fitzgerald subregion). Comer et al. (2001) described the subregion as mostly dominated by myrtaceous and proteaceous scrub and mallee heaths on sandplain overlying Eocene sediments that were rich in endemics. Eucalypt woodlands existed in the gullies and on alluvial foot-slopes. The relief is subdued on the sandplains in the coastal region with metamorphosed granite and quartzite in the inland ranges. Vegetation was often diverse, with eucalypts being dominant in most vegetation systems (Comer et al. 2001).

Fauna species considered at risk in 2001 were Chuditch, Numbat, Dibbler, Red-tailed Phascogale, Western Ringtail Possum, Heath Mouse, Quokka, Black-Cockatoos, Noisy Scrubbird, Australasian Bittern, Western Bristlebird, Malleefowl, Western Ground Parrot, Cape Barren Goose and Carpet Python (Comer et al. 2001). Since Comer et al. (2001) was produced additional species have been added to the list, and some have been removed.

2.2 LAND USE HISTORY

The dominant land uses for the bioregion are native bushland, agriculture pasture to support grazing and cropping, and crown land reserves, and to a much lesser extent mining and exploration. The bioregion contains large tracts of land set aside for conservation and species maintenance (e.g. Fitzgerald River National Park).

2.3 CLIMATE

Climate in the project areas is characterised as Mediterranean. Ravensthorpe, which is approximately 15km to the north-east, has an annual rainfall of approximately 430mm, although this varies considerably from year-to-year (Chart 1). The highest mean maximum and minimum temperatures in Ravensthorpe are typically in January with an average of 29°C and 14°C, respectively (Bureau of Meteorology, 2022). The lowest mean daily maximum and minimum temperatures occur in July (Chart 1). Average monthly rainfall is heaviest in July.

Summer rain is unpredictable and often results from thunderstorms coming from the north and the west as low-pressure cells move in an easterly or south-easterly direction.

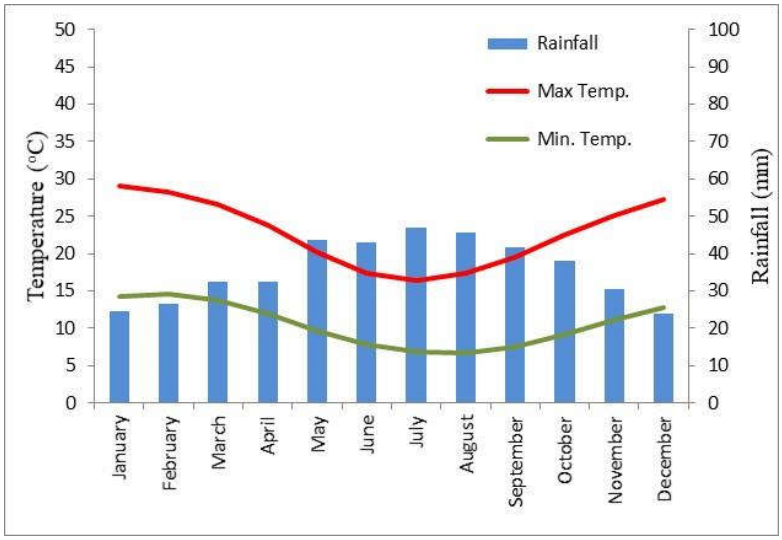

Chart 1. Climatic averages for Ravensthorpe

2.4 REGIONAL BIOLOGICAL FAUNA CONTEXT OF PROJECT AREA

Biologic (2022) prepared a report on the flora and vegetation in the 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:

- Animal Plant Mineral (2016) *Ravensthorpe Gold Copper Project Biological Survey*. Unpublished report for ACHMinerals, Perth.
- Bamford Consulting Ecologists (2016) *Kingston Resources Ravensthorpe Mt Cattlin Project Fauna Assessment*, Unpublished report for Woodman Environmental Pty Ltd, Perth.
- Biologic (2017) *Cocanarup Fauna Survey for Lithium Australia*, Unpublished report for Lithium Australia NL, Perth.
- Biota Environmental Sciences (2004) *Fauna and Fauna Assemblages of Kundip and Trilogy Study Sites*. Unpublished report for Tectonic Resources NL, Perth.
- Biota Environmental Sciences (2005) *Kundip Phase II Fauna Survey - Summary of Findings*. Letter report to Tectonic Resources NL, Perth.
- Chapman, A. and Newbey, K.R. (1995a) A biological survey of the Fitzgerald area, Western Australia, *CALMScience*, 3, 1-258.
- Chapman, A. and Newbey, K.R. (1995b) A vertebrate fauna survey and some notes on the vegetation of the Ravensthorpe Range, Western Australia. *CALMScience*, 1(4), 465-508.
- Keith Lindbeck and Associates (2008) *Ravensthorpe Spodumene Project Spring 2008 Fauna Survey*, Unpublished report for Galaxy Resources Ltd, Perth.

There are a number of additional surveys east of Ravensthorpe, however, they have not been included due to the distance from the project area. In addition, individual records for fauna contained in the Atlas of Living Australia and the Western Australian Museum collection have also been accessed. Data from the DBCA threatened species database was accessed for information on the potential presence of conservation significant species.

3. METHODOLOGY

3.1 DATABASE SEARCHES

A review of the *EPBC Act 1999* list of conservation significant species was undertaken to identify species of interest to the Commonwealth Government in the vicinity of the project area (Appendix A). 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 areas. A search of DBCA's threatened species database was used as a reference for conservation significant fauna potentially in the project area.

Other more general texts were also used to provide supplementary information on vertebrates in the bioregion, including Tyler et al. (2000) for frogs; Storr et al. (1983, 1990, 1999, 2002) and Thompson and Thompson (2006) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals.

These sources of information were collected to create lists of species expected to utilise the project areas and broader bioregion. 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 areas due to a lack of suitable habitat (e.g. wetland and shore birds). Vagrants can be recorded almost anywhere. Many of the records are historical and the species is no longer present in the areas (e.g. Western Bristlebird, Western Ground Parrot). 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 areas. 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 areas. Therefore, many species will be included in the lists produced from database searches but will not be present in the actual project areas.

There are errors in most databases, including DBCA's threatened species database, Atlas of Living Australia and the Western Australian Museum (WAM) 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. Readers should therefore 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 between 19-22 September 2022 to assess fauna habitat types and condition, examine significant Black-Cockatoo trees and to search for Malleefowl, their tracks and mounds near the routes of the proposed drill rig access tracks. The entire project area as shown in Figure 2 has not been searched for Malleefowl mounds nor for significant trees. The fauna habitat assessment methodology required the assessor to stop at multiple locations, photograph the habitat at these locations and record a suite of data about the fauna habitat (Table 1).

Table 1. Fauna habitat assessment criteria

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 affected 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 SIGNIGIFICANT BLACK-COCKATOO TREE ASSESSMENT

Trees were assessed as to whether they met the Commonwealth Government's (Department of Sustainability Environment Water Population and Communities 2012, Department of Agriculture Water and the Environment 2022) Black-Cockatoo habitat tree assessment criteria. Trees with a diameter at breast height (DBH) of ≥50cm and for salmon gum and wandoo ≥30cm were recorded that were near to the proposed drill rig access track. For each significant tree, its location was recorded using GPS, the species, an estimate of its height, its DBH and whether it contained hollows that might provide suitable nesting sites for Black-Cockatoos, as assessed from ground level, were recorded.

3.4 MALLEEFOWL MOUNDS

The proposed exploration access tracks, drill pads and immediate adjacent area were searched for Malleefowl, their mounds and tracks. If Malleefowl mounds were located, then Terrestrial Ecosystems zoologist collected data consistent with the National Malleefowl Monitoring System. Each identified mound was classified on a 6-point rating as follows:

(1) Typical crater with raised rim - this is a typical shape of an inactive mound, and it can be open or closed;
(2) Mound fully dugout - the characteristic of this profile is that the crater slopes down steeply and at the base the sides drop vertically to form a box-like structure with side usually 20-30 cm deep. Often litter may have been raked into windrows and may have started to enter the mound;
(3) Mound with litter - this is the next stage after profile 2. Litter will have been raked into the mound by Malleefowl and thick layers of litter are evident on the surface. There may or may not be sand mixed with the litter at this stage;
(4) Mound mounded up but no crater - this is the typical profile of an active by unopened mound;

(5) Mound forms a sandy crater with peak in the centre - this is a profile of an active mound which is in the process of being closed by the Malleefowl; and
(6) Mound low and flat without a peak or crater.

In addition, Bulletin Resources acquired LiDAR data that were interpreted for Malleefowl mounds. These potential locations were ground truthed by Terrestrial Ecosystems.

3.5 SURVEY AND REPORTING STAFF

Joel Wilson in the company of Bulletin Resources and Tetris Environmental staff undertook the field assessment. 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, have undertaken multiple vertebrate fauna surveys and feral pest control programs in the vicinity of Ravensthorpe, 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.

3.6 TAXONOMY AND NOMENCLATURE

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

3.7 LIMITATIONS

This vertebrate fauna risk assessment is based on a site visit, a review of the available vertebrate fauna databases and prior experience of undertaking vertebrate fauna surveys in the vicinity of Ravensthorpe. 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 areas.

The EPA (2020) Technical Guidance Terrestrial Fauna Surveys 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	No	There are fauna survey data available for areas to the east of Ravensthorpe and around the Galaxy mining area to the north of the project areas. The project areas or adjacent areas have not been surveyed for vertebrate fauna.
Competency/experience of the survey team, including experience in the bioregion surveyed	No	The Terrestrial Ecosystems staff member that undertook the field survey was a qualified environmental practitioner. The authors of this report have appropriate post-graduate qualifications and have undertaken multiple surveys and assessments in the vicinity of Ravensthorpe.
Scope of the survey, e.g. where faunal groups were excluded from the survey	No	The proposed drill rig track, drill pads and the immediate adjacent area were surveyed for Malleefowl (mounds and tracks) and significant trees were assessed. The assessment for Malleefowl and significant trees was around the proposed disturbance areas and not entire project area.
Timing, weather and season	No	The weather and season were suitable for the field assessment.
Disturbance that may have affected results, e.g. fire, flood	No	The smaller northern area was mostly regrowth from historical disturbance. Disturbances in the project areas 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	The field assessment was adequate for the purposes of providing a Basic fauna risk assessment to determine potential impacts on vertebrate fauna of constructing an exploration access track and drill pads.
Access problems	No	The project areas were accessible by walking.
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

The following four broad fauna habitat types are in the project areas:

- Acacia shrubland;
- Allocasuarina woodland;
- Eucalypt woodland; and
- Melaleuca woodland.

Appendix B provides images of available fauna habitat at 48 locations in the project areas.

4.2 MALLEEFOWL

Three Malleefowl mounds were recorded in the southern project area. The coordinates for these three mounds are shown in Table 3 and images of the mounds are shown in Plates 1-3.

These mounds have not been recently used but are in a condition that they could be used again.

None of the locations identified by LiDAR were Malleefowl mounds.

Table 3. Malleefowl mound data (UTM Zone 50)

Mound #	Diameter (cm)	Crater diameter (cm)	Height (cm)	Crater depth (cm)	Mound classification	Easting	Northing
1	280	190	40	20	1	768823	6273180
2	420	360	40	20	1	770109	6272931
3	380	210	50	40	1	769692	6272949

Plate 1. Malleefowl mound #1

Plate 2. Malleefowl mound #2

Plate 3. Malleefowl mound #3

4.3 SIGNIFICANT TREES

One hundred and sixty-six trees were recorded that had a diameter at breast height (DBH) ≥30cm, and images of those trees are provided in Appendix E, the data for the trees in Appendix F and locations show in Figures 3 and 4. A female Carnaby's Black-Cockatoo was seen emerging from a hollow in tree 133, and it is highly likely that this salmon gum contains an active nest. Some of the significant trees are within the 3.5m wide proposed drill rig access track route.

4.4 BIOREGIONAL VERTEBRATE FAUNA ASSEMBLAGE

Appendix C provides a summary of the fauna survey data that are available in the vicinity of the project areas. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys shown in Appendix C. These differences can partially be 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 4-7 provide a list of vertebrate species potentially found near the project areas that have been compiled based on the fauna survey report results shown in Appendix C.

Table 4. Fish potentially found near the project areas

Family	Species	Common Name
Atherinidae	*Leptatherina wallacei*	Western Hardyhead
Gobiidae	*Pseudogobius olorum*	Bluespot Goby

Family	Species	Common Name
Galaxiidae	*Galaxias maculatus*	Common Galaxias

Table 5. Birds potentially found near the project areas

Family	Species	Common Name
Casuariidae	*Dromaius novaehollandiae*	Emu
Anatidae	*Anas gracilis*	Grey Teal
	Anas castanea	Chestnut Teal
Megapodiidae	*Leipoa ocellata*	Malleefowl
Phasianidae	*Synoicus ypsilophorus*	Brown Quail
Otididae	*Otis australis*	Bustard
Columbidae	*Phaps chalcoptera*	Common Bronzewing
	Phaps elegans	Brush Bronzewing
	Ocyphaps lopotes	Creasted Pigeon
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo
	Chrysococcyx lucidus	Shining Bronze-Cuckoo
	Cacomantis flabelliformis	Fan-tailed Cuckoo
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar
Apodidae	*Apus pacificus*	

Family	Species	Common Name
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar
Turnicidae	*Turnix varius*	Painted Buttonquail
Ardeidae	*Egretta novaehollandiae*	White-faced Heron
Accipitridae	*Lophoictinia isura*	Square-tailed Kite
	Aquila audax	Wedge-tailed Eagle
	Accipiter fasciatus	Brown Goshawk
	Elanaus caeruleus	Black-Shouldered Kite
	Haliastur sphenurus	Whistling Kite
	Acciiter fasciatus	Brown Goshawk
	Accipiter cirrocephalus	Collared Sparrowhawk
	Aquila morphnoides	Little Eagle
	Haliaeetus leucogaster	White-Breasted Sea-Eagle
	Circus assimilis	Spotter Harrier
	Circus aeruginosus	Marsh Harrier

Family	Species	Common Name
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler
Pandionidae	*Pandion haliaetus*	Osprey
Tytonidae	*Tyto alba*	Barn Owl
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo
	Cuculus flabelliformis	Fan-tailed Cuckoo
	Chrysococcyx basalis	Horsfield's Bronze-Cuckoo
	Chrysococcyx lucidus	Shining Bronze-Cuckoo
Strigidae	*Ninox boobook*	Southern Boobook
	Ninox novaeseelandiae	
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra
	Halycon sancta	Sacred Kingfisher
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Falconidae	*Falco cenchroides*	Nankeen Kestrel
	Falco peregrinus	Peregrine Falcon
	Falco longipennis	Australian Hobby
	Falco berigora	Brown Falcon
Timaliidae	*Zosterops lateralis*	Silvereye
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Black-Cockatoo
	Eolophus roseicapilla	Galah
Psittaculidae	*Polytelis anthopeplus*	Regent Parrot
	Neophema elegans	Elegant Parrot
	Barnardius zonarius	Australian Ringneck
	Purpureicephalus spurius	Red-capped Parrot
	Platycercus spurius	Elegant Parrot
	Neophema petrophila	Rock Parrot
	Pezoporus wallicus	Western Ground Parrot
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet
Maluridae	*Stipiturus malachurus*	Southern Emuwren
	Malurus pulcherrimus	Blue-breasted Fairywren
	Malurus splendens	Splendid Fairywren

Family	Species	Common Name
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill
	Lichenostomus cratitius	Purple-gaped Honeyeater
	Manorina flavigula	Yellow-throated Miner
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater
	Anthochaera chrysoptera	Little Wattlebird
	Anthochaera lunulata	Western Wattlebird
	Anthochaera carunculata	Red Wattlebird
	Anthochaera paradoxa	Yellow Wattlebird
	Epthianura albifrons	White-fronted Chat
	Gavicalis virescens	Singing Honeyeater
	Ptilotula ornata	Yellow-plumed Honeyeater
	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 lunatus	White-naped Honeyeater
	Melithreptus brevirostris	Brown-headed Honeyeater
Dasyornithidae	*Dasyornis longirostris*	Western Bristlebird
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren
	Hylacola cauta	Shy Heathwren
	Acanthiza inornata	Western Thornbill
	Acanthiza apicalis	Inland Thornbill
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill

Family	Species	Common Name
	Smicrornis brevirostris	Weebill
	Gerygone fusca	Western Gerygone
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike
	Lalage tricolor	White-winged Triller
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella
Psophodidae	*Psophodes nigrogularis*	Western Whipbird
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush
	Falcunculus frontatus	Crested Shrike-tit
	Pachycephala pectoralis	Golden Whistler
	Pachycephala rufiventris	Rufous Whistler
	Pachycephala inornata	Gilbert's Whistler
Artamidae	*Artamus cinereus*	Black-faced Woodswallow
	Artamus personatus	Masked 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
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
	Myiagra inquieta	Restless Flycatcher
Corvidae	*Corvus coronoides*	Australian Raven
Petroicidae	*Petrocia multicolor*	Red-Capped Robin
	Melanodryas cucullata	Hooded Robin
	Tregellasia capito	Pale-yellow Robin
	Eopsaltria griseogularis	Western Yellow Robin
	Drymodes brunneopygia	Southern Scrub-Robin
Acrocephalidae	*Acrocephalus stentoreus*	Clamorous Reed-warbler
Locustellidae	*Poodytes gramineus*	Little Grassbird
	Cincloramphus mathewsi	Rufous Songlark
Hirundinidae	*Hirundo neoxena*	Welcome Swallow
	Hirundo leucosterna	White-backed Swallow
	Petrochelidon nigricans	Tree Martin
Zosteropidae	*Zosterops lateralis*	Silvereye
Estrildidae	*Stagonopleura oculata*	Red-eared Firetail
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit

Table 6. Amphibians potentially found near the project areas

Family	Species	Common Name
Limnodynastidae	*Heleioporus albopunctatus*	Western Spotted Frog
	Heleioporus eyrei	Moaning Frog
	Heleioporus psammophilus	Sand Frog
	Limnodynastes dorsalis	Western Banjo Frog
	Neobatrachus albipes	White-footed Trilling Frog
	Neobatrachus kunapalari	Wheatbelt Frog
Myobatrachidae	*Crinia georgiana*	Quacking Frog
	Crinia pseudinsignifera	Bleating Froglet
	Pseudophryne guentheri	Gunther's Toadlet
	Pseudophryne occidentalis	Western Toadlet
Pelodryadidae	*Litoria adelaidensis*	Slender Tree Frog
	Litoria cyclorhyncha	Spotted-thighed Frog
	Litoria moorei	Motorbike Frog

Table 7. Mammal species potentially near the project areas

Family	Species	Common name
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna
Canidae	*Canis lupus*	Dingo
	Vulpes vulpes	Red Fox
	Felis catus	Cat
Leporidae	*Oryctolagus cuniculus*	Rabbit
Dasyuridae	*Sminthopsis griseoventer*	Grey-bellied Dunnart
Molossidae	*Austronomus australis*	White-striped Freetail Bat
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat
	Chalinolobus morio	Chocolate Wattled Bat
	Nyctophilus geoffroyi	Lesser Long-eared Bat
	Vespadelus regulus	Southern Forest Bat
Dasyuridae	*Dasyurus geoffroii*	Chuditch
	Parantechinus apicalis	Dibbler
	Phascogale calura	Red-tailed Phascogale
	Sminthopsis crassicaudata	Fat-tailed Dunnart
	Sminthopsis fuliginosus	Grey-bellied Dunnart
	Sminthopsis gilberti	Gilbert's Dunnart
	Sminthopsis granulipes	White-tailed Dunnart
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo
	Notamacropus eugenii	Tammar Wallaby
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum
Potoroidae	*Bettongia penicillata*	Woylie
Tarsipedidae	*Tarsipes rostratus*	Honey Possum
Peramelidae	*Isoodon fusciventer*	Quenda
	Isoodon obesulus	Southern Brown Bandicoot
Muridae	*Mus musculus*	House Mouse
	Hydromys chrysogaster	Water Rat
	Pseudomys albocinereus	Ash-grey Mouse
	Pseudomys occidentalis	Western Mouse
	Pseudomys shortridgei	Heath Mouse
	Notomys mitchellii	Mitchell's Hopping Mouse
	Ratus fuscipes	Bush Rat
	Ratus ratus	Black Rat

Table 8. Reptile species potentially near the project areas

Family	Species	Common name
Agamidae	*Amphibolurus norrisi*	Mallee Tree Dragon
	Ctenophorus maculatus	Spotted Dragon
	Ctenophorus ornatus	Ornate Crevice Dragon
	Diporiphora amphiboluroides	Mulga Dragon
	Pogona minor	Western Bearded Dragon
	Ctenophorus adelaidensis	Western Heath Dragon
Carphodactylidae	*Underwoodisaurus milii*	Barking Gecko
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko
	Diplodactylus calcicolus	South Coast Gecko
	Diplodactylus granariensis	Wheatbelt Stone Gecko
	Oedura marmorata	Marbled Velvet Gecko
	Strophurus spinigerus	South-western Spiny-tailed Gecko
Elapidae	*Echiopsis curta*	Bardick
	Elapognathus coronatus	Crowned Snake

Family	Species	Common name
	Notechis scutatus	Tiger Snake
	Suta gouldii	Gould's Snake
	Suta nigriceps	Short-tailed Snake
	Pseudonaja affinis	Dugite
	Rhinoplocephalus bicolor	Square-nosed Snake
Gekkonidae	*Christinus marmoratus*	Marbled Gecko
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard
	Aprasia striolata	Striated Worm-lizard
	Delma australis	Marble-faced Delma
	Delma fraseri	Fraser's Delma
	Pygopus lepidopodus	Common Scaly-foot
Pythonidae	*Morelia spilota*	Carpet Python
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink
	Cryptoblepharus pulcher	Elegant Snake-eyed Skink
	Cryptoblepharus virgatus	Striped Snake-eyed Skink
	Ctenotus catenifer	Chained-striped Southwest Ctenotus
	Ctenotus gemmula	Jewelled South-west Skink
	Ctenotus impar	Odd-stripped Ctenotus
	Ctenotus labillardieri	Common South-west Ctenotus
	Egernia kingii	King's Skink
	Egernia multiscutata	Southern Sand-skink
	Egernia napoleonis	Southwestern Crevice Skink
	Hemiergis initialis	South-western Earless Skink
	Hemiergis peronii	Lowlands Earless Skink
	Lerista distinguenda	South-western Orange-tailed Slider
	Lerista microtis	Southwest Slider
	Lerista viduata	Ravensthorpe Range Slider
	Menetia greyii	Common Dwarf Skink
	Morethia obscura	Shrubland Pale-flecked Morethia
	Tiliqua occipitalis	Western Blue-tongued Lizard
	Tiliqua rugosa	Bobtail
Typhlopidae	*Anilios australis*	Austral Blind Snake
	Anilios bituberculatus	Prong-snouted Blind Snake
Varanidae	*Varanus rosenbergi*	Heath Monitor

4.5 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). The *BC Act 2016* provides for the publishing of the Wildlife Conservation (Specially Protected Fauna) Notice that lists species under multiple categories. In addition, the 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 wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *BC Act 2016* are provided in Appendix D.

Wetland and wetland migratory bird species have been excluded from the following list and assessments as the proposed disturbance areas do not contain suitable habitat for these species. These excluded species include the Curlew Sandpiper (*Calidris ferruginea*), Eastern Curlew (*Numenius madagascariensis*), Common Sandpiper (*Actitis hypoleucos*), Sharp-tailed Sandpiper (*Calidris acuminata*), Curlew Sandpiper (*Calidris*

ferruginea), Pectoral Sandpiper (*Calidris malanotos*), and Osprey (*Pandion haliaetus*). Listed marine species are not relevant as we are not near marine areas. Seven threatened species of fauna and one migratory/marine species of bird identified under the *EPBC Act 1999* potentially occur in the project areas. Five species listed on the DBCA's Priority Fauna List that potentially occur in the project areas. The following is an assessment of the likelihood of each of the species listed in Table 9 being found in the project areas.

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

Species	Common Name	*EPBC Act* status	*BC Act* status	DBCA Priority Species	Comment on the potential presence of a species
Pezoporus flaviventris	Western Ground Parrot	Cr	Cr		The probability of it being within the project areas is very low.
Calidris ferruginea	Curlew Sandpiper	Cr	Cr		Highly unlikely to be present in the project areas, due to a lack of suitable habitat.
Botaurus poiciloptilus	Australian Bittern	En	En		Highly unlikely to be present in the project areas, due to a lack of suitable habitat.
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	En	En		Recorded foraging in the northern project area and breeding in the southern project area.
Panantechinus apicalis	Dibbler	En	En		Potentially in the project areas.
Myrmecobius fasciatus	Numbat	En	En		Very low probability that they are present in the project areas.
Dasyornis longirostris	Western Bristlebird	En	En		Could potentially be present in the open Mallee woodlands.
Phascogale calura	Red-tailed Phascogale	Vu	CD		Very low possibility it is present in the project area.
Pseudomys shortridgei	Heath Mouse	En	En		Is potentially present in the project areas.
Leipoa ocellata	Malleefowl	Vu	Vu		Malleefowl mounds are present in the project areas, however no individuals were recorded.
Falco hypoleucos	Grey Falcon	Vu	Vu		Not recorded in other surveys in the area, so it is highly unlikely to be in the project area, and if it was disturbed by vegetation clearing it would readily move to an adjacent area.
Dasyurus geoffroii	Chuditch	Vu	Vu		Possibly present in the project areas.
Falco peregrinus	Peregrine Falcon		OS		Possibly present in very low abundance.
Lerista viduata	Ravensthorpe Range Slider			P1	Unlikely to be present in the project areas.
Acanthophis antarcticus	Southern Death Adder			P3	Very low probability it is present in the project areas.
Macropus eugenii	Tammar Wallaby			P4	Possibly present in very low abundance.
Psophodes nigrogularis oberon	Western Whipbird (western mallee subspecies)			P4	Probably present.
Pseudomys occidentalis	Western Mouse			P4	Potentially present in the project areas.
Macropus irma	Western Brush Wallaby			P4	Potentially present in the project areas.
Isoodon fusciventer	Quenda			P4	Potentially present in the project areas.
Motacilla cinerea	Grey Wagtail	Migratory	Migratory		Highly unlikely to be present in the project areas.
Apus pacificus	Fork-tailed Swift	Migratory	Migratory		May infrequently be seen flying over the area.

IA – Migratory birds protected under international agreements; OS – Other Specially protected fauna, CD – Species of special conservation interest, Vu – Vulnerable, En – Endangered, Cr – Critically Endangered

Western Ground Parrot (*Pezoporus flaviventris*) – Critically endangered under the *EPBC Act* and *BC Act*

The Western Ground Parrot is a medium sized, slender, long-tailed parrot about 30cm in length and 84-110g in weight (Johnstone and Storr 1998, Higgins 1999). Its known extant geographic distribution is confined to the Waychinicup-Manypeaks, Fitzgerald River National Park and the Cape Arid National Park-Nuytsland Nature Reserve (Threatened Species Scientific Committee 2013).

Chapman and Newbey (1995a) reported nine records of one to six birds at three locations in the northern section of the Fitzgerald area in long unburnt open mallee. This parrot is particularly rare, so the probability of it being within the project areas is very low, although the open Mallee woodland is present in the project areas and these birds have been recorded in the Fitzgerald area.

Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered under the *EPBC Act 1999* and *BC Act 2016*; migratory under both Acts

Curlew Sandpipers occur around the coasts and are also quite widespread inland. In Western Australia they were widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division, but are more sparsely distributed between Carnarvon and Dampier Archipelago. They occur in large numbers, at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod. In the last two decades there has been a significant reduction in their abundance. It breeds in Siberia in the northern hemisphere summer and winters in Australia.

Habitat preferences include intertidal mudflats in estuaries, bays, inlets and lagoons, non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.

There are no lakes or water courses in the project area, so it is highly unlikely to be present or impacted.

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

The Australasian Bittern is a heavy-set, partially nocturnal heron (Birdlife Australia 2017). Its preferred habitat is beds of tall dense Typha, Baumea and sedges in the shallows of freshwater swamps. Its distribution ranges from Moora east to Cape Arid and the south-west of Western Australia. Johnstone and Storr (1998) reported it as locally common in the wetter parts of the south-west and Garnett et al. (2011) more recently indicated that the WA sub-population is restricted to a few records away from the south coast and Lake Muir wetlands, with few confirmed records from the Swan Coastal Plain since 1992.

Threats include drainage of permanent and ephemeral swamps for agriculture and urban development (Garnett et al. 2011) and droughts (Birdlife International 2016a). There is a single old record south-east of the project areas in DCBA's threatened species database. There is no suitable habitat for this species in the project areas, so it is highly unlikely to be present.

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) - Endangered under the *BC Act* 1950 and *EPBC Act 1999*

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) is a large, pied, cockatoo which inhabits the south-west of Western Australia, from Kalbarri to Cape Arid east of Esperance (Department of Sustainability Environment Water Population and Communities 2011, Garnett et al. 2011). On the Swan Coastal Plain, it has shifted its activity area in a westerly direction (Department of the Environment and Energy 2017). It mostly breeds inland from the Stirling Ranges to near Three Springs and moves to the coastal areas when chicks have fledged (Saunders et al. 1985).

In some locations, breeding populations have decreased or become locally extinct (Saunders 1986, Saunders and Ingram 1987). For example, in the Coomallo Creek area north of Perth, Black-Cockatoos laid 74 clutches in 1973, 75 in 1974, 82 in 1975 but only 20 in 1994 and 19 in 1996 (Saunders and Ingram 1987). Nesting success

has subsequently increased at this site with the installation of artificial hollows (Taillier 2016). Saunders (1986) reported finding 13 nests at Manmanning in 1969 but by 1977, the species had stopped breeding in the area. Saunders (1990) reported failed nestings due to predation by a cat, galahs broke Carnaby's Black-Cockatoo eggs and took over nests, while other adult birds were killed by vehicles and Wedge-tailed Eagles (*Aquilla audax*).

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).

Saunders (1980) recorded non-breeding cockatoos at Coomallo Creek, 200km north of Perth, foraging within a 50km radius of their breeding area, whereas, cockatoos at Manmanning, 180km north-east of Perth moved a much greater distance to the coastal plain during their non-breeding season. These data 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) and 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). Hollows are large, ranging from 10 to over 250cm in depth (Higgins 1999) and 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* (Marri; Higgins 1999, Cale 2003). When breeding, they most often forage in the surrounding shrub land and kwongan heath (Higgins 1999).

Eggs are laid on a mat of wood chips chewed from the sides of the hollow. Clutches are 1-2, but most often only one chick is raised. Incubation takes 29 days, and only the female incubates and broods (Johnstone et al. 2011). Initially the female will return to the nest mid-morning to feed the chick, but after about 2-3 weeks both parents leave in the early morning and return late evening.

Young remain with their parents until the parents return to the breeding area in the following year (Saunders 1980). Immature birds probably do not move into the breeding areas until they are ready to breed, although little is known of the movements of immature Carnaby's Black-Cockatoo until they are ready to breed (Saunders 1977).

The breeding success of Carnaby's Black-Cockatoo is influenced by the availability of food at breeding sites (Saunders et al. 1985). Saunders (1977) found that birds that foraged within one or two kilometres from nesting sites had greater fledgling success than those from populations that had to travel up to four kilometres to obtain food. In a study that monitored Carnaby's Black-Cockatoo's breeding over 25 years at Coomallo Creek, Saunders and Ingram (1998) showed that the number of breeding attempts halved by the end of the study. During this period, native vegetation cover was reduced from 90% in 1959 to 25% in 1996. Their study revealed that although there was a surplus of trees with hollows of sufficient sizes, clearing of adjacent foraging habitat had adversely impacted on the success of breeding birds. Therefore, breeding sites typically have nearby areas of scrub and heath where birds forage on seeds and flowers of numerous trees and shrubs including *Banksia, Hakea, Dryandra, Grevillea* and *Callistemon* spp. (Robinson 1965, Saunders 1980, Higgins 1999). Unlike other cockatoo species, Carnaby's Black-Cockatoo will not utilise cereal crops (Saunders et al. 1985), but will feed on Erodium seed (Saunders 1980). Breeding success of females in their first two breeding seasons had failure rates four times that of older and more experienced females and older females tended to produce lighter nestlings (Saunders et al. 2016).

Threats to this species include loss of foraging areas, habitat fragmentation, fires and plant pathogen *Phytophthora cinnamomi*, loss of suitable nesting hollows due to fires, vegetation clearing and competition

from other species and lack of suitable a sufficient foraging opportunities near breeding areas (Birdlife International 2016c).

The proposed disturbance areas and immediate surrounds support 166 significant trees, of which 32 are in the northern section, with eight of these having a potential hollow that could provide a nesting site for a Black-Cockatoo (Appendix E; Figure 4). There are 134 significant trees in the southern section of which 57 have a hollow that could provide a nesting site for a Black-Cockatoo (Appendix E; Figure 3). There are additional significant trees in the project area but not near the proposed disturbance areas. Carnaby's Black-Cockatoo were observed foraging in the northern section. A Carnaby's Black-Cockatoo was recorded exiting a tree hollow (UTM 50 769861mE 6273427mS), so it is likely that this tree is an active breeding location. According to the Department of Biodiversity, Conservation and Attractions' database of breeding activity, the project areas is within one of the Black-Cockatoo breeding sites.

Dibbler (*Parantechinus apicalis*) - Endangered under the *EPBC Act 1999* and *BC Act*

Woinarski et al. (2014) indicated that Dibbler are a semi-arboreal and mainly crepuscular dasyurid that occur in long-unburnt heathland. The preferred vegetation structure is a dense shrubland <1 metre high that has not been burnt for 10 years (Woinarski et al. 2014).

The Dibbler is a small dasyurid with males growing to about 100g and females to about 75g; its geographic distribution includes the Fitzgerald River National Park, east of Cheyne Beach and Torndirrup National Park. It is also found on Boullanger and Whitlock Island off the coast of Jurien Bay and Gunton Island (Van Dyck and Strahan 2008). They have been introduced to Escape Island (11ha) Jurien Bay, in 1998-2000, and reintroduced to Penup Nature Reserve (2001) and Stirling Range National Park (2004) and an enclosure free of foxes and feral cats in Waychinicup National Park (Burbidge and Woinarski 2016c).

There are records of Dibbler being caught south, south-west and south-east of the project areas (i.e. ~12km) in the DBCA's threatened species database, but none in the vicinity of the project areas. Chapman and Newbey (1995a) caught 17 individuals in eight locations in the Fitzgerald area, with all but one in very open mallee, habitat that is present in the project areas. It is therefore potentially in the project areas.

Numbat (*Myrmecobius fasciatus*) - Endangered under the *EPBC Act 1999* and *BC Act*

The Numbat is a small marsupial to 45cm long and up to 700g in weight. Numbats were once present across southern semi-arid and arid Australia, including parts of NSW, SA and southern NT, as well as the south-west of Western Australia. In Western Australia, there are small residual populations at Dryandra and Perup, with recent translocations at Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve. Numbats are essentially solitary, forage during the day in winter and in the early morning and late afternoon in summer.

Major threats are listed as predation by foxes, feral cats and raptors and changed fire regimes (Woinarski and Burbidge 2016).

Numbats were reintroduced in the Cocanarup Timber Reserve between 2006 to 2010 (Department of Environment and Conservation 2012b), however it is anecdotally reported that none survived the translocation program. There is a very low probability that they are still present, although it is probable that they have been predated on by foxes and feral cats.

Western Bristlebird (*Dasyornis longirostris*) - Endangered under the *EPBC Act 1999* and *BC Act*

The Western Bristlebird is a small, brownish bird that prefers dense heath, especially in damp places with a mix of shrubs and tall sedges. Its present known geographic distribution is along the south coast of WA from Wilson Inlet east to Waychinicup River, and further east in the Fitzgerald River National Park (Smith 1987,

Chapman and Newbey 1995a, Johnstone and Storr 2004) as well as at Two Peoples Bay Nature Reserve, Betty's Beach, Mount Manypeaks to Bluff Creek, and in the Fitzgerald River National Park.

It occurs in floristically diverse, closed, near-coastal heaths 1-1.5m high with a wide variety of shrubs, usually with abundant sedges and thickets of low eucalypts 2-4m tall. In the Fitzgerald River National Park, the habitat is more open, but contains patches of dense shrubs. This bird is terrestrial and sedentary, with defined home-ranges, which suggests that it has a relatively limited capacity to disperse, and is susceptible to burning (Smith 1987).

A search of the DBCA Threatened and Priority Species database indicates that all Western Bristlebird records are to the west and south of the project areas. Chapman and Newbey (1995a) recorded 27 pair of Bristlebird in the Fitzgerald area, indicating they are habitat specific and found in areas that are long unburnt mallee and open mallee woodland. Given the habitat for this species is present in the project areas, it is possible that a low number of Bristlebirds could be present.

Red-tailed Phascogale (*Phascogale calura*) - Endangered under the *EPBC Act 1999* and conservation dependent under the *BC Act*

This small, nocturnal, arboreal marsupial grows to 12cm long and 68g in weight and lives mostly in unburnt eucalypt woodlands such as wandoo in areas that receive 350-600mm of rain per year. It is an opportunistic predator, preying on insects, spiders, small birds and small mammals. It constructs a small nest either in a tree fork or tree hollow of leaves and twigs. It is currently found in remnant bushland in the Western Australian wheatbelt between Brookton and the Fitzgerald River National Park.

It is threatened by habitat loss and fragmentation associated with clearing for agriculture, and possibly by predation by foxes and cats (Friend 2008). Altered fire regimes resulting in a loss of old, long-unburnt vegetation is also considered a primary reason for the contraction in its geographic distribution (Friend 2008).

There are two old records of Red-tailed Phascogale to the east of Ravensthorpe, and two records to the south-west. Chapman and Newbey (1995a) reported that this phascogale is dependent on stands of *Allocasuarina huegeliana* in the Fitzgerald area. Its current known distribution does not include the project areas, however, the project areas include *A. huegeliana* woodland, so there is a very low possibility it is in the project areas.

Heath Mouse (*Pseudomys shortridgei*) - Endangered under the *EPBC Act 1999* and Vulnerable under the *BC Act*

The Heath Mouse is a small rodent with a body mass of 55-90g, and is similar in appearance to the native rat *Rattus fuscipes* (Cockburn 2000). It was once present from Shark Bay in the north of WA to Eucla in the east. The Heath Mouse has been recorded at Lake Magenta Nature Reserve and the Fitzgerald River National Park (Cancilla and Johnson 2013). It is now known in WA from a population around Ravensthorpe, Lake Magenta Nature Reserve, Fitzgerald River National Park, Dragon Rocks Reserve and Kundip.

The Heath Mouse builds multiple shallow burrows, usually dug under a low bush, in which they seek shelter, and in Lake Magenta Nature Reserve they predominantly build their burrows under thick *Dryandra pteridifolia* clumps and if this was not available, such as in areas around Ravensthorpe, thick Banksia or even the root mass of Eucalypts are chosen as burrow building sites (Cancilla and Johnson 2013). It has a generalist diet which is varied based on what is seasonally available (Cancilla and Johnson 2013, Di Stefano et al. 2014). The density of Heath Mice at Lake Magenta Nature Reserve was estimated at 1.95/ha (Cancilla and Johnson 2013).

Woinarski et al. (2014) reported the Heath Mouse being caught in long unburnt dry heath that is floristically rich, however, Cooper et al. (2003) using unpublished records from Chapman et al. (ref. not provided) indicated that its habitat varied as did soil type in the vicinity of the Fitzgerald Biosphere Reserve, with the predominant vegetation being shrub mallee over either heath or scrub over sedges and soils included loamy sands or sandy

loams with lateritic scree and clayey soils. At Lake Magenta 93% of the Heath Mouse were caught in heath communities with a dense structural layer up to 1.2m (Quinlan et al. 2004).

A search of the DBCA Threatened and Priority Species and Terrestrial Ecosystems' databases indicate that most of the recent records for the Heath Mouse are either east (i.e. <20km), south (i.e. <20km), or south-west of the project areas. Animal Plant Mineral (2016) recorded a Heath Mouse in habitat it described as *Eucalyptus falcata/E. pleurocarpa* - Proteaceous mallee-heath and the same as used by *Rattus fuscipes* at Kundip. Chapman and Newbey (1995a) recorded four Heath Mouse in the Fitzgerald area, with one record near the project areas. All Heath Mouse were caught in open mallee. Based on these data, the Heath Mouse is potentially present in the project areas.

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, Benshemesh and Burton 1999, Benshemesh 2007, Lewis and Hines 2014). 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. Active and recently active Malleefowl mounds are used by environmental consultants and regulators as a proxy to determine the present of Malleefowl in a particular area.

A search of DBCA's threatened species and Terrestrial Ecosystems' fauna survey databases indicates that there are multiple records of Malleefowl in the dense bushland areas around the project areas.

Three Malleefowl mounds were recorded in the vicinity of the proposed drill rig access tracks (Figure 3; Table 3). These mounds were found when assessing the proposed drill line disturbance areas. None of the identified mounds were active but they were in suitable condition that they could be used again. Malleefowl are likely to be present or move through the project areas but are not abundant. Terrestrial Ecosystems have not searched the entire project areas; however, the client indicates that other consultants and geologists have traversed the area without finding birds or additional mounds.

Grey Falcon (*Falco hypoleucos*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

The Grey Falcon occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Threatened Species Scientific Committee, 2020) where it frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses, but has been seen in in treeless areas and frequents tussock grassland and open woodland.

There are no records for the Grey Falcon in other surveys in the vicinity of the project area, so it is unlikely to be present.

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

The Chuditch is a medium-sized arboreal-terrestrial dasyurid that is carnivorous/insectivorous and nocturnal (Serena and Soderquist 2008). Its range has declined since European settlement, and is now restricted to the south-west of Western Australia, mostly in the Jarrah forest, but they are also in the Fitzgerald River National Park, Ravensthorpe Range (Orell and Morris 1994, Woinarski et al. 2014) and dense shrubland east of Ravensthorpe.

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 (Department of Environment and Conservation 2012a, Woinarski et al. 2014). The Department of Biodiversity, Conservation and Attractions (2012a) estimated there were less than 10,000 Chuditch in 2007, with 75% of these occurring in the eucalypt forest and woodlands, and mallee heath and shrub lands of the south-west and south coast. It dens in hollow logs and burrows and has also been recorded in tree hollows and cavities (Van Dyck and Strahan 2008).

In the Jarrah forest male Chuditch have a home range of up to 15km^2 and for females 3-4km^2 (Serena and Soderquist 2008). The core activity area of females, as defined by denning sites, do not overlap but they do for males (Serena and Soderquist 1989b). Serena and Soderquist (1989b) reported core activity areas along the Murray River, WA being 55-120ha for females and about 438ha for males. For most of the time, individuals live a solitary life. In a semi-arid area near Forrestania, under-estimates of home range size (because of inadequate fixes) was 189ha (range 174-202 ha) for females and 2,125ha (range 662–3,522 ha) for males. The estimated density of Chuditch at Forrestania was 0.039 individuals km^2, which was lower than at Dwellingup at 0.11 individuals km^2, Batalling at 0.34 individuals km^2 and Julimur at 0.68 individuals km^2 (Rayner et al. 2012).

Chuditch has a generalist diet which includes mammals, birds, reptiles, invertebrates and plant material (Rayner et al. 2012, Woinarski et al. 2014). Major threats are listed as habitat alteration due to vegetation clearing, frequent fires and predation by foxes (Morris et al. 2008).

Litters are born from May to September, with most appearing in June to July. For nine weeks the young are left in the den while the female goes in search of food and they are first seen outside the den at about 17 weeks (Soderquist and Serena 2000). Young are weaned by 22-24 weeks (Serena and Soderquist 2008) in late October and early November. In the Jarrah Forest along the Murray River, denning sites were all ground burrows (Serena and Soderquist 1989a). Of the 22 dens located by Serena and Soderquist (1989a), six were in the base of a tree with entrances located under large surface roots, five followed root channels exposed under remnants of burnt rotting stumps, one was under a large boulder and other were either abandoned rabbit burrows or not associated with a particular surface feature.

A search of DBCA Threatened and Priority Species and Terrestrial Ecosystems' databases indicates there are multiple records for Chuditch in the vicinity of the project areas. The vegetation in the project areas is mostly open woodland, however, there are patches of dense ground level vegetation, and the probable presence of predators would mean that any Chuditch in the area would be vulnerable to predation. Chuditch is possibly present in the project areas.

Peregrine Falcon (*Falco peregrinus*) - Otherwise specially protected 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 shows habitat preference for areas near cliffs along coastlines, rivers and ranges and within woodlands along watercourses and around lakes. 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.

A search of DBCA's threatened species database and Terrestrial Ecosystems' fauna survey database indicate that the Peregrine Falcon has been recorded in the bioregion. Chapman and Newbey (1995a) recorded a single Peregrine Falcon in the Fitzgerald area, so a very small number could be present in the vicinity of the project

areas. However, this raptor typically has a large home range, and will readily move from a disturbance, so vegetation clearing is unlikely to have a significant impact on this species.

Ravensthorpe Range Slider (*Lerista viduata*) – DBCA Priority 1

Lerista viduata is a fossorial skink, up to 45mm snout to vent length and endemic to the Ravensthorpe Range (Cogger 2014). The species has been recorded in the Ravensthorpe Range, at the Kundip mine site south-east of Ravensthorpe off the Hopetoun-Ravensthorpe Road. There are no records of this species in the vicinity of the project areas, so it is unlikely to be in the project areas and therefore significantly impacted by vegetation clearing.

Southern Death Adder (*Acanthophis antarcticus*) – DBCA Priority 4

The Southern Death Adder is a variable coloured, cryptic, slow moving, but a quick to strike snake that is found in the south-west of Western Australia, southern Nullarbor to the eastern side of the Gulf of St Vincent in South Australia (Cogger 2014).

There is a single old record of this snake approximately 15km north of the project areas in the DBCA's threatened species database. There are no records for this species in the Atlas of Living Australia near the project areas, therefore the probability of them being found in the project areas is very low.

Tammar Wallaby (*Macropus eugenii derbianus*) – DBCA Priority 4

Van Dyck and Strahan (2008) reported that the Tammar Wallaby retreats to dense low vegetation during the day and feeds in open grassy areas at night. It inhabits coastal scrub, heath, dry sclerophyll forest and thickets of mallee and woodlands.

Major threats are predation by foxes and cats, and inappropriate fire regimes (Burbidge and Woinarski 2016b).

A search of the DBCA Threatened and Priority Species database indicates that there are records of the Tammar Wallaby around the project areas and Chapman and Newbey (1995a) reported them in low numbers in the northern part of the Fitzgerald area. Its preference for dense heath, shrubs and thickets almost certainly means there is only a low probability of them being found in the project areas and thus significantly impacted by vegetation clearing.

Western Whipbird – (Western Mallee race; Psophodes nigrogularis oberon) – DBCA Priority 4

The Western Whipbird is a medium-sized, ground-dwelling songbird with a short crest, powerful legs, short wings and a long tail, with the upper body being greyish olive-green and the underbody is whitish (Schodde and Mason 1991). It has a slight crest, a black throat bordered on either side by white whiskers and outer tail feathers with a subterminal black band prominently tipped white. Both sexes construct domed nests in dense vegetation over a period of 1-2 weeks and lay two eggs up to 10 days later. Incubation of the eggs is shared and lasts about 21 days. Both parent birds feed the chicks, and take care of one chick each when they leave the nest (Smith 1991). The nestlings fledge at about 12 days and remain with their parents for about two months (Smith 1991).

The western mallee subspecies of Western Whipbird is restricted to a scattered distribution throughout the southern wheatbelt and central south coast region, with the majority in the Fitzgerald River National Park and the Stirling Ranges National Park. It occurs in open mallee eucalypt woodland with a dense, tall shrub layer up to 1.5m tall, dominated by such species as Hakea, Lambertia or Banksia.

A search of the DBCA Threatened and Priority Species and Terrestrial Ecosystems' databases indicated that the mallee subspecies of the Western Whipbird has been recorded in multiple locations around the project areas. Chapman and Newbey (1995a) indicated that the Western Whipbird was present in the Fitzgerald area, so it is

likely to be present near the project areas. They will readily move away from disturbance and therefore will not be significantly impacted by vegetation clearing.

Western Mouse (*Pseudomys occidentalis*) – DBCA Priority 4

The Western Mouse is a rodent up to 14cm long with an average weight of 34g. Its preferred habitat is tall shrub land with mallee eucalypts and a heath understorey on a substrate of gravelly loam (Kitchener and Chapman 1977), and particularly long unburnt habitat (30-50 years) on sandy clay loam or sandy loam surfaces supporting variable vegetation communities from sparse low shrubland, tall dense shrub land, sparse to dense shrub mallee and mid-dense woodland (Department of Environment and Conservation 2012c).

It lives in a burrow with a vertical entrance connected to a loop that is 2-3m in diameter and 20-30cm deep and has a diet of fibrous plant material, flowers of *Acacia* sp. and *Hibbertia* spp., invertebrates and fruits and seeds from native plants (Department of Environment and Conservation 2012c).

Whisson and Kitchener (2000) reported its geographic distribution was once from the southern Wheatbelt in Western Australia, Nullarbor Plain to the Eyre Peninsula and a now extinct population on the mid-west coast north of Perth. It possibly still occurs in the following conservation reserves: Anderson Lake, Dragon Rocks, Bendering, Harris, Lake Grace, North Kalgarin, Rock View and Tarin Rock Nature Reserves, Fitzgerald River National Park and Ravensthorpe Range (www.environment.gov.au/node/14809). Vegetation clearing and altered fire regimes have probably had a significant impact on this species (Morris et al. 2008b).

A search of the DBCA Threatened and Priority Species database and Terrestrial Ecosystems' fauna survey database indicates that there are multiple records for the Western Mouse around the project areas. Chapman and Newbey (1995a) indicated its distribution was restricted in the Fitzgerald River National Park to an area in the north-western upland and spongolite surfaces, with most of these mice being caught in open mallee. Like other small mammals potentially in the project areas, predation by cats and foxes has probably impacted on the Western Mouse, and if they are still present then they would be in low abundance.

Western Brush Wallaby (*Macropus irma*) – DBCA Priority 4

The Western Brush Wallaby is a medium sized wallaby that is found in a variety of habitats from open forest or woodland, around seasonally wet flats to dry open shrub land and scrubby thickets (Christensen 2000). Woinarski et al. (2014) reported its geographic distribution extending from Kalbarri to Cape Arid in WA.

Wann and Bell (1997) reported on the Swan Coastal Plain near Whiteman Park Western Brush Wallabies fed on a variety of foliage including *Cynodon dactylon*, the dominant grass of the lawn areas, *Carpobrotus edulis*, a succulent species in roadside disturbed sites, and the native cycad, *Macrozamia riedlei*, similar finding to Shepherd et al. (1997) in the Perup Nature Reserve in south-west of WA.

A search of the DBCA Threatened and Priority Species and Terrestrial Ecosystems' databases indicate that there are numerous records of the Western Brush Wallaby to the south, south-east and south-west of the project areas, including the Fitzgerald River National Park. Chapman and Newbey (1995a) indicated that they were uncommon and mostly in the northern parts of the Fitzgerald area, and mostly found in woodland, mallee and shrubland. It is therefore possible that the Western Brush Wallaby is present in the project areas.

Quenda (*Isoodon fusciventer*) – DBCA Priority 4

The Quenda is a medium-sized, ground-dwelling marsupial that belongs to the Peramelidae family (Paull 1992, Travouillon and Phillips 2018) and populations of Quenda occur widely throughout southern WA (Bramwell 1998) including the Fitzgerald River area (Woinarski et al. 2014).

Quenda's prefer habitats with a dense shrub understorey, a thick ground cover layer in dry sclerophyll forests, grasslands and heathlands where they can establish runways that are difficult to detect beneath the interlocking vegetation (Stoddard and Braithwaite 1979). Often, suitable Quenda habitat occurs in low lying and swampy

areas and close to waterways. They are active late in the afternoon, during the night and often early in the morning.

They are omnivorous, mostly eating ground level foliage, fruit and seeds, and invertebrates. Quenda reach sexual maturity at five to six months of age when they weigh approximately 600g (Paull 1992). They have a gestation period of less than 15 days and litters of one to six young are produced, although litters of two to four are most common. Peak breeding period is in spring.

A search of the DBCA Threatened and Priority Species and Terrestrial Ecosystems' databases indicates there are numerous records for the Quenda to the south-west, south and south-east of the project areas and Chapman and Newbey (1995a) recorded a single individual in the Fitzgerald area survey. Predation by foxes and cats has a significant impact on Quenda along with changed fire regimes and vegetation clearing (Burbidge and Woinarski 2016a). Quenda are potentially present in very low abundance in the project areas.

Grey Wagtail (*Motacilla cinerea*) - Migratory 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.

Its preferred habitat in Australia is around the banks and rocks of fast-running fresh water including rivers, streams and creeks where it feeds on insects. It is also found in more lowland watercourses, even canals, where there are artificial waterfalls, weirs, millraces or lock gates. Outside of the breeding season it occupies a wider variety of habitats, including farmyards, sewage farms, forest tracks, tea estates and even town centres (Birdlife International 2016b). It feeds mainly on insects but also takes freshwater shrimps (Gammarus), terrestrial snails (Mollusca) and spiders (Araneae) (Birdlife International 2016b).

The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project areas. It is highly unlikely to be seen in the project areas due to a lack of records and suitable habitat, so it is highly unlikely to be impacted by the proposed development.

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 earth, 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.

There are isolated records of the Fork-tailed Swift in the DBCA's threatened species database along the coast east of Hopetoun, but none around the project areas. Chapman and Newbey (1995a) reported a flock of 24 in January 1986 at the Twertup Field Studies Centre, in the Fitzgerald River National Park.

This is mostly an aerial species, sleeping while flying, and it typically only come to ground to nest. It is highly unlikely that clearing of vegetation will have a significant impact on this species.

5. DISCUSSION

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

The EPA's (2020) Technical Guidance on terrestrial fauna surveys indicated that the type of survey that should be undertaken should be based on:

- level of existing regional knowledge;
- type and comprehensiveness of recent local surveys;
- degree of existing disturbance or fragmentation at the regional scale;
- extent, distribution and significance of habitats;
- significance of species likely to be present;
- sensitivity of the environment to the proposed activities; and
- scale and nature of impact.

The two fauna assessments in nearby areas (Bamford Consulting Ecologists 2016, Biologic 2017) provide little information about the vertebrate fauna in the project areas. The survey of the Fitzgerald area (Chapman and Newbey 1995a) was comprehensive, and as the vegetation in this area is connected to the southern project area, species in that area are potentially in the southern project area. The species lists provided in this report also includes information in Western Australian Museum and Atlas of Living Australia records for the area. The shorebird, waders and wetland species recorded in the Chapman and Newbey (1995a) report are not listed here as there is no suitable habitat for these species in the project areas.

The northern area has previously been extensively disturbed, but the southern area is in good to very good condition and has suffered little from disturbance, and the fauna habitats in the project area are connected with the Fitzgerald National Park. The project area has the potential to support multiple conservation significant species and is within a DBCA nominated breeding area for Carnaby's Black-Cockatoo. The scale of the proposed disturbance (i.e. 3.5m wide drill rig track and 20m x 20m drill pads) does not warrant a more detailed fauna survey.

The field survey undertaken for this report is therefore adequate for the purposes of constructing an exploration track and drill pads.

5.1.1 Fish

Phillips River and some of its tributaries run through or immediately adjacent to the southern project area. This ephemeral river flows are substantial rain, so any fish in the river are either contained in the remaining pools or are present only when it is flowing. The three species of fish potentially in the river (i.e. *Leptatherina wallacei*, *Pseudogobius olorum* and *Galaxias maculatus*) are abundant and widespread. Fish are unlikely to be significantly impacted by the proposed drill activity.

5.1.2 Amphibians

There are multiple amphibian species recorded in adjacent areas (Table 6). Many of these frogs require either water or damp conditions to survive (e.g. *Crinia pseudinsignifera*), whereas others may be found some distance from waterways and wetlands (e.g. *Heleioporus albopunctatus*). Neither of the project areas contain permanent freshwater, however, the Phillips River and the tributaries that run through the southern project area flow after heavy rain, so there is likely to be a low abundance of amphibians in and near that project areas. None of these amphibians are of conservation significance.

5.1.3 Reptiles

The northerly area being mostly regrowth will have fewer reptiles than then southern area, but the southern area is likely to have been impacted by feral cats and foxes, so it will have a depleted reptile fauna assemblage but most of the species found in undisturbed adjacent areas will still be present.

The only lizard that has a conservation status in the general area is the Ravensthorpe Range Slider (*Lerista viduata*) which has been recorded in the Ravensthorpe Range and a mine site south of Ravensthorpe (i.e. Kundip). The preferred habitat for this species is not described, but presumably it is like that found in the Ravensthorpe Range. The Death Adder is listed as potentially occurring in the vicinity of the project areas. This is a very cryptic, sit and wait predator that is rarely encountered even when it is relatively abundant. The clearing of drill rig access tracks in the project areas is unlikely to significantly impact on the reptile fauna of the bioregion.

5.1.4 Birds

The avian assemblage is diverse (Table 5). The four conservation significant species potentially in the project areas and impacted by disturbance activities are Carnaby's Black-Cockatoo, Malleefowl, Bristlebird and the Western Whipbird. Carnaby's Black-Cockatoo was seen foraging in the northern project area and were almost certainly breeding in the southern project area.

Three Malleefowl mounds were recorded in the southern project area (Table 5) with images of mounds shown in Plates 1-3. Malleefowl are in the general area, but the open woodland in the project areas would mean that they are vulnerable to predation by foxes and feral cats. The Bristlebird and Western Whipbird could be present in the project areas.

5.1.5 Mammals

There is a diversity of small terrestrial mammals potentially present in the project areas (Table 7), but this assemblage would have been depleted by the presence of foxes and feral cats. There is a possibility that Heath Mouse, Chuditch, Dibbler, Quenda, Western Mouse, Tammar Wallaby and Western Brush Wallaby are present in the southern project area. Given that the former Department (now DBCA) released Numbats nearby in the Cocanarup Timber Reserve there is a very low possibility that they still exist, but predation by foxes and cats will have almost certainly removed them from the area.

5.2 BIODIVERSITY VALUE

An ecological assessment of a site should consider its biodiversity value at the genetic, species and ecosystem levels, and its ecological functional value at the ecosystem level. There are inadequate data to assess the ecological value at the genetic level.

The available fauna survey data (Appendix C), the threatened database species search and field assessment indicate that the project areas should have a diverse vertebrate fauna assemblage, however, this fauna assemblage is likely to have been impacted by the presence of feral cats and foxes, with the potential that some conservation significant species have become locally extinct. A detailed survey of the area would be required to understand what vertebrate fauna currently reside in the project areas, however, such as survey is not required for the purposes of clearing an exploration track and drill pads.

5.2.1 Ecological functional value at the ecosystem level

The northern project area has been disturbed and most vegetation (except trees) is regrowth. The southern project area is largely intact and surrounded by similar bushland. The project areas are east of the Fitzgerald River National Park which is home to a variety of conservation significant species, and of high ecological value. The continuous native vegetation linkage to this national park adds to the ecological value of the southern project area, as it enables park animals to access a much larger area, reducing potential impacts from threats such as wildfires and predator species.

5.2.2 Maintenance of threatened ecological communities

There are no threatened ecological fauna communities in the project areas, however, DBCA has nominated this area as an important Carnaby's Black-Cockatoo breeding area, and it is probable that the area contains a low abundance of Malleefowl, and possibly Heath Mouse, Chuditch, Quenda, Dibbler, Western Mouse, Tammar and Western Brush Wallaby.

5.2.3 Condition of fauna habitat

Fauna habitat in the northern project area is of low-medium value, due to the past disturbance and vegetation regrowth, however, the area does support 32 significant Black-Cockatoo habitat trees and is foraged by Carnaby's Black-Cockatoo.

The fauna habitat quality in the southern section is assessed as high to excellent given the abundance of significant Black-Cockatoo habitat trees, the presence of a breeding population of Carnaby's Black-Cockatoo, the presence of Malleefowl in the area, and the low possibility that a Malleefowl mound in the southern area could be reused, or another Malleefowl mound constructed in the future. Given the unbroken native vegetation linkage with the Fitzgerald River National Park, and the presence of Heath Mouse, Chuditch, Quenda, Dibbler, Western Mouse, Tammar and Western Brush Wallaby in the National Park, these species are also potentially in the project areas.

5.2.4 Ecological linkages

The project areas is part of a large patch of largely undisturbed bushland to the east of the Fitzgerald River National Park. There is a near continuous native vegetation linkage from the Fitzgerald River National Park north-east to south of Ravensthorpe then to the Great Western Woodlands. This linkage crosses the barrier fence which largely stops the movement of large animals in the east-west direction, and is narrowed by agriculture areas east of Ravensthorpe. This is known as the Great Western Woodlands and Gondwana Link (Bradby 2013). The proposed vegetation clearing for exploration access tracks and associated drill pads will not significantly impact on this linkage.

5.2.5 Size and scale of the proposed disturbance

The project areas are a small (i.e. 6.71ha and 214.2ha) proportion of similar fauna habitat found in the adjacent area and the bioregion. It is acknowledged that much of the original native vegetation to the north and east of the project areas has been cleared many years ago for agriculture.

5.2.6 Abundance and distribution of similar habitat in the adjacent areas

Fauna habitats present in the project areas are abundant in adjacent areas. There is currently a continuous link of native vegetation in a south-westly direction to the Fitzgerald River National Park and a near continuous band of native vegetation in an easterly direction toward Jerdacuttup.

6. POTENTIAL ENVIRONMENTAL IMPACTS

Vegetation clearing and drilling activity will potentially affect vertebrate fauna in numerous ways, including death/injury of fauna during vegetation clearing, impacts with vehicles and the loss of habitat.

Clearing a track and drill pads to allow a drilling rig and for exploration drilling in the area is likely to result in the limited loss of small vertebrate fauna on-site that are unable to move away during the clearing process. Larger animals, such as kangaroos and large goannas, and birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas could temporarily disrupt the ecosystems in these areas until a balance is restored, but this disturbance is considered minor.

Impacts associated with clearing vegetation in a landscape or bioregional context on the vertebrate fauna are likely to be low, unless an active Malleefowl mound or an active Black-Cockatoo nest is disturbed.

Although there are anticipated short term impacts on fauna, they are not likely to result in significant impacts on fauna habitat and fauna assemblages in the long term when view in a bioregional context. The overall impact of clearing drill rig access tracks and exploration drilling on fauna species and species of conservation significance will be minimal.

The impact of feral and pest fauna which are probably present in the project areas will be doing more long-term environmental damage than the combined impacts of a proposed disturbance for constructing a drill access track and drilling activity.

6.1 DIRECT IMPACTS

6.1.1 Animal deaths during the clearing process and displacement of fauna

Clearing vegetation and drilling activities will result in the loss of some small fauna that retreat to burrows or are fossorial. Nocturnal species are unlikely to be active when most of the land clearing and drilling is taking place which may result in a small number of individuals being adversely impacted when they attempt to escape. This loss of vegetation is unlikely to have a significant impact on the vertebrate fauna assemblage when considered in a bioregional context, other than potential impacts on an active Malleefowl mound or an active Black-Cockatoo nest. Larger terrestrial animals and avian species will almost certainly move into adjacent areas.

Clearing vegetation creates habitat edges. Small mammals can respond both positively and negatively to edges depending on their ecological traits (Laurance 1991, 1994, Goosem and Marsh 1997, Goosem 2000). Edge and disturbance effects can lead to altered and most often higher levels of predation, restricting or increasing fauna movements and altering assemblage structure (Oxley et al. 1974, Paton 1994, Baker et al. 1998, Temple 1998, Luck et al. 1999, Goosem et al. 2001). Goldingay and Whelan (1997) and Clarke and Oldland (2007) reported that edge effects can extend up to 150-200m from the edge for some species, meaning the impact area on vertebrate fauna is likely to be larger than the cleared footprint.

Edge effects can disrupt ecological processes such as predation, dispersal, animal movements and can change assemblage structure. The consequence is that the impact area will always be larger than the cleared area. However, the width of the drill rig access tracks for exploration drilling activity is unlikely to be of significant concern, particularly if it is located to avoid the mature trees and the disturbance area is rehabilitated at the conclusion of the project.

6.1.2 Reduction or loss of activity areas and closure of burrows

Clearing vegetation and exploration drilling activities can potentially destroy reptile and mammal burrows or foraging habitat that are currently in use or could be used again. Clearing vegetation that forms part of the

activity area of individuals has the potential to force these animals into adjacent areas. These areas may offer fewer resources placing individuals under survival pressure. It could also cause individuals to move into the territories of other individuals increasing competition for resources. Forced relocations could increase the possibility of predation. The narrowness of the proposed drill rig access track and drill pads is unlikely to result in a significant impact on the vertebrate fauna assemblage.

6.2 INDIRECT IMPACTS

6.2.1 Habitat loss and fragmentation

Clearing vegetation to construct exploration access tracks and drill pads is unlikely to significantly or permanently fragment the fauna habitat in the project areas. The minor loss of vegetation is unlikely to significantly impact on foraging opportunities for Black-Cockatoos as there is an abundance of similar habitat in adjacent areas.

6.2.2 Fire

Increased human activity is often associated with an altered fire regime which can lead to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some conservation significant species as numerous small mammal and bird species rely on long unburnt vegetation.

Drilling and anthropogenic activity can result in bushfires, however, the openness of the vegetation for most of the project areas means there is a low risk of fires being generated.

6.2.3 Anthropogenic activity

Unnatural noises, vibrations, and vehicle and human movement in an area may be sufficient to force individuals or fauna species to move from adjacent areas or alter their activity periods. This form of disturbance is likely to occur during the initial vegetation clearing and drilling activity. The overall impact is likely to be confined to relatively small areas and is unlikely to be a significant impact.

Given that drilling at any one site will occur on one or a few days, this is unlikely to result in a significant impact on the vertebrate fauna assemblage.

6.2.4 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 areas. 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 areas.
4	Major	Significant impact on conservation significant fauna or their habitat in the project areas 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. Levels of acceptable risk

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequence	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. A risk assessment of the impact of ground disturbance activity on fauna

			Before management				With management		
	Potential impacts		Inherent risk			Risk controls	Residual risk		
Factor			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.	C	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 areas.	C	2	Low				
Clearing vegetation	Loss of fauna habitat – local scale	Loss of terrestrial fauna in the project areas.	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				
Death or loss of conservation significant fauna	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				
	Carnaby's Black-Cockatoo	Loss of a Carnaby's Black-Cockatoo or small population of Carnaby's Black-Cockatoo	C	4	High	Avoid disturbance during the Black-Cockatoo breeding season. Avoid clearing significant Black-Cockatoo habitat trees and in particular those with active Black-Cockatoo nests.	B	2	Low

			Before management				With management		
	Heath Mouse	Loss of a Heath Mouse or small population of Heath Mouse	B	3	Low				
	Malleefowl	Loss of a Malleefowl or small population of Malleefowl	B	2	Low				
	Dibbler	Loss of a Dibbler or small population of Dibbler	B	2	Low				
	Chuditch	Loss of a Chuditch or small population of Chuditch	B	2	Low				
	Ravensthorpe Range Slider	Loss of a Ravensthorpe Range Slider or small population of Ravensthorpe Range Slider	B	2	Low				
	Bristlebird	Loss of a Bristlebird or small population of Bristlebird	B	2	Low				
	Western Whipbird	Loss of a Western Whipbird or small population of Western Whipbird	B	2	Low				
	Western Mouse	Loss of a Western Mouse or small population of Western Mouse	B	2	Low				
	Quenda	Loss of a Quenda or small population of Quenda	B	2	Low				
Human impacts	Increase or spread of weeds	Changed vegetation and a resulting loss of fauna habitat.	E	2	Mod.	Implement hygiene management procedures on tracks and pads	E	1	Low
	Road kills	Animals being killed by vehicles as they cross access tracks	E	1	Low	Limiting speeds	E	1	Low
	Increase in feral mammals, specifically the dog and cat	Increased predation on the native fauna	A	1	Low				

6.3 IMPACTS ON BLACK-COCKATOOS

The Commonwealth Government (Department of Agriculture Water and the Environment 2022) has recently released updated referral guidelines for the three south-west Australian species of Black-Cockatoos. The referral criteria for foraging and breeding for Carnaby's Black-Cockatoo have been included in a table below with a response against each criterion to determine whether a referral is required.

The proposed access track length in the northern area is 258m, and if the access track is 3.5m wide and drill pads are 20m x 20m then the disturbed area will be 0.2226ha. In the southern area, the proposed access track length is 6,024m and if the access track is 3.5m wide, and the drill pads are 20m x 20m, then the disturbed area is 2.69ha. The combined disturbed footprint is 2.91ha.

The northern area falls below the 1ha criterion in the referral guidelines. In the southern area, there are four fauna habitat types:

- Acacia shrubland;
- Allocasuarina woodland;
- Eucalypt woodland; and
- Melaleuca woodland.

The only Black-Cockatoo foraging habitat type that is relevant to the referral guidelines is the Eucalypt woodland. The Eucalypt woodland area in the proposed exploration access track and drill pads in the northern area is 0.087ha and for the southern area it is 2.69ha, which exceeds the Commonwealth Government referral criteria for foraging habitat.

Earlier in this report we have discussed edge effects, and that the impacts of vegetation clearing often go beyond the immediately cleared area (i.e. indirect impacts), however, edge effects are not a consideration in the EPBC referral guidelines (Department of Agriculture Water and the Environment 2022), so they have not been taken into account here. The exploration company undertaking the drilling has indicated that it will not impact on any 'significant' trees. Given that a few of the significant trees are within the 3.5m drill rig access corridor along the proposed access track route, then the proposed access track will be rerouted to avoid those trees. We have presumed that no significant trees will be disturbed and a minimum 10m buffer will be applied to all significant trees.

Table 13. Referral thresholds for Black-Cockatoos

Attribute	Referral threshold	Response
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.	Black-Cockatoo significant habitat trees are in both project areas. The client has committed to not clearing or disturbing any of these significant trees and the exploration access track will therefore avoid all significant Black-Cockatoo habitat trees. There is one active Carnaby's Black-Cockatoo nest site in the southern project area. The referral guidelines do not define 'habitat around breeding trees' so it is not possible to determine if construction of an exploration triggers this threshold.
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 and takes into account context i.e. proximity of the impact site to important attributes.	Carnaby's Black-Cockatoos were observed foraging in the northern project area, but the proposed disturbance area is less than 1ha. There is 2.69ha of Eucalypt fauna habitat within the proposed disturbance areas in the southern area. This area triggers this referral criterion. Based on the referral guidelines this is a score of 10 for the northern area and 8 for the southern area as we found no evidence of foraging.
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 and takes into account context i.e. proximity of the impact site to important attributes.	Less than 10ha of low-quality foraging habitat will be impacted.
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.	Foraging habitat is mostly native vegetation or regrowth of native vegetation.
Night roosting habitat	Removal of any part of a known night roosting site is likely to require referral to the minister.	Roosting sites in this area are unknown.

Based on this assessment, there is a requirement to refer the proposed action to the Commonwealth Government under the *EPBC Act 1999*.

6.4 REFERRAL UNDER THE *EPBC ACT*

The proposed location of exploration access tracks is shown in Figures 3 and 4 along with proposed exploration drill pads. It is presumed that each drill pad will be a maximum of 20m x 20m.

The foraging habitat quality score for Carnaby's Black-Cockatoo in the northern area is 10 and southern area is 8, however, as the two areas are being assessed together the foraging score is 10. An assessment against the EPBC Act referral guideline thresholds is in Table 13 and foraging quality score is shown in Table 14.

Table 14. Foraging quality scoring tool for Carnaby's Black Cockatoo

Starting score		Carnaby's Black Cockatoo	Comment
10		Start at a score of 10 if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as Banksia spp. (including Dryandra spp.), Hakea spp. and Grevillea spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	The site is native bushland which contains foraging species.
Attribute	**Subtractions**		
Foraging potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Carnaby's Black Cockatoos were observed foraging in the northern area, but not in the southern area.
Connectivity	-2	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12km of your site.	There is foraging habitat within 12km of the project area.
Proximity to breeding	-2	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	Carnaby's Black Cockatoo are nesting in the southern area and there are records of nesting within 12km.
Proximity to roosting	-1	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Carnaby's Black Cockatoo will roost within 20km of the site.
Impact from significant plant disease	-1	Subtract 1 if your site has disease present	There was no evidence of disease.
Total score			Northern area – 10 Southern area – 8 Combined – 10
Appraisal			Although there is foraging habitat in the southern area, no Carnaby's Black Cockatoo were observed foraging during the four days of field assessment. If the areas were referred separately, they would have different foraging habitat scores, however, as they are being referred together the score is 10.

Given the assessed potential impacts on Carnaby's Black-Cockatoo using the Commonwealth Government's assessment criteria (Department of Agriculture Water and the Environment 2022) the proposed action triggers the EPBC referral criteria. There is also the possible presence of Malleefowl, Bristlebird, Heath Mouse, Chuditch, Red-tailed Phascogale and Dibbler which are also listed under the *EPBC Act 1999*.

The route of the exploration access track should be reassessed to minimise impacting on significant Black-Cockatoo habitat trees and the three Malleefowl mounds. It would be highly desirable for the clearing of the access track and the exploration drilling to occur outside the Carnaby's Black-Cockatoo breeding season (i.e. July to mid-December). When an EPBC referral application is submitted it should be supported by information about the distribution and size of foraging habitat in proximity (i.e. 12km) to the proposed disturbance area and details of roosting and breeding habitat (i.e. within 20km for roosting and 12km for breeding).

7. SUMMARY

This is an assessment of project areas; the northern area of 6.71ha is mostly regrowth (except for the large trees) and the southern area of 214.2ha is mostly good to excellent quality native vegetation. Fauna habitats in these two project areas are:

- Acacia shrubland;
- Allocasuarina woodland;
- Eucalypt woodland; and
- Melaleuca woodland.

Carnaby's Black-Cockatoo was recorded breeding in one of the trees in the southern project area and foraging in the northern project area. The project area is within an area designated by DBCA as Carnaby's Black-Cockatoo breeding area. The proposed disturbance of 2.69ha of Eucalypt woodland in the southern area triggers one of the criteria in the Commonwealth Government's EPBC referral guidelines for Black-Cockatoos. Three Malleefowl mounds were recorded in the southern area, none of which were active, but they could be reused again in future.

The vegetation in the project areas, in particular the southern project area, is connected via remnant habitat to the Fitzgerald National Park, which is a high value conservation area, and conservation significant species in this park have the potential to be in the project area. The project area therefore has the potential to support Bristlebird (Endangered), Heath Mouse (Endangered), Dibbler (Endangered), Red-tailed Phascogales (Vulnerable), Chuditch (Vulnerable), Quenda (Priority 4), Western Mouse (Priority 4), Tammar (Priority 4), Western Whipbird (Priority 4) and Western Brush Wallaby (Priority 4).

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8. REFERENCES

Animal Plant Mineral. 2016. Ravensthorpe Gold Copper Project - Biological Survey.

Baker, J., R. L. Goldingay, and R. J. Whelan. 1998. Powerline easement through forests: a case study of impacts on avifauna. Pacific Conservation Biology **4**:79-89.

Bamford Consulting Ecologists. 2016. Kingston Resources Ravensthorpe Mt Cattlin Project Fauna Assessment. 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.

Biologic. 2017. Cocanarup Fauna Survey for Lithium Australia. Perth.

Biologic. 2022. Cocanarup Timber Reserve Targeted and Reconnaissance Flora and Vegetation Survey. Perth.

Biota Environmental Sciences. 2004. Fauna and Fauna Assemblages of the Kundip and Trilogy Study Sites. Perth.

Biota Environmental Sciences. 2005. Kundip Phase II Fauna Survey - Summary of Findings. Perth.

Birdlife Australia. 2017. Australasian Bittern - *Botaurus poiciloptilus*. Birdlife Australia.

Birdlife International. 2016a. *Botaurus poiciloptilus*. The IUCN Red List of Threatened Species 2016: e.T22697353A93610014, Online.

Birdlife International. 2016b. *Motacilla cinerea*. The IUCN Red List of Threatened Species 2016: e.T22718392A88123490, Online.

Birdlife International. 2016c. Zanda latirostris. The IUCN Red List of Threatened Species 2016: e.T22684733A93044196, Online.

Bradby, K. 2013. Gondwana Link: 1000 kilometres of hope. Pages 25-35 *in* I. Pulsford, J. Fitzsimons, and G. Wescott, editors. Linking Australia's Landscapes: Lessons and Opportunies from Large-scale Conservation Networks.

Bramwell, E. 1998. Encouraging Quendas. Wildlife Notes **No 5 April 1998**:1-4.

Burbidge, A. A., and J. Woinarski. 2016a. *Isoodon obesulus*. The IUCN Red List of Threatened Species 2016: e.T40553A21966368, Online.

Burbidge, A. A., and J. Woinarski. 2016b. *Macropus eugenii*. The IUCN Red List of Threatened Species 2016: e.T41512A21953803, Online.

Burbidge, A. A., and J. Woinarski. 2016c. *Parantechinus apicalis*. The IUCN Red List of Threatened Species 2016: e.T16138A21944584, Online.

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

Cancilla, D., and B. Johnson. 2013. The status and ecology of the *Pseudomys shortridgei* (Heath Mouse) in southern western Australia. Perth.

Chapman, A., and K. R. Newbey. 1995a. A biological survey of the Fitzgerald area, Western Australia. **CAMScience**:1-258.

Chapman, A., and K. R. Newbey. 1995b. A vertebrate fauna survey and some notes on the vegetation of the Ravensthorpe Range, Western Australia. CALMScience **1**:465-508.

Christensen, P. 2000. Western Brush Wallaby *Macropus irma*. Pages 341-342 *in* R. Strahan, editor. The Mammals of Australia. Reed New Holland, Sydney.

Clarke, M. F., and J. M. Oldland. 2007. Penetration of remnant edges by noisy miners (*Manorina melanocphala*) and implications for habitat restoration. Wildlife Research **34**:253-261.

Cockburn, A. 2000. Heath Rat *Pseudomys shortridgei*. Pages 617-618 *in* R. Strahan, editor. The Mammals of Australia. Reed New Holland, Sydney.

Cogger, H. G. 2014. Reptiles and Amphibians of Australia. 7th edition. CSIRO, Collingwood, Victoria.

Comer, S., S. Gilfillan, M. Grant, S. Barrett, and L. Anderson. 2001. Esperance 1 (ESP1 - Fitzgerald subregion). Pages 637-654 A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002. Department of Conservation and Land Management.

Cooper, N. K., T. Bertozzi, A. Baynes, and R. J. Teale. 2003. The relationship between eastern and western populations of the Heath Rat, *Pseudomys shortridgei* (Rodentia: Muridae). Records of the Western Australian Museum **21**:367-370.

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 Environment and Conservation. 2012a. Chuditch (*Dasyurus geoffroii*) Recovery Plan. Wildlife Management Program No. 54. Perth, Western Australia.

Department of Environment and Conservation. 2012b. Fitzgerald Biosphere Recovery Plan: A Landscape Approach to Threatened Species and Ecological Communities Recovery and Biodiversity Conservation. Albany.

Department of Environment and Conservation. 2012c. Western Mouse (Walyadji) *Pseudomys occidentalis* (Tate 1951). Fauna Profiles. Page 2 *in* Department of Environment and Conservation, editor. Department of Environment and Conservation,.

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 Sustainability Environment Water Population and Communities. 2012. EPBC Act 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 and Energy. 2017. *Calyptorhynchus latirostris* in Species Profile and Threats Database. Department of the Environment, Canberra.

Di Stefano, J., A. Ashton, and A. York. 2014. Diet of the silky mouse (*Pseudomys apodemoides*) and the heath rat (*P. shortridgei*) in a post-fire environment. INternational Journal of Wildland Fire **23**:746.

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

Friend, T. 2008. *Phascogale calura*. The IUCN Red List of Threatened Species 2008: e.T16888A6544803, Online.

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

Goldingay, R. L., and R. J. Whelan. 1997. Powerline easements: do they promote edge effects in eucalypt forest for small mammals? Wildlife Research **24**:737-744.

Goosem, M. 2000. Effects of tropical rainforest roads on small mammals: Edge changes in community composition. Wildlife Research **27**:151-163.

Goosem, M., Y. Izumi, and S. Turton. 2001. Efforts to restore habitat connectivity for an upland tropical rainforest fauna: A trial of underpasses below roads. Ecological Management and Restoration **2**:196-202.

Goosem, M. W., and H. Marsh. 1997. Fragmentation of small mammal community by a powerline corridor through tropical rainforest. Wildlife Research **24**:613-629.

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 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 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.

Keith Linbeck and Associates. 2008. Ravensthorpe Spodumene Project: Spring Fauna Survey. Perth.

Kitchener, D. J., and A. Chapman. 1977. Mammals of Bendering and West Bendering Nature Reserves. Records of the Australian Museum **Supplement 5**:17-23.

Laurance, W. F. 1991. Edge effects in tropical forest fragments: application of a model for design of nature reserves. Biological Conservation **57**:205-219.

Laurance, W. F. 1994. Rainforest fragmentation and the structure of small mammal communities in tropical Queensland. Biological Conservation **69**:23-32.

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.

Luck, G. W., H. P. Possingham, and D. C. Paton. 1999. Bird responses at inherent and induced edges in the Murray Mallee, South Australia. 1. Differences in abundance and diversity. Emu **99**:157-169.

Morris, K., A. Burbidge, and S. Hamilton. 2008. *Dasyurus geoffroii*. The IUCN Red List of Threatened Species 2008: e.T6294A12599937, Online.

Orell, P., and K. Morris. 1994. Chuditch Recovery Plan 1992-2001. Department of Conservation and Land Management, Perth.

Oxley, D. J., M. B. Fenton, and G. R. Carmody. 1974. The effects of roads on populations of small mammals. Journal of Applied Ecology **11**:51-59.

Paton, P. W. C. 1994. The effect of edge on avian nest success: How strong is the evidence? Conservation Biology **8**:17-26.

Paull, D. J. 1992. The Distribution, Ecology and Conservation of the Southern Brown Bandicoot (*Isoodon obesulus obesulus*) in South Australia. Adelaide University.

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

Quinlan, K., D. Moro, and M. Lund. 2004. Is the home range of the Heath Mouse *Pseudomys shortridgei* an anomaly in the *Pseudomys* genus. Wildlife Research **31**:219-227.

Rayner, K., B. Chambers, B. Johnson, K. D. Morris, and H. R. Mills. 2012. Spatial and dietary requirements of the chuditch (*Dasyurus geoffroii*) in a semiarid climatic zone. Australian Mammalogy **34**:59.

Robinson, A. 1965. Feeding notes on the white-tailed black cockatoo. The Western Australian Naturalist **9**:169-170.

Saunders, D. A. 1977. The effect of agricultural clearing on the breeding success of the White-tailed Black Cockatoo. Emu **77**:180-184.

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. 1990. Problems of survival in an extensively cultivated landscape: the case of Carnaby's Cockatoo *Calyptorhynchus funereus latirostris*. Biological Conservation **54**:277-290.

Saunders, D. A., R. Dawson, and A. O. Nicholls. 2016. Breeding failure and nestling body mass as a function of age of breeding females in the endangered Carnaby's Cockatoo, *Calyptorhynchus latirostris*. Australian Zoologist **38**:171-182.

Saunders, D. A., and J. A. Ingram. 1987. Factors affecting survival of breeding populations of Carnaby's Cockatoo *Calyptorhynchus funereus latirostris* in remnants of native vegetation.*in* D. A. Saunders, G. W. Arnold, A. A. Burbidge, and A. J. M. Hopkins, editors. Nature Conservation: The Role of Remnants of Native Vegetation. Surrey Beatty, Sydney.

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.

Schodde, R., and I. Mason, J. 1991. Subspeciation in the Western Whipbird *Psophodes nigrogularis* and its zoogeographical significance, with descriptions of two new subspecies. Emu **91**:133-144.

Serena, M., and T. Soderquist. 2008. Western Quoll *Dasyurus geoffroii*. Pages 54-56 *in* S. van Dyck and R. Strahan, editors. The Mammals of Australia. Reed New Holland, Sydney.

Serena, M., and T. R. Soderquist. 1989a. Nursery dens of *Dasyurus geoffroii* (Marsupialia : Dasyuridae), with notes on nest building behaviour. Australian Mammalogy **12**:35-36.

Serena, M., and T. R. Soderquist. 1989b. Spatial organisation of a riparian population of the carnivorous marsupial *Dasyurus geoffroii*. Journal of Zoology, London **219**:373-383.

Shepherd, K. A., G. W. Wardell-Johnson, W. A. Loneragan, and D. T. Bell. 1997. Diet of herbivorous marsupials in the *Eucalyptus marginata* forest and their impact on the understorey vegetation. Journal of the Royal Society of Western Australia **80**:47-54.

Smith, G. T. 1987. Observations on the biology of the Western Bristlebird *Dasyornis longirostris*. Emu **87**:111-118.

Smith, G. T. 1991. Ecology of the Western Whipbird *Psophodes nigrogularis* in Western Australia. Emu **91**:145-157.

Soderquist, T. R., and M. Serena. 2000. Juvenile behaviour and dispersal of Chuditch (*Dasyurus geoffroii*) (Marsupialia: Dasyuridae). Australian Journal of Zoology **48**:551-560.

Stoddard, D. M., and R. W. Braithwaite. 1979. A strategy for utilisation of regenerating heathland habitat by the brown bandicoot (*Isoodon obesulus*; Marsupialia: Peramelidae). Journal of Animal Ecology **48**:165-179.

Storr, G. M., and R. E. Johnstone. 1983. Part VI Amphibians and Reptiles. Pages 70-74 *in* N. L. McKenzie, editor. Wildlife of the Dampier Peninsula, south-west Kimberley, Western Australia. Western Australian Wildlife Research Centre, Department of Fisheries and Wildlife, Perth.

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.

Taillier, S. 2016. Fresh hopes for Carnaby's black cockatoos as numbers 'increase dramatically' with artificial hollows. ABC News, Perth.

Temple, S. A. 1998. The edge of the cut: implications for wildlife populations. Journal of Forestry **96**:22-26.

Thompson, S. A., and G. G. Thompson. 2006. Reptiles of the Western Australian Goldfields. Goldfields Environmental Management Group, Kalgoorlie, WA.

Threatened Species Scientific Committee. 2013. Approved Conservation Advice for *Pezoporus wallicus flaviventris* (western ground parrot). Canberra.

Travouillon, K. J., and M. J. Phillips. 2018. Total evidence analysis of the phylogenetic relationships of bandicoots and bilbies (Marsupialia: Peramelemorphia): reassessment of two species and description of a new species. Zootaxa **4378**:224-256.

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

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

Wann, J. M., and D. T. Bell. 1997. Dietary preferences of the black-gloved wallaby (*Macropus irma*) and the western grey kangaroo (*M. fuliginosus*) in Whiteman Park, Perth, Western Australia. Journal of the Royal Society of Western Australia **80**:55-62.

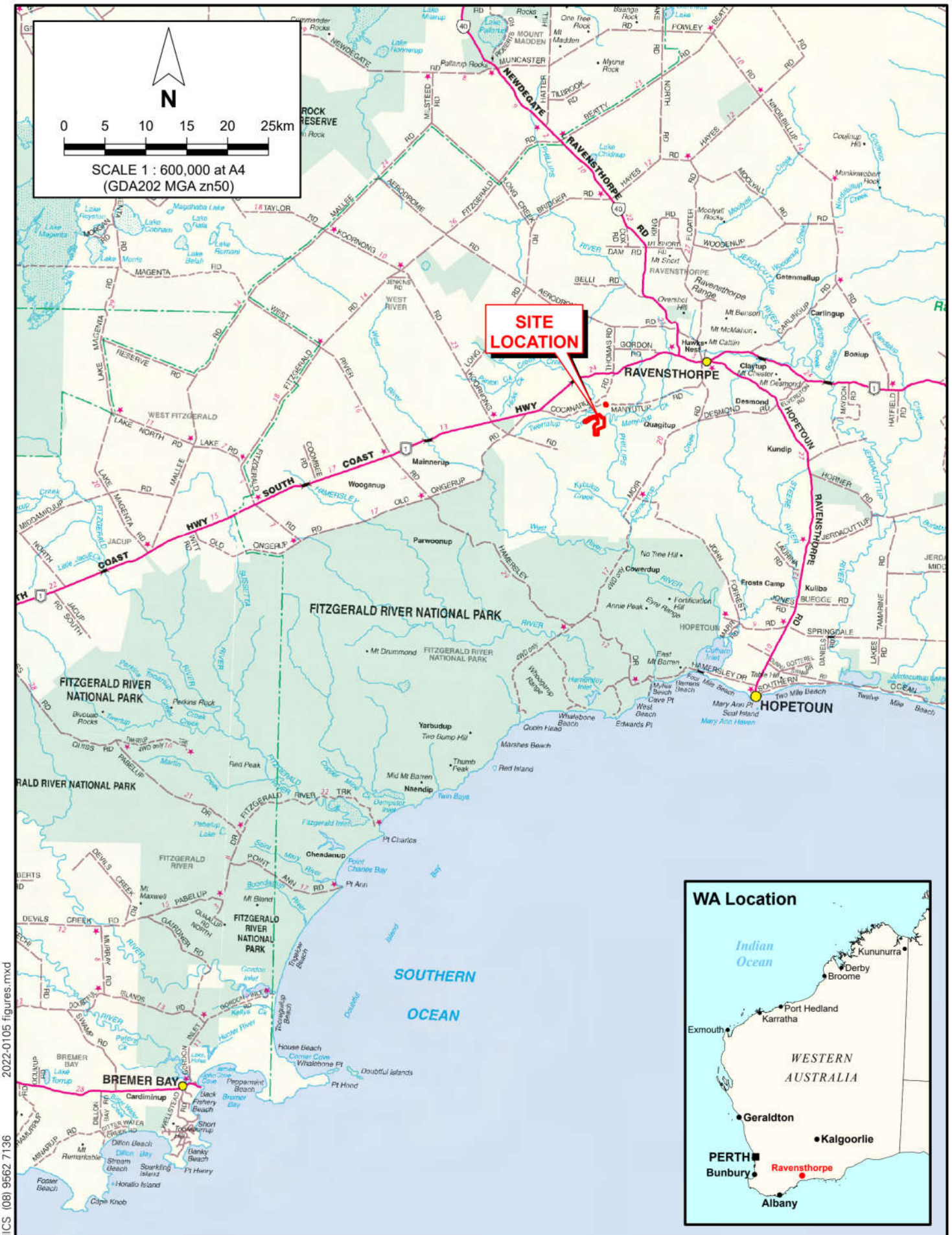
Whisson, L., and D. J. Kitchener. 2000. Western Mouse *Pseudomys occidentalis*. Pages 613-614 *in* R. Strahan, editor. The Mammals of Australia. Reed New Holland, Sydney.

Woinarski, J., and A. A. Burbidge. 2016. *Myrmecobius fasciatus*. The IUCN Red List of Threatened Species 2016: e.T14222A21949380, Online.

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

Figures

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve



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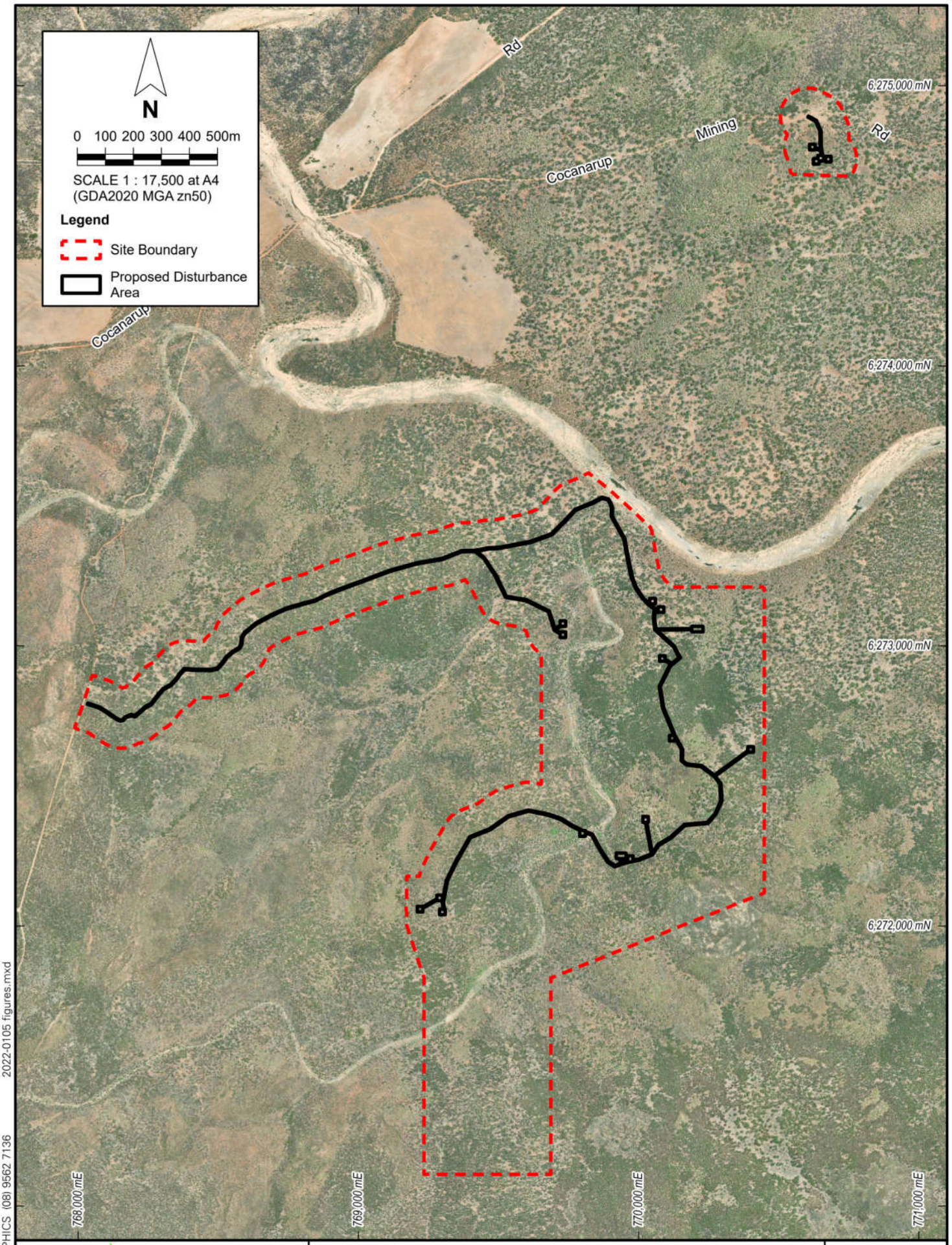
TERRESTRIAL ECOSYSTEMS

Tetris Environmental
BASIC VERTEBRATE FAUNA SURVEY AND RISK ASSESSMENT
COCANARUP TIMBER RESERVE

Figure 1

REGIONAL CONTEXT

Drawn: G. Thompson | Date: 11 Dec 2022 | Job: 2022-0105



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TERRESTRIAL ECOSYSTEMS

Tetris Environmental
BASIC VERTEBRATE FAUNA SURVEY AND RISK ASSESSMENT
COCANARUP TIMBER RESERVE

Figure 2

PROJECT AREA

Drawn: G. Thompson | Date: 11 Dec 2022 | Job: 2022-0105

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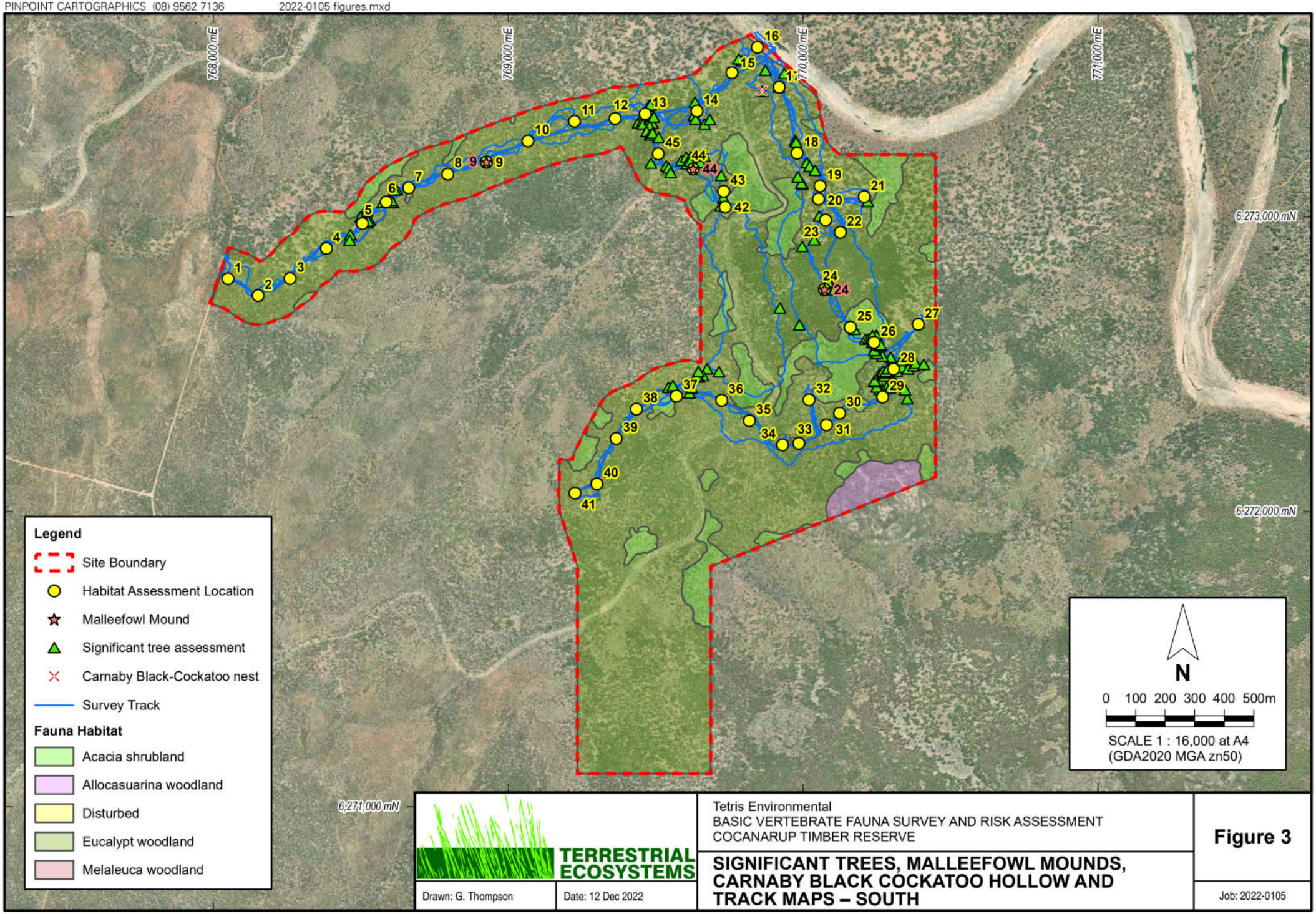


TERRESTRIAL ECOSYSTEMS

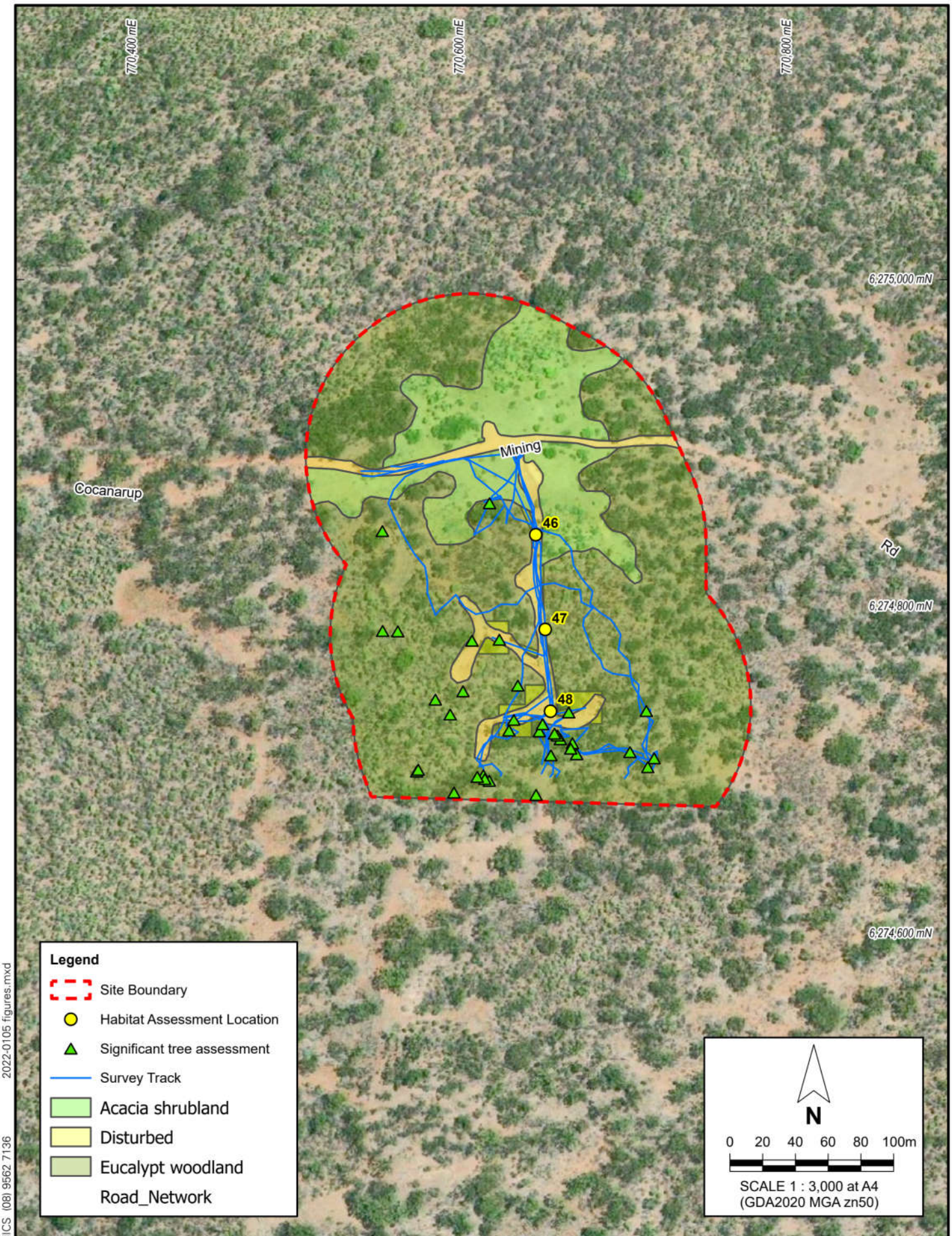
Drawn: G. Thompson | Date: 12 Dec 2022

Tetris Environmental
BASIC VERTEBRATE FAUNA SURVEY AND RISK ASSESSMENT
COCANARUP TIMBER RESERVE

SIGNIFICANT TREES, MALLEEFOWL MOUNDS, CARNABY BLACK COCKATOO HOLLOW AND TRACK MAPS – SOUTH

Figure 3

Job: 2022-0105



PINPOINT CARTOGRAPHICS (08) 9562 7136 2022-0105 figures.mxd

TERRESTRIAL ECOSYSTEMS

Drawn: G. Thompson | Date: 12 Dec 2022

Tetris Environmental
BASIC VERTEBRATE FAUNA SURVEY AND RISK ASSESSMENT
COCANARUP TIMBER RESERVE

SIGNIFICANT TREES AND TRACK MAPS NORTH

Figure 4

Job: 2022-0105

Appendix A.
Results of the EPBC Act Protected Matters Search

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve

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: 02-Oct-2022

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:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	22
Listed Migratory Species:	8

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

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

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	13
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:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Natural		
Fitzgerald River National Park	WA	Listed place

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
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis longirostris Western Bristlebird [515]	Endangered	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pezoporus flaviventris Western Ground Parrot, Kyloring [84650]	Critically Endangered	Species or species habitat may 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
MAMMAL		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Myrmecobius fasciatus Numbat [294]	Endangered	Species or species habitat known to occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat known to occur within area
Phascogale calura Red-tailed Phascogale, Red-tailed Wambenger, Kenngoor [316]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys shortridgei Heath Mouse, Dayang, Heath Rat [77]	Endangered	Species or species habitat known to occur within area
PLANT		
Acacia rhamphophylla Kundip Wattle [64659]	Endangered	Species or species habitat may occur within area
Adenanthos dobagii Fitzgerald Woollybush [21253]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Anigozanthos bicolor subsp. minor		
Little Kangaroo Paw, Two-coloured Kangaroo Paw, Small Two-colour Kangaroo Paw [21241]	Endangered	Species or species habitat likely to occur within area
Banksia anatona		
Cactus Dryandra [82758]	Critically Endangered	Species or species habitat may occur within area
Daviesia megacalyx		
Long-sepalled Daviesia [56785]	Endangered	Species or species habitat likely to occur within area
Eremophila denticulata subsp. denticulata		
Fitzgerald Eremophila [64569]	Vulnerable	Species or species habitat known to occur within area
Ricinocarpos trichophorus		
Barrens Wedding Bush [19931]	Endangered	Species or species habitat may occur within area
Roycea pycnophylloides		
Saltmat [21161]	Endangered	Species or species habitat may occur within area
Thelymitra psammophila		
Sandplain Sun-orchid [4908]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		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 likely 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
Unknown	
Commonwealth Land - [51744]	WA

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
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]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
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
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thinornis cucullatus as Thinornis rubricollis		
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Fitzgerald River	National Park	WA
Koornong	Nature Reserve	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Ravensthorpe Heavy Haulage Route Project, WA	2013/7082	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

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 B.
Rapid habitat assessment results

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve

Date: 19-Sep-22 | Habitat Assessment #: 1 | Observer: Joel Wilson

Zone: 50 | Easting: 768049 mE | Northing: 6272790 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 2 | Observer: Joel Wilson

Zone: 50 | Easting: 768152 mE | Northing: 6272732 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 3 | Observer: Joel Wilson

Zone: 50 | Easting: 768260 mE | Northing: 6272791 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 4 | Observer: Joel Wilson

Zone: 50 | Easting: 768384 mE | Northing: 6272893 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 5 | Observer: Joel Wilson

Zone: 50 | Easting: 768506 mE | Northing: 6272977 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 6 | Observer: Joel Wilson

Zone: 50 | Easting: 768587 mE | Northing: 6273050 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 7 | Observer: Joel Wilson

Zone: 50 | Easting: 768662 mE | Northing: 6273098 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 8 | Observer: Joel Wilson

Zone: 50 | Easting: 768795 mE | Northing: 6273144 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22	Habitat Assessment #: 9	Observer: Joel Wilson
Zone: 50	Easting: 768926 mE	Northing: 6273185 mN
Fire History: > 5 years	Landform: Flat plain	Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good

Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 10 | Observer: Joel Wilson

Zone: 50 | Easting: 769066 mE | Northing: 6273256 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 11 | Observer: Joel Wilson

Zone: 50 | Easting: 769224 mE | Northing: 6273323 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 12 | Observer: Joel Wilson

Zone: 50 | Easting: 769362 mE | Northing: 6273333 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 13 | Observer: Joel Wilson

Zone: 50 | Easting: 769464 mE | Northing: 6273348 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 14 | Observer: Joel Wilson

Zone: 50 | Easting: 769640 mE | Northing: 6273358 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 15 | Observer: Joel Wilson

Zone: 50 | Easting: 769759 mE | Northing: 6273488 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 16 | Observer: Joel Wilson

Zone: 50 | Easting: 769845 mE | Northing: 6273574 mN

Fire History: > 5 years | Landform: Ephemeral creekline | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 19-Sep-22 | Habitat Assessment #: 17 | Observer: Joel Wilson

Zone: 50 | Easting: 769919 mE | Northing: 6273439 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 18 | Observer: Joel Wilson

Zone: 50 | Easting: 769979 mE | Northing: 6273215 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 19 | Observer: Joel Wilson

Zone: 50 | Easting: 770057 mE | Northing: 6273104 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 20 | Observer: Joel Wilson

Zone: 50 | Easting: 770052 mE | Northing: 6273060 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 21 | Observer: Joel Wilson

Zone: 50 | Easting: 770206 mE | Northing: 6273068 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 22 | Observer: Joel Wilson

Zone: 50 | Easting: 770126 mE | Northing: 6272947 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 23 | Observer: Joel Wilson

Zone: 50 | Easting: 770076 mE | Northing: 6272988 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 24 | Observer: Joel Wilson

Zone: 50 | Easting: 770072 mE | Northing: 6272753 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 25 | Observer: Joel Wilson

Zone: 50 | Easting: 770160 mE | Northing: 6272625 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Acacia shrubs

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 26 | Observer: Joel Wilson

Zone: 50 | Easting: 770240 mE | Northing: 6272574 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Acacia shrubs

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 27 | Observer: Joel Wilson

Zone: 50 | Easting: 770390 mE | Northing: 6272635 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 28 | Observer: Joel Wilson

Zone: 50 | Easting: 770306 mE | Northing: 6272483 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 29 | Observer: Joel Wilson

Zone: 50 | Easting: 770269 mE | Northing: 6272389 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 30 | Observer: Joel Wilson

Zone: 50 | Easting: 770124 mE | Northing: 6272334 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 31 | Observer: Joel Wilson

Zone: 50 | Easting: 770079 mE | Northing: 6272294 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 32 | Observer: Joel Wilson

Zone: 50 | Easting: 770020 mE | Northing: 6272379 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Rocky

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 33 | Observer: Joel Wilson

Zone: 50 | Easting: 769985 mE | Northing: 6272231 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 34 | Observer: Joel Wilson

Zone: 50 | Easting: 769930 mE | Northing: 6272226 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22	Habitat Assessment #: 35	Observer: Joel Wilson
Zone: 50	Easting: 769817 mE	Northing: 6272308 mN
Fire History: > 5 years	Landform: Flat plain	Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good

Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 36 | Observer: Joel Wilson

Zone: 50 | Easting: 769724 mE | Northing: 6272378 mN

Fire History: > 5 years | Landform: Ephemeral creekline | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 37 | Observer: Joel Wilson

Zone: 50 | Easting: 769570 mE | Northing: 6272392 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 38 | Observer: Joel Wilson

Zone: 50 | Easting: 769434 mE | Northing: 6272348 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 39 | Observer: Joel Wilson

Zone: 50 | Easting: 769365 mE | Northing: 6272248 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 40 | Observer: Joel Wilson

Zone: 50 | Easting: 769300 mE | Northing: 6272094 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 41 | Observer: Joel Wilson

Zone: 50 | Easting: 769226 mE | Northing: 6272063 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 42 | Observer: Joel Wilson

Zone: 50 | Easting: 769736 mE | Northing: 6273032 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Acacia shrubs

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 43 | Observer: Joel Wilson

Zone: 50 | Easting: 769731 mE | Northing: 6273086 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: Stoney

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 44 | Observer: Joel Wilson

Zone: 50 | Easting: 769627 mE | Northing: 6273162 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 45 | Observer: Joel Wilson

Zone: 50 | Easting: 769509 mE | Northing: 6273213 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Very good | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 46 | Observer: Joel Wilson

Zone: 50 | Easting: 770647 mE | Northing: 6274844 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Acacia shrubs

Habitat Quality: Disturbed | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 47 | Observer: Joel Wilson

Zone: 50 | Easting: 770652 mE | Northing: 6274786 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Disturbed | Surface: None

TERRESTRIAL ECOSYSTEMS

Date: 20-Sep-22 | Habitat Assessment #: 48 | Observer: Joel Wilson

Zone: 50 | Easting: 770656 mE | Northing: 6274736 mN

Fire History: > 5 years | Landform: Flat plain | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland over shrubs of varying densities

Habitat Quality: Disturbed | Surface: None

TERRESTRIAL ECOSYSTEMS

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

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve

C.1 VERTEBRATE FAUNA ASSESSMENTS

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
Fish																														
Atherinidae	*Leptatherina wallacei*	Western Hardyhead	X																											
Gobiidae	*Pseudogobius olorum*	Bluespot Goby	X																											
Galaxiidae	*Galaxias maculatus*	Common Galaxias	X																											
Amphibians																														
Limnodynastidae	*Heleioporus albopunctatus*	Western Spotted Frog	X	X	1																									
	Heleioporus eyrei	Moaning Frog	X	X	1																									
	Heleioporus psammophilus	Sand Frog	X																											
	Limnodynastes dorsalis	Western Banjo Frog	X	X	1									X																
	Neobatrachus albipes	White-footed Trilling Frog	X	X																										
	Neobatrachus kunapalari	Wheatbelt Frog	X	X										X																
Myobatrachidae	*Crinia georgiana*	Quacking Frog	X	X																										
	Crinia pseudinsignifera	Bleating Froglet	X	X	1									X																
	Pseudophryne guentheri	Gunther's Toadlet	X	X	1																									
	Pseudophryne occidentalis	Western Toadlet	X																											
	Myobatrachus gouldii	Turtle Frog		X																										
Pelodryadidae	*Litoria adelaidensis*	Slender Tree Frog	X	X																										
	Litoria cyclorhyncha	Spotted-thighed Frog	X	X	1									X	2															
	Litoria moorei	Motorbike Frog												X																
Reptiles																														
Agamidae	*Amphibolurus norrisi*	Mallee Tree Dragon	X											X		4														
	Ctenophorus maculatus	Spotted Dragon	X	X		1								X			4													
	Ctenophorus ornatus	Ornate Crevice Dragon	X	X																										
	Diporiphora amphiboluroides	Mulga Dragon												X																
	Pogona minor	Western Bearded Dragon	X	X	1																									
	Ctenophorus adelaidensis	Western Heath Dragon		X																										
Carphodactylidae	*Underwoodisaurus milii*	Barking Gecko	X	X			5	1	3	8				X		2		2	2	2										
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko	X	X	1									X				2												
	Diplodactylus calcicolus	South Coast Gecko	X																											
	Diplodactylus granariensis	Wheatbelt Stone Gecko		X						1	1			X						2	14									

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
	Oedura marmorata	Marbled Velvet Gecko		X		6																								
	Strophurus spinigerus	South-western Spiny-tailed Gecko	X	X																										
Elapidae	*Echiopsis curta*	Bardick	X	X																										
	Elapognathus coronatus	Crowned Snake		X										X	2															
	Notechis scutatus	Tiger Snake	X	X	1																2									
	Suta gouldii	Gould's Snake	X	X	1									X		2				4		2								
	Suta nigriceps	Short-tailed Snake		X																										
	Pseudonaja affinis	Dugite	X	X	1									X																
	Rhinoplocephalus bicolor	Square-nosed Snake	X	X																										
Gekkonidae	*Christinus marmoratus*	Marbled Gecko	X											X	2	4				4										
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard	X	X										X																
	Aprasia striolata	Striated Worm-lizard	X	X																										
	Delma australis	Marble-faced Delma	X	X										X									2							
	Delma fraseri	Fraser's Delma	X	X										X	2					2			2							
	Pygopus lepidopodus	Common Scaly-foot	X	X	1									X																
Pythonidae	*Morelia spilota*	Carpet Python		X	1									X																
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink	X	X										X																
	Cryptoblepharus pulcher	Elegant Snake-eyed Skink	X		1											2			12	2	6									
	Cryptoblepharus virgatus	Striped Snake-eyed Skink	X	X										X																
	Ctenotus catenifer	Chained-striped Southwest Ctenotus	X																											
	Ctenotus gemmula	Jewelled South-west Skink	X	X																										
	Ctenotus impar	Odd-stripped Ctenotus	X	X		1								X				2						2						
	Ctenotus labillardieri	Common South-west Ctenotus	X	X								1		X																
	Egernia kingii	King's Skink	X	X	1									X																
	Egernia multiscutata	Southern Sand-skink		X	1																									
	Egernia napoleonis	Southwestern Crevice Skink		X																										
	Hemiergis initialis	South-western Earless Skink	X	X										X	22			2						4						
	Hemiergis peronii	Lowlands Earless Skink	X	X		1	1							X				2	2	2				2						
	Lerista distinguenda	South-western Orange-tailed Slider	X	X										X				2			2		2	4						
	Lerista microtis	Southwest Slider		X																										

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
	Lerista viduata	Ravensthorpe Range Slider	X		1									X															
	Menetia greyii	Common Dwarf Skink	X	X										X				2											
	Morethia obscura	Shrubland Pale-flecked Morethia	X	X				1					1	X		2		10	2		2		4	8					
	Tiliqua occipitalis	Western Blue-tongued Lizard	X	X	1																			2					
	Tiliqua rugosa	Bobtail	X	X	1									X				2			2			2	2	4			
Typhlopidae	*Anilios australis*	Austral Blind Snake	X	X	1													2		2			2						
	Anilios bituberculatus	Prong-snouted Blind Snake																											
Varanidae	*Varanus rosenbergi*	Heath Monitor	X	X			10							X		2	2		6	4	4		2					2	2
Chelidae	*Chelodinia oblonga*	South-western Snake-necked Turtle		X																									
Birds																													
Casuariidae	*Dromaius novaehollandiae*	Emu			1									X															
Anatidae	*Anas gracilis*	Grey Teal			1																								
	Anas castanea	Chestnut Teal			1																								
Megapodiidae	*Leipoa ocellata*	Malleefowl		X	1									X															
Phasianidae	*Synoicus ypsilophorus*	Brown Quail												X															
Otididae	*Otis australis*	Bustard		X																									
Columbidae	*Phaps chalcoptera*	Common Bronzewing		X	1									X															
	Phaps elegans	Brush Bronzewing		X	1									X															
	Ocyphaps lopotes	Creasted Pigeon		X																									
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo		X	1																								
	Chrysococcyx lucidus	Shining Bronze-Cuckoo		X	1									X															
	Cacomantis flabelliformis	Fan-tailed Cuckoo			1									X															
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar			1																								
Apodidae	*Apus pacificus*			X																									
Podargidae	*Podargus strigoides*	Tawny Frogmouth			1									X															
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar			1									X															
Turnicidae	*Turnix varius*	Painted Buttonquail		X			1						1	X															
Ardeidae	*Egretta novaehollandiae*	White-faced Heron			1																								
Accipitridae	*Lophoictinia isura*	Square-tailed Kite		X	1									X															
	Aquila audax	Wedge-tailed Eagle		X	1																								
	Accipiter fasciatus	Brown Goshawk		X										X															
	Elanaus caeruleus	Black-Shouldered Kite		X																									
	Haliastur sphenurus	Whistling Kite		X																									

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
	Acciiter fasciatus	Brown Goshawk		X																									
	Accipiter cirrocephalus	Collared Sparrowhawk		X																									
	Aquila morphnoides	Little Eagle		X																									
	Haliaeetus leucogaster	White-Breasted Sea-Eagle		X																									
	Circus assimilis	Spotter Harrier		X																									
	Circus aeruginosus	Marsh Harrier		X																									
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler		X																									
Pandionidae	*Pandion haliaetus*	Osprey		X																									
Tytonidae	*Tyto alba*	Barn Owl		X										X															
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo		X	1																								
	Cuculus flabelliformis	Fan-tailed Cuckoo		X																									
	Chrysococcyx basalis	Horsfield's Bronze-Cuckoo		X																									
	Chrysococcyx lucidus	Shining Bronze-Cuckoo		X																									
Strigidae	*Ninox boobook*	Southern Boobook			1																								
	Ninox novaeseelandiae	Morepork												X															
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra		X	1																								
	Halycon sancta	Sacred Kingfisher		X																									
Meropidae	*Merops ornatus*	Rainbow Bee-eater		X	1																								
Falconidae	*Falco cenchroides*	Nankeen Kestrel		X	1																								
	Falco peregrinus	Peregrine Falcon		X																									
	Falco longipennis	Australian Hobby		X	1																								
	Falco berigora	Brown Falcon			1																								
Timaliidae	*Zosterops lateralis*	Silvereye			1																								
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Black-Cockatoo		X	1									X															
	Eolophus roseicapilla	Galah																											
Psittaculidae	*Polytelis anthopeplus*	Regent Parrot		X	1																								
	Neophema elegans	Elegant Parrot			1																								
	Barnardius zonarius	Australian Ringneck		X	1									X															
	Purpureicephalus spurius	Red-capped Parrot		X	1									X															
	Platycercus spurius	Elegant Parrot		X																									
	Neophema petrophila	Rock Parrot		X																									
	Pezoporus wallicus	Western Ground Parrot		X																									
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet		X	1									X															
Maluridae	*Stipiturus malachurus*	Southern Emuwren	X	X	1																								

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
	Malurus pulcherrimus	Blue-breasted Fairywren	X	X	1									X															
	Malurus splendens	Splendid Fairywren	X	X																									
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill	X	X	1																								
	Lichenostomus cratitius	Purple-gaped Honeyeater	X	X	1									X															
	Manorina flavigula	Yellow-throated Miner	X	X	1																								
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	X	X																									
	Anthochaera chrysoptera	Little Wattlebird		X	1																								
	Anthochaera lunulata	Western Wattlebird	X											X															
	Anthochaera carunculata	Red Wattlebird	X		1																								
	Anthochaera paradoxa	Yellow Wattlebird												X															
	Epthianura albifrons	White-fronted Chat		X																									
	Gavicalis virescens	Singing Honeyeater	X	X																									
	Ptilotula ornata	Yellow-plumed Honeyeater	X		1																								
	Gliciphila melanops	Tawny-crowned Honeyeater	X	X	1									X															
	Lichmera indistincta	Brown Honeyeater	X	X	1									X															
	Phylidonyris novaehollandiae	New Holland Honeyeater	X	X	1									X															
	Phylidonyris niger	White-cheeked Honeyeater	X	X	1																								
	Nesoptilotis leucotis	White-eared Honeyeater	X	X	1									X															
	Melithreptus chloropsis	Gilbert's Honeyeater	X											X															
	Melithreptus lunatus	White-naped Honeyeater		X	1																								
	Melithreptus brevirostris	Brown-headed Honeyeater	X		1																								
Dasyornithidae	*Dasyornis longirostris*	Western Bristlebird		X																									
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	X	X	1									X															
	Pardalotus striatus	Striated Pardalote	X	X	1									X															
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	X	X	1									X															
	Hylacola cauta	Shy Heathwren	X	X	1									X															
	Acanthiza inornata	Western Thornbill	X																										
	Acanthiza apicalis	Inland Thornbill	X		1									X															
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X	X	1																								
	Smicrornis brevirostris	Weebill	X		1									X															
	Gerygone fusca	Western Gerygone	X											X															
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	X		1									X															
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike	X	X	1									X															
	Lalage tricolor	White-winged Triller	X	X																									

		Surveys	A	B	C									D	E																
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	X	X	1																								
Psophodidae	*Psophodes nigrogularis*	Western Whipbird	X	X	1									X															
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird	X	X	1									X															
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush	X	X	1									X															
	Falcunculus frontatus	Crested Shrike-tit		X																									
	Pachycephala pectoralis	Golden Whistler	X	X	1									X															
	Pachycephala rufiventris	Rufous Whistler	X	X	1																								
	Pachycephala inornata	Gilbert's Whistler		X																									
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	X	X																									
	Artamus personatus	Masked Woodswallow		X																									
	Artamus cyanopterus	Dusky Woodswallow	X	X	1									X															
	Cracticus torquatus	Grey Butcherbird	X	X	1									X															
	Cracticus nigrogularis	Pied Butcherbird	X																										
	Gymnorhina tibicen	Australian Magpie	X	X	1									X															
	Strepera versicolor	Grey Currawong	X	X	1									X															
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	X	X	1									X															
	Rhipidura albiscapa	Grey Fantail	X	X																									
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	X	X	1																								
	Myiagra inquieta	Restless Flycatcher	X	X	1									X															
Corvidae	*Corvus coronoides*	Australian Raven	X	X	1									X															
Petroicidae	*Petroica goodenovii*	Red-capped Robin	X	X																									
	Petrocia multicolor	Red-Capped Robin		X																									
	Melanodryas cucullata	Hooded Robin	X	X																									
	Tregellasia capito	Pale-yellow Robin			1																								
	Eopsaltria griseogularis	Western Yellow Robin	X	X										X															
	Drymodes brunneopygia	Southern Scrub-Robin	X	X	1									X															
Acrocephalidae	*Acrocephalus stentoreus*	Clamorous Reed-warbler		X																									
Locustellidae	*Poodytes gramineus*	Little Grassbird		X																									
	Cincloramphus mathewsi	Rufous Songlark	X																										
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	X	X	1									X															
	Hirundo leucosterna	White-backed Swallow		X																									
	Petrochelidon nigricans	Tree Martin	X	X	1									X															
Zosteropidae	*Zosterops lateralis*	Silvereye	X											X															
Estrildidae	*Stagonopleura oculata*	Red-eared Firetail	X	X	1																								

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit	X	X																									
Mammals																													
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	X	X										X															
Canidae	*Canis lupus*	Dingo	X																										
	Vulpes vulpes	Red Fox		X										X															
	Felis catus	Cat		X																									
Leporidae	*Oryctolagus cuniculus*	Rabbit		X																									
Dasyuridae	*Sminthopsis griseoventer*	Grey-bellied Dunnart	X											X															
Molossidae	*Austronomus australis*	White-striped Freetail Bat		X																									
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	X	X																									
	Chalinolobus morio	Chocolate Wattled Bat	X																										
	Nyctophilus geoffroyi	Lesser Long-eared Bat	X																										
	Vespadelus regulus	Southern Forest Bat	X																										
Dasyuridae	*Dasyurus geoffroii*	Chuditch	X											X															
	Parantechinus apicalis	Dibbler		X																									
	Phascogale calura	Red-tailed Phascogale	X	X																									
	Sminthopsis crassicaudata	Fat-tailed Dunnart	X											X															
	Sminthopsis fuliginosus	Grey-bellied Dunnart		X			2	1	11							2				2		2							
	Sminthopsis gilberti	Gilbert's Dunnart	X																										
	Sminthopsis granulipes	White-tailed Dunnart	X	X																									
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum	X	X			5									22		12	10	26	12		28	8					
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	X	X										X															
	Notamacropus eugenii	Tammar Wallaby	X	X							1																		
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	X	X																									
Potoroidae	*Bettongia penicillata*	Woylie		X																									
Tarsipedidae	*Tarsipes rostratus*	Honey Possum	X	X		29	7		1	5				X		16		38	4	8	24		24	28					
Peramelidae	*Isoodon fusciventer*	Quenda	X	X																									
	Isoodon obesulus	Southern Brown Bandicoot	X																										
Muridae	*Mus musculus*	House Mouse	X	X		1	1	17		2		7	3	X		2	8	4			4	12	6	2	4		2		
	Hydromys chrysogaster	Water Rat		X																									
	Pseudomys albocinereus	Ash-grey Mouse	X	X																									
	Pseudomys occidentalis	Western Mouse	X	X						2		1	3																
	Pseudomys shortridgei	Heath Mouse	X	X			1					1	1	X															

		Surveys	A	B	C									D	E															
Family	Species	Common name			Opportuni	Site 12	Site 7	Site 11	Site 13	Site 10	Site 4	Site 8	Site 9	Unknown	Opp	KU5	KU19	KU3	KU4	KU7	KU6	KU18	KU1	KU2	KU17	KU14	KU20	KU15	KU16
	Notomys mitchellii	Mitchell's Hopping Mouse		X																									
	Rattus fuscipes	Bush Rat	X	X			7	3		22		7	20	X		28	32	2	4			40	2		16	56	52	38	26

A Atlas of Living Australia

B Chapman, A. and Newbey, K.R. (1995a) A biological survey of the Fitzgerald area, Western Australia, CALMScience, 3, 1-258.

C Chapman, A and Newbey, K.R. (1995b) A vertebrate fauna survey and some notes on the vegetation of the Ravensthorpe Range, Western Australia. *CALMScience*, 1(4), 465-508.

D Animal Plant Mineral (2016) *Ravensthorpe Gold Copper Project Biological Survey*. Unpublished report for ACHMinerals, Perth.

E Biota Environmental Sciences (2005) *Kundip Phase II Fauna Survey - Summary of Findings*. Letter report to Tectonic Resources NL, Perth.

		Surveys	A								B																						
Family	Species	Common name	Site 7	Site 3	Site 6	Site 2	Site 1	Site 4	Site 5a	Site 5b	KU1	KU9	KU12	KU2	Opp	KU5	KU19	KU3	KU4	KU7	KU8	KU11	KU6	KU18	KU13	KU10	KU17	KU14	KU20	KU15	KU16	TR1
Amphibians																																	
Limnodynastidae	*Limnodynastes dorsalis*	Western Banjo Frog	1																														
	Neobatrachus kunapalari	Wheatbelt Frog									1																						
Myobatrachidae	*Crinia pseudinsignifera*	Bleating Froglet									1	1																					
Pelodryadidae	*Litoria cyclorhyncha*	Spotted-thighed Frog											7	2	1																		
Reptiles																																	
Agamidae	*Amphibolurus norrisi*	Mallee Tree Dragon														2																	
	Ctenophorus maculatus	Spotted Dragon									4						2																
Carphodactylidae	*Underwoodisaurus milii*	Barking Gecko	3	2	4							3	4	1		1		1	1	2	1												
Diplodactylidae	*Crenadactylus ocellatus*	Clawless Gecko		2		1	1					3						1	4		2	3	1										
	Diplodactylus granariensis	Wheatbelt Stone Gecko	9	9	12	4	10	14	3	6																							
	Diplodactylus granariensis	Wheatbelt Stone Gecko											1			3		2	18	3			10										
	Oedura marmorata	Marbled Velvet Gecko		1																													
Elapidae	*Elapognathus coronatus*	Crowned Snake													1																		
	Notechis scutatus	Tiger Snake													1									1									
	Pseudonaja affinis	Dugite									1					1				1			2		1								
Gekkonidae	*Christinus marmoratus*	Marbled Gecko									1	2			1	2		3	3	2	3					2							
Pygopodidae	*Aprasia repens*	Southwest Sandplain Worm Lizard									1																						
	Delma australis	Marble-faced Delma												3									1										
	Delma fraseri	Fraser's Delma						1																									
	Delma fraseri	Fraser's Delma												2	1			1					1										
Scincidae	*Cryptoblepharus pulcher*	Elegant Snake-eyed Skink										8	3	5		1		1	8	1	5		4			3							
	Ctenotus impar	Odd-stripped Ctenotus												2				1					2										
	Ctenotus labillardieri	Common South-west Ctenotus										1																					
	Hemiergis initialis	South-western Earless Skink									1	1		4	11	2		2	10	1	2		1		3								
	Hemiergis peronii	Lowlands Earless Skink	1	2				3																									
	Hemiergis peronii	Lowlands Earless Skink										12		3		3		2	2	1	2					1							
	Hemiergis peronii	Lowlands Earless Skink												1				1	1	1													
	Lerista distinguenda	South-western Orange-tailed Slider						1	1		2			2				1					5										

		Surveys	A								B																						
Family	Species	Common name	Site 7	Site 3	Site 6	Site 2	Site 1	Site 4	Site 5a	Site 5b	KU1	KU9	KU12	KU2	Opp	KU5	KU19	KU3	KU4	KU7	KU8	KU11	KU6	KU18	KU13	KU10	KU17	KU14	KU20	KU15	KU16	TR1
	Lerista viduata	Ravensthorpe Range Slider												1																		
	Menetia greyii	Common Dwarf Skink	2	13		1	2		4							1		2	1				1									
	Morethia obscura	Shrubland Pale-flecked Morethia	15		5			10			2	1		4		1		7	4		2		5									
	Tiliqua occipitalis	Western Blue-tongued Lizard																									1					
	Tiliqua rugosa	Bobtail	6	2	2	4	1		1					1				1	1				1				1	1	2			
Typhlopidae	*Anilios australis*	Austral Blind Snake	1					1	1		1							1		1												
	Anilios bituberculatus	Prong-snouted Blind Snake	7					3																								
Varanidae	*Varanus rosenbergi*	Heath Monitor									2			2		2	1	3	3	2		1	3							1	1	
Birds																																
Casuariidae	*Dromaius novaehollandiae*	Emu																2	4													
Anatidae	*Tadorna tadornoides*	Australian Shelduck																														2
	Chenonetta jubata	Australian Wood Duck																														10
	Anas superciliosa	Pacific Black Duck																														16
	Anas gracilis	Grey Teal																														10
	Anas castanea	Chestnut Teal		2																												
Phasianidae	*Synoicus ypsilophorus*	Brown Quail											4					3					1									
Columbidae	*Streptopelia orientalis*	Oriental Turtle-Dove			1																											
	Phaps chalcoptera	Common Bronzewing									1																					
	Phaps elegans	Brush Bronzewing			1		1								1																	
	Ocyphaps lophotes	Crested Pigeon		3																												
Cuculidae	*Chrysococcyx lucidus*	Shining Bronze-Cuckoo									2										1		2									
	Cacomantis flabelliformis	Fan-tailed Cuckoo			1													1														
Podargidae	*Podargus strigoides*	Tawny Frogmouth													1																	
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar									1																					
Turnicidae	*Turnix varius*	Painted Buttonquail																1														
Accipitridae	*Elanus axillaris*	Black-shouldered Kite																														1
	Lophoictinia isura	Square-tailed Kite																1	2													
	Accipiter fasciatus	Brown Goshawk																1														
Tytonidae	*Tyto alba*	Barn Owl											1																			
Strigidae	*Ninox boobook*	Southern Boobook													1																	
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra			3																											
Meropidae	*Merops ornatus*	Rainbow Bee-eater		5				5																								

		Surveys	A								B																						
Family	Species	Common name	Site 7	Site 3	Site 6	Site 2	Site 1	Site 4	Site 5a	Site 5b	KU1	KU9	KU12	KU2	Opp	KU5	KU19	KU3	KU4	KU7	KU8	KU11	KU6	KU18	KU13	KU10	KU17	KU14	KU20	KU15	KU16	TR1
Falconidae	*Falco cenchroides*	Nankeen Kestrel																														1
Timaliidae	*Zosterops lateralis*	Silvereye									1			3		3		1		46	3		3		1							
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Black-Cockatoo									2									7			4									
	Eolophus roseicapilla	Galah		1			3	2																								
Psittaculidae	*Barnardius zonarius*	Australian Ringneck	9	3	4	5	2	2	4	3	6			2					3	7			1		3							
	Purpureicephalus spurius	Red-capped Parrot												2		1																
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet	8	14	12	170	15	60	18	11	3			1		44		11	94	34	2		3									
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairywren														5		3		2												
	Malurus splendens	Splendid Fairywren		1			3																									
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater		4	5		2	11	3	5																						
	Lichenostomus cratitius	Purple-gaped Honeyeater														1				8												
	Manorina flavigula	Yellow-throated Miner	1																													2
	Anthochaera lunulata	Western Wattlebird									6			7						1	4		4		3							
	Anthochaera carunculata	Red Wattlebird	6	8	5	11	5	8	7	5	4					2		4	7	13	2		4									
	Gavicalis virescens	Singing Honeyeater	1					1		2																						
	Gliciphila melanops	Tawny-crowned Honeyeater			1						1			9		37				2												
	Lichmera indistincta	Brown Honeyeater		2	2						5			5		8		2	3	23			1									
	Lichmera indistincta	Brown Honeyeater																														
	Phylidonyris novaehollandiae	New Holland Honeyeater	4	1	2						29			57		42		1	30	74	10		50		8							
	Nesoptilotis leucotis	White-eared Honeyeater									1					1				1												
	Nesoptilotis flavicollis	Yellow-throated Honeyeater		6		14		1																								
	Melithreptus lunatus	White-naped Honeyeater																	12	3					1							
	Melithreptus brevirostris	Brown-headed Honeyeater					1							2																		
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		5	3	1	1	1	1	1	1			3		3		4	2	3	1		2									
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren		1			3							1		7		5	2	3	4		1									
	Hylacola cauta	Shy Heathwren												4		2							5									
	Acanthiza apicalis	Inland Thornbill									2								2	2	2		1									
	Smicrornis brevirostris	Weebill	3	13	9		8	5	2	1	1		2	3		15		6	17	15	1		11									
	Gerygone fusca	Western Gerygone																	1													
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler			3	1	3							1									1									
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike																1	2													

		Surveys	A								B																					
Family	Species	Common name	Site 7	Site 3	Site 6	Site 2	Site 1	Site 4	Site 5a	Site 5b	KU1	KU9	KU12	KU2	Opp	KU5	KU19	KU3	KU4	KU7	KU8	KU11	KU6	KU18	KU13	KU10	KU17	KU14	KU20	KU15	KU16	TR1
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella					4																									
Psophodidae	*Psophodes nigrogularis*	Western Whipbird									3			2				1														
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird	1	2	1	2	2			1	1							2		1	2		3									
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush	2		4		1	3								3			1													
	Pachycephala pectoralis	Golden Whistler									2			1		3				1	2											
Artamidae	*Artamus cinereus*	Black-faced Woodswallow			3			2																								
	Artamus cyanopterus	Dusky Woodswallow														6			1	2												
	Cracticus torquatus	Grey Butcherbird														1							1									
	Gymnorhina tibicen	Australian Magpie	5	2	2	9	9	2	6	5										1												
	Strepera versicolor	Grey Currawong	4	3	3	4	6	2	1		2			3		2		3		7	1		8		2							
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail			1				2									2		1	1											
Monarchidae	*Myiagra inquieta*	Restless Flycatcher		1																	1											
Corvidae	*Corvus coronoides*	Australian Raven	5	3	2	9	4	1	2	5								1	1	1			4									3
Petroicidae	*Petroica boodang*	Scarlet Robin	1		4				1	1																						
	Eopsaltria griseogularis	Western Yellow Robin									1										1											
	Drymodes brunneopygia	Southern Scrub-Robin									2			3		7		1	5	3	3		3									
Hirundinidae	*Hirundo neoxena*	Welcome Swallow									1			6		2		10		4			12									
	Petrochelidon nigricans	Tree Martin			2									12		8							3									
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit																														7
Mammals																																
Emballonuridae	*Taphozous australis*	Coastal Sheath-tail Bat											1																			
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	X	X	X	X	X	X	X				1																			
	Chalinolobus morio	Chocolate Wattled Bat	X	X	X	X	X		X	X									1													
	Vespadelus regulus	Southern Forest Bat	X	X	X	X	X	X	X										1													
Dasyuridae	*Sminthopsis fuliginosus*	Grey-bellied Dunnart									1			3		3			1	3				1								
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum	2	1	3	14	27	9	1	3	16			6		12		8	42	22			9									
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo																1	1				1									
Tarsipedidae	*Tarsipes rostratus*	Honey Possum									19			39		17		35	8	12			25									
Muridae	*Mus musculus*	House Mouse									4			2		1	4	4		1			3	6			2		1			
	Rattus fuscipes	Bush Rat									1					24	16	3	2			4		20			8	28	26	19	13	

A Keith Lindbeck and Associates (2008) *Ravensthorpe Spodumene Project Spring 2008 Fauna Survey,* Unpublished report for Galaxy Resources Ltd, Perth.

B Biota Environmental Sciences (2004) *Fauna and Fauna Assemblages of Kundip and Trilogy Study Sites*. Unpublished report for Tectonic Resources NL, Perth.

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

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve

ATTACHMENT D
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.

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.

[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).

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 E.
Black-Cockatoo significant tree assessment results

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve

Tree #1

Tree #2

Tree #3

Tree #4

Tree #5

Tree #6

Tree #7

Tree #8

Tree #9

Tree #10

Tree #11

Tree #12

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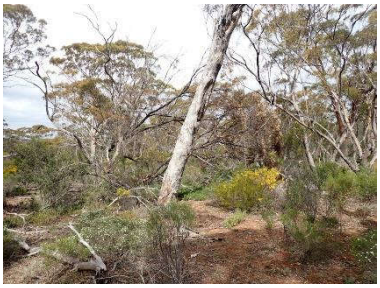
Tree #133

Tree #134

Tree #135

Tree #136



Tree #137

Tree #138

Tree #139

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Tree #165

Tree #166

Appendix F.
Significant tree data

Basic Vertebrate Fauna Survey and Risk Assessment
Cocanarup Timber Reserve

F.1 SIGNIFICANT TREE DATA

Tree #	Tree species	DBH	Tree type	Number of hollows	Hollow entrance size	Comments
1	Salmon Gum	46	Straight	1	250mm	
2	Salmon Gum	77	Forked above 3m	0		
3	Salmon Gum	36	Forked above 3m	0		
4	Salmon Gum	63	Forked above 3m	3	<150mm	
5	Salmon Gum	36	Forked above 3m	0		
6	Salmon Gum	48	Forked above 3m	0		
7	Salmon Gum	45	Forked above 3m	1		
8	Salmon Gum	32	Forked between 1.3 and 3m	0		
9	Salmon Gum	40	Forked below 1.3m	3	<150mm	
10	Salmon Gum	47	Forked above 3m	0		
11	Salmon Gum	48	Forked above 3m	0		
12	Salmon Gum	44	Forked below 1.3m multiple >300mm DBH	0		
13	Salmon Gum	36	Forked below 1.3m	0		
14	Salmon Gum	32	Forked above 3m	0		
15	Salmon Gum	38	Forked above 3m	0		
16	Salmon Gum	41	Forked above 3m	0		
17	Salmon Gum	73	Forked above 3m	1	200mm	Bees in the hollow
18	Salmon Gum	43	Straight	0		
19	Salmon Gum	45	Forked above 3m	0		
20	Salmon Gum	60	Forked above 3m	0		Partially dead
21	Salmon Gum	57	Forked above 3m	1	<150mm	
22	Salmon Gum	53	Forked above 3m	3	<150mm	Mostly dead
23	Salmon Gum	32	Forked above 3m	0		
24	Salmon Gum	95	Forked between 1.3 and 3m	2	<150mm	
25	Salmon Gum	53	Forked above 3m	1	<150mm	
26	Salmon Gum	50	Forked above 3m	0		
27	Salmon Gum	70	Forked between 1.3 and 3m	0		
28	Salmon Gum	34	Forked above 3m	0		
29	Salmon Gum	32	Forked below 1.3m	0		
30	Salmon Gum	40	Forked between 1.3 and 3m	0		

Tree #	Tree species	DBH	Tree type	Number of hollows	Hollow entrance size	Comments
31	Salmon Gum	104	Forked between 1.3 and 3m	2	<200mm	
32	Salmon Gum	39	Forked above 3m	0		
33	Salmon Gum	81	Forked above 3m	1	200mm	Galah nesting in hollow.
34	Dead	96	Forked above 3m	3	300mm	3 suitable hollows
35	Salmon Gum	50	Forked above 3m	1	<100mm	
36	Salmon Gum	85	Forked between 1.3 and 3m	3	<200mm	
37	Dead	55	Forked above 3m	2	200mm	
38	Salmon Gum	58	Forked above 3m	0		
39	Dead	65	Forked above 3m	1	200mm	
40	Dead	64	Forked above 3m	1	<150mm	
41	Salmon Gum	57	Forked above 3m	0		
42	Salmon Gum	35	Forked between 1.3 and 3m	0		Partially dead
43	Dead	87	Forked below 1.3m multiple >300mm DBH	2	<200mm	
44	Salmon Gum	73	Forked between 1.3 and 3m	0		
45	Salmon Gum	54	Forked above 3m	2	<200mm	
46	Salmon Gum	50	Forked above 3m	1	<200mm	
47	Salmon Gum	36	Forked above 3m	0		
48	Salmon Gum	43	Forked between 1.3 and 3m	1	<150mm	Partially dead
49	Dead	76	Forked between 1.3 and 3m	3	300mm	Potentially too low to the ground
50	Salmon Gum	48	Forked below 1.3m multiple >300mm DBH	1	<200mm	
51	Salmon Gum	70	Forked below 1.3m multiple >300mm DBH	3	200mm	2 Eastern Barn Owls using hollows
52	Salmon Gum	67	Forked below 1.3m	1	<150mm	
53	Salmon Gum	51	Forked above 3m	0		
54	Dead	50	Forked above 3m	2	<200mm	
55	Salmon Gum	50	Forked above 3m	1	<150mm	
56	Salmon Gum	37	Forked between 1.3 and 3m	0		
57	Salmon Gum	33	Forked between 1.3 and 3m	0		
58	Salmon Gum	42	Forked above 3m	0		
59	Dead	73	Forked above 3m	2	<200mm	
60	Dead	63	Forked above 3m	2	<200mm	

Tree #	Tree species	DBH	Tree type	Number of hollows	Hollow entrance size	Comments
61	Salmon Gum	56	Forked between 1.3 and 3m	0		
62	Salmon Gum	46	Forked above 3m	0		
63	Salmon Gum	44	Forked above 3m	0		
64	Dead	86	Forked above 3m	2	200mm	
65	Salmon Gum	43	Forked above 3m	2	<150mm	
66	Salmon Gum	70	Forked above 3m	4	<200mm	Being used by Australian Ringneck Parrot
67	Salmon Gum	50	Forked above 3m	1	<150mm	
68	Salmon Gum	55	Forked above 3m	0		3 suitable hollows but currently used by bees
69	Salmon Gum	42	Forked between 1.3 and 3m	0		
70	Salmon Gum	58	Forked between 1.3 and 3m	0		
71	Salmon Gum	35	Forked between 1.3 and 3m	0		
72	Salmon Gum	34	Forked below 1.3m	0		
73	Salmon Gum	47	Forked above 3m	0		
74	Salmon Gum	48	Forked below 1.3m	0		
75	Salmon Gum	45	Forked below 1.3m	0		
76	Salmon Gum	44	Forked below 1.3m	0		
77	Dead	61	Forked below 1.3m multiple >300mm DBH	3	300mm	3 suitable hollows but currently used by bees
78	Salmon Gum	35	Forked below 1.3m	0		
79	Salmon Gum	38	Forked below 1.3m	1		
80	Salmon Gum	36	Forked above 3m	0		
81	Salmon Gum	56	Forked below 1.3m	0		
82	Salmon Gum	47	Forked between 1.3 and 3m	0		
83	Salmon Gum	44	Forked between 1.3 and 3m	0		
84	Salmon Gum	34	Forked above 3m	0		
85	Salmon Gum	38	Forked between 1.3 and 3m	0		
86	Salmon Gum	60	Forked below 1.3m	0		
87	Salmon Gum	38	Forked above 3m	0		
88	Salmon Gum	38	Forked above 3m	0		
89	Salmon Gum	111	Forked between 1.3 and 3m	5	<200mm	
90	Salmon Gum	92	Forked between 1.3 and 3m	4	<200mm	
91	Salmon Gum	31	Forked above 3m	0		

Tree #	Tree species	DBH	Tree type	Number of hollows	Hollow entrance size	Comments
92	Salmon Gum	39	Forked below 1.3m multiple >300mm DBH	1	<100mm	
93	Salmon Gum	72	Forked above 3m	2	300mm	Potentially not very deep
94	Salmon Gum	80	Forked above 3m	1	150mm	
95	Salmon Gum	45	Forked above 3m	0		
96	Salmon Gum	38	Forked above 3m	0		
97	Salmon Gum	44	Forked above 3m	2	<100mm	
98	Salmon Gum	41	Forked below 1.3m multiple >300mm DBH	0		
99	Other	67	Forked below 1.3m	2	200mm	
100	Salmon Gum	87	Forked above 3m	2	150mm	
101	Salmon Gum	46	Forked above 3m	3	<200mm	Partially dead
102	Salmon Gum	66	Forked above 3m	2	<150mm	
103	Salmon Gum	46	Straight	1	<150mm	
104	Salmon Gum	54	Forked between 1.3 and 3m	0		
105	Salmon Gum	90	Forked between 1.3 and 3m	3	<200mm	Mostly dead
106	Salmon Gum	51	Forked above 3m	0		
107	Salmon Gum	36	Forked above 3m	0		
108	Salmon Gum	36	Forked above 3m	0		
109	Salmon Gum	37	Forked above 3m	0		
110	Salmon Gum	38	Forked between 1.3 and 3m	0		
111	Salmon Gum	35	Forked between 1.3 and 3m	0		
112	Dead	59	Straight	1	<150mm	
113	Salmon Gum	41	Forked above 3m	0		
114	Salmon Gum	39	Forked below 1.3m	0		
115	Salmon Gum	53	Forked between 1.3 and 3m	2	<150mm	Partially dead
116	Salmon Gum	64	Forked between 1.3 and 3m	1	200mm	
117	Dead	71	Forked above 3m	4	<200mm	
118	Salmon Gum	48	Forked above 3m	1	<100mm	
119	Salmon Gum	32	Forked between 1.3 and 3m	0		
120	Salmon Gum	39	Forked above 3m	0		
121	Dead	50	Straight	2	<200mm	
122	Salmon Gum	35	Forked above 3m	0		

Tree #	Tree species	DBH	Tree type	Number of hollows	Hollow entrance size	Comments
123	Salmon Gum	41	Forked above 3m	0		
124	Salmon Gum	43	Forked above 3m	0		
125	Salmon Gum	56	Forked between 1.3 and 3m	0		
126	Dead	44	Forked between 1.3 and 3m	1	250mm	
127	Salmon Gum	61	Forked below 1.3m	2	<200mm	
128	Dead	51	Forked above 3m	1	<150mm	
129	Salmon Gum	64	Forked below 1.3m multiple >300mm DBH	4	<200mm	
130	Salmon Gum	60	Forked above 3m	0		
131	Salmon Gum	30	Forked above 3m	0		
132	Salmon Gum	40	Forked above 3m	0		
133	Salmon Gum	57	Forked above 3m	3	300mm	Carnaby's Black Cockatoo currently nesting in hollow
134	Other	109	Forked above 3m	2	<200mm	Some signs of use possibly Galah
135	Salmon Gum	45	Forked above 3m	0		
136	Salmon Gum	81	Straight	2	300mm	Potential Black Cockatoo hollows but currently used by Eastern Barn Owls
137	Dead	63	Straight	0		
138	Salmon Gum	48	Forked above 3m	0		
139	Dead	56	Straight	0		
140	Salmon Gum	32	Forked above 3m	0		
141	Salmon Gum	46	Forked above 3m	0		
142	Salmon Gum	39	Forked above 3m	0		
143	Salmon Gum	40	Forked above 3m	1	<150mm	
144	Salmon Gum	33	Straight	0		
145	Salmon Gum	53	Forked above 3m	0		
146	Salmon Gum	74	Forked above 3m	2	<150mm	
147	Salmon Gum	87	Forked above 3m	2	<200mm	Used by bees
148	Salmon Gum	55	Forked above 3m	0		
149	Salmon Gum	57	Forked above 3m	0		
150	Salmon Gum	73	Forked above 3m	2	<100mm	
151	Salmon Gum	64	Forked above 3m	2	<200mm	
152	Salmon Gum	61	Forked above 3m	0		

Tree #	Tree species	DBH	Tree type	Number of hollows	Hollow entrance size	Comments
153	Salmon Gum	35	Forked above 3m	0		
154	Salmon Gum	43	Forked between 1.3 and 3m	0		
155	Salmon Gum	45	Forked above 3m	0		
156	Salmon Gum	35	Forked above 3m	0		
157	Salmon Gum	62	Forked above 3m	2		
158	Salmon Gum	79	Forked above 3m	0		
159	Salmon Gum	62	Forked above 3m	0		
160	Salmon Gum	63	Forked above 3m	0		
161	Salmon Gum	60	Forked above 3m	0		
162	Salmon Gum	63	Forked above 3m	1	<200mm	
163	Salmon Gum	60	Forked above 3m	0		
164	Dead	47	Forked above 3m	0		
165	Salmon Gum	68	Forked above 3m	1	<150mm	Used by bees
166	Salmon Gum	62	Forked above 3m	0		