Basic and Targeted Fauna Survey

Warner Glen Road, Warner Glen

(0 - 1.6; 7.78 -8.1, 9.42 - 19.34 SLK)

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SW environmental

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Common terms/acronyms

BC Act	WA *Biodiversity Conservation Act 2016*
DAWE	Federal Department of Agriculture, Water and the Environment
DBCA	WA Department of Biodiversity, Conservation and Attractions
DBH	Diameter at Breast Height in centimetres
DWER	WA Department of Water and Environmental Regulation
EP Act	WA *Environmental Protection Act 1986*
EPBC Act	Federal *Environment Protection and Biodiversity Conservation Act 1999*
FRTBC	Forest Red-tailed Black Cockatoo
Locality	A 5 km buffer around the Study area
Project	The proposed action
Study area	The Warner Glen Road reserve between 0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK
Suitable DBH tree	Tree of a suitable size to develop large hollows (>50cm DBH most trees in the southwest or >75cm for Karri).
WA	Western Australia

Executive summary

The Shire of Augusta Margaret River proposes to carry out road works to improve the safety between of Warner Glen Road (0 - 1.6, 7.78 - 8.1 and 9.42 - 19.34 SLK), Warner Glen. The 'project' will include road reconstruction and widening, including drainage improvements and construction or replacement of culverts. The works will tie into the existing bridges at Chapman Brook, Upper Chapman Brook and Blackwood River. Selective vegetation clearing will be required to achieve construction requirements. The exact locations of clearing are yet to be determined.

SW Environmental was commissioned to carry out a basic survey comprising of habitat assessment and likelihood of occurrence assessment of conservation significant fauna, along with a targeted black cockatoo survey[1]. The targeted black cockatoo survey was required to identify black cockatoo habitat values, including potential and actual breeding habitat, foraging habitat and roost sites.

Field work consisted of site reconnaissance visits on 22nd and 27th October 2021 by SW Environmental Principal, Shane Priddle.

The study area passes through a mix of NP and cleared farm land. In most locations the road reserve had an existing four metre wide maintenance zone. Six fauna habitat types were identified within the study area (30.81 ha):

- Jarrah Marri Forest with areas of Karri over Peppermint (Good quality) 10.82 ha
- Marri Open Forest (Moderate quality) 2.37 ha
- Jarrah Marri Open Forest (Good quality) 1.01 ha
- Jarrah Marri Forest over Peppermint Woodland (Good quality) 0.93 ha
- Riparian (Moderate quality) 0.29 ha
- Water 0.14 ha

Other areas of disturbed or no fauna habitat include

- Cleared or predominately cleared with paddock trees (Poor quality) 3.25 ha
- Planted (Poor quality) 0.30 ha
- Cleared road infrastructure (Poor quality) 11.72 ha

Twenty-three species of fauna were recorded from the 179 that may occur based on desktop assessment. Evidence of conservation significant black cockatoos (all three species) and Western Ringtail Possum was observed within the study area, from the 24 fauna of conservation significance that may occur locally.

[1] Black cockatoos collectively refers to

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii subsp. naso*) (Vulnerable)
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) (Endangered)
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered)

The habitat tree assessment was restricted to four metres from the edge of seal (total study area of 9.47 ha). It found

- Numerous large senescing trees occurred within the broader road reserve, many of which contained large hollows. These may be used by a range of hollow dependant fauna including many conservation significant species.
- A total of 140 suitable DBH trees were recorded within the study area (within four metres from the seal).
- Eighteen trees contained hollows, 14 with hollow apertures greater than 10 cm. Four trees were located within 2 m of the seal – the remaining 10 trees were approximately 2-4 m from the edge of seal.

Targeted black cockatoo surveys identified the following

- The study area falls within the breeding range of all three black cockatoo species.
- Of the 14 trees (three Jarrah and 11 Marri) with hollows >10 cm, five had hollows that were considered unsuitable for black cockatoo breeding (due to other factors such as branch thickness, orientation, access, and chamber size etc. Eight trees had hollows potentially large enough and with suitable characteristics for breeding but no signs of use when viewed from the ground. One tree (ID 44) had possible wear or chews when viewed from the ground, which indicated it is possibly being used by black cockatoos or other fauna. Further work (such as camera pole or drone) would need to be carried out to confirm black cockatoo nesting status.
- There was no evidence of roosts observed within the study area.
- Feed residue from all three cockatoo species. Fauna habitat types 1-4 may provide quality foraging habitat (15.12 ha over the full road reserve). Paddock trees and some planted vegetation may also contribute to local feed resources.
- Habitat within the study area (circa 15 ha within the road reserve) only contributes to a very small proportion of available habitat locally. There are 17 State reserves within 12 km of the study area, with significant tracts of contiguous and connected State Forest and NP located west, south and east of the study area. Approximately 47,585 ha of native vegetation is mapped (or 54%) remaining within 12 km of the study area (87,775 ha) (Government of Western Australia 2020).

Other fauna that may use the study area as part of a larger patch include Peregrine Falcon, Masked Owl (southern sub sp), Chuditch, Southern Brush-tailed Phascogale, Western Brush Wallaby, Water Rat, Southern Brown Bandicoot and Western Ringtail Possum. Individual hollow dependant fauna are most likely to be impacted through the clearing of hollows.

Mud minnow, Pouched Lamprey, Salamanderfish and Carters Freshwater Mussel may occur upstream or downstream in the larger drainage lines (Blackwood River, Upper Chapman Brook and Chapman Brook). The project will not impact on bridge infrastructure at these locations.

The following recommendations are made:

- Clearing should be minimised in areas of native vegetation.
- Road alignments and widening should be chosen to minimise impacts to hollows trees, then DBH trees, in that order. Alternative design measures should be considered where

hollow trees are likely to be impacted (e.g. curbing, relocation of drains, etc) to enable the trees to be retained.

- Clearing should be conducted outside of spring to minimise impacts to breeding fauna. It is noted that not all fauna breed nest in spring (e.g. FRTBC).
- Culvert works should be carried out in the 'dry' months to minimise impacts offsite downstream through turbidity and sedimentation. Appropriate stormwater, erosion and sediment control should be implemented for any works associated with steep slopes or drainage lines.
- Further work (such as camera pole or drone) would need to be carried out to confirm black cockatoo nesting status or hollow status in Tree ID 18, 23, 30, 35, 44, 94, 97, 109, 125, if these trees are to be cleared.
- A licensed fauna spotter should be on site during the clearing of hollow trees to manage impacts on hollow dependant fauna.
- The final impact footprints should be checked against the significant impact criteria (DEWHA 2013; SEWPAC 2012) for black cockatoos and other matters of NES to determine the need to refer the project to DAWE.

1 Introduction

1.1 Background

The Shire of Augusta Margaret River (the Shire) proposes to carry out road works to improve the safety between of Warner Glen Road (0 - 1.6, 7.78 - 8.1 and 9.42 - 19.34 SLK), Warner Glen, within the Shire. The study area and locality are shown in Figures 1 and 2 (Appendix A).

Specifically, the 'project' will include road reconstruction and widening, including drainage improvements and construction or replacement of culverts. The works will tie into the existing bridges at Chapman Brook, Upper Chapman Brook and Blackwood River. Selective vegetation clearing will be required to achieve construction requirements. The exact locations of clearing are yet to be determined but will likely include a width of two metres from the existing seal at most locations, or slightly more at selected points to provide room for a roadside drain and culverts.

The Shire will be submitting a Clearing Permit application to the Department of Water and Environmental Regulation (DWER). This Fauna Survey report identifies baseline fauna and habitat values along the road verge and will be used to guide the project design to and inform the Clearing Permit application.

1.2 Scope of work

SW Environmental was commissioned to carry out a basic survey comprising of habitat assessment and likelihood of occurrence of conservation significant fauna, along with a targeted black cockatoo survey[2]. The targeted black cockatoo survey was required to identify black cockatoo habitat values, including potential and actual breeding habitat, foraging habitat and roost sites. The fauna survey is restricted to terrestrial vertebrate fauna. Threatened aquatic fauna and invertebrates were considered through desktop assessment only.

The survey is in accordance with EPA Technical Guidance and other relevant State and Commonwealth guidelines. The survey report also identifies whether any Matters of National Environmental Significance afforded protection under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are present or likely to occur within the area.

The survey includes

- Desktop study,
- Field survey - validation of the desktop study and habitat assessment,

[2] Black cockatoos collectively refers to

- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii subsp. naso*) (Vulnerable)
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) (Endangered)
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (Endangered)

- Consultation, reporting, mapping, and recommendations.

1.3 Regulatory context

1.3.1 Key legislation

Key environmental legislation that may be relevant to the fauna survey is outlined in Table 1-1. These are described in more detail in Appendix B, along with conservation code descriptions.

Table 1-1 Environmental legislation that may be relevant to the Project

Legislation	Responsible Government Department	Aspect
Federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Federal Department of Agriculture, Water, and the Environment (DAWE)	Matters of National Environmental Significance including threatened fauna and environmental offsets.
Biodiversity Conservation Act 2016 (BC Act)	WA Department of Biodiversity, Conservation and Attractions (DBCA)	Threatened species habitats, threatening processes, environmental pests and weeds.
Biosecurity and Agricultural Management Act 2007 (BAM Act)	WA Department of Primary Industries and Regional Development	Weeds, feral animals and other pests.
Environmental Protection Act 1986 (EP Act)	Environmental Protection Authority or DWER	Environmental impact assessment and management and offsets.

Fauna in WA may be afforded protection under the WA BC Act and or federal EPBC Act. Species listed as threatened or migratory under the above legislation are referred to collectively in this document as being 'conservation significant' or 'target' species. These terms include species and communities listed under the DBCA Priority lists.

1.3.2 Guidelines

The survey methodologies were developed with consideration of:

- Environmental Protection Authority (2020) Technical Guidance – Terrestrial Guidance for Fauna Surveys for Environmental Impact Assessment. Perth, Western Australia
- Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3, EPA (2002).
- Commonwealth Matters of National Environmental Significance – *Significant impact guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999*, Department of the Environment, Water, Heritage and the Arts (DEWHA)', (2009).

2 Methods

2.1 Desktop study

A desktop study of fauna within and near the study area was undertaken. A key aim of the study was to determine the likelihood of any species of conservation significance (target species) occurring within the study area and the importance of the site to them. Common (non-target) species are also considered more generally.

Database searches using Western Australian Museum Nature Map and the Protected Matters Search Tool (Appendix C) were carried out for within five kilometres of the study area. This was supplemented by Atlas of Living Australia (ALA, 2021), Birdata (BirdLife Australia, 2021), Index of Biodiversity Surveys for Assessment (IBSA, 2021) species lists within 10 km. Aerial photography (Landgate, 2021), data from the Government of WA's Shared Land Information Platform (SLIP, 2021) were also queried along with management plans, recovery plans, books, scientific journals and other publications, previous survey reports and expert consultation carried out as required.

Soil mapping from Tille and Lantzke (1990) was used to identify soil types and vegetation associations and complexes were reviewed to identify potential vegetation and therefore habitat types occurring within and near the study area (SLIP 2021).

A brief review of the ecology, habitat and range of target species were used in an evaluation matrix to determine the likelihood of occurrence of conservation significant fauna (Appendix D). Fauna of conservation significance that may occur locally are listed in Sections 3.3.2 and 4.3.

2.2 Field surveys

2.2.1 Study area, timing, and personnel

The study area included 11.84 km of Warner Glen Road reserve between

- 0 - 1.6 SLK (1.6 km),
- 7.78 -8.1 SLK (0.32 km), and
- 9.42 - 19.34 SLK (9.92 km).

Field work consisted of site reconnaissance visits on 22nd and 27th October 2021 by SW Environmental Principal, Shane Priddle. The field visit was undertaken to validate the desktop study and ground truth fauna habitat. Fauna habitat type was documented based on structural vegetation and soil mapping where significant changes occurred. Evidence of fauna (e.g., scat searches, diggings or feed residue), and fauna sightings were also noted. Fauna habitat quality was based on tables 2-1 to 2-3.

Table 2-1 Vegetation structure (Keighery 1994).

Life Form/Height Class	Canopy cover			
	100% to 70%	70%to 30%	30%to 10%	10% to 2%
Trees over 30 m	Tall Closed Forest	Tall Open Forest	Tall Woodland Woodland	Tall Open Woodland
Trees 10-30 m	Closed Forest	Open Forest		Open Woodland
Trees under 10 m	Low erased Forest	Low Open Forest	Low Woodland·	Low Open Woodland ..
Mallee over 8 m (Tree Mallee)	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree. Mallee
Mallee under 8 m (Shrub Mallee)	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub
Shrubs over 2 m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland Shrubland	Tall Open Shrubland
Shrubs 1 2 m	Closed Heath	Open Heath	Low Shrubland	Open Shrubland
Shrubs under 1 m	Closed Low Heath	Open Low Heath		Very Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland·	Open Sedgeland.	Very Open Sedgeland

Table 2-2 Vegetation condition scale (EPA 2016).

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Table 2-3 Fauna habitat quality categories and descriptions (SW Environmental, undated).

Quality	Description
Good	• Native vegetation with intact and diverse habitat structure. Different vegetation age classes present at most stratum levels (ground, understorey, midstorey, canopy). • Forest/woodland: abundant hollow-bearing trees, including those with or likely to develop large hollows. Mature trees offer more foraging resources (nectar/seed). • Presence of shelter/refuges at ground level (dense understorey plants, tussock, rocky outcrop, hollow logs). • High habitat complexity (ecotones between vegetation types or habitat mosaic). This increases the range of foraging and shelter opportunities within a habitat. • Presence of key foraging and microhabitat components for target species. • Little to no obvious weed invasion or evidence of grazing. • May be large patch and/or connected to other areas of native vegetation.
Moderate	• Native flora species dominant with moderate habitat structure complexity appropriate to vegetation type. Ground litter intact or slightly disturbed. More than one age class present. • Forest/woodland: low to moderate abundance of hollow-bearing trees or trees likely to develop hollows. • Some shelter and refuge present for ground dwelling fauna. • Some habitat complexity (ecotones between vegetation types or areas forming a habitat mosaic). • Marginal presence of key microhabitat components for target species. • May be small or large in scale, and isolated or well connected.
Poor	• Habitat highly disturbed and simplified with low structural complexity. Ground litter layer absent or highly modified. Complexity reduced by only one age class present. • Little or no shelter and refuge for ground dwelling fauna. • Forest/woodland: not likely to support hollow-bearing trees. • Lack of key foraging and microhabitat components for target species. • May have evidence of weed invasion or grazing. • May be narrow or small area and substantially influenced by edge effects, isolated from other areas of native vegetation.

2.3 Black cockatoo habitat assessment

The field survey methodology was based on the Commonwealth referral guidelines for black cockatoos (Commonwealth of Australia 2017, SEWPaC 2012) and the black cockatoo species profiles provided in the desktop study (Section 3.4). The species profiles are based on literature review and consultation with Tony Kirby, a recognised black cockatoo expert. Black cockatoo habitat surveys included:

- **Foraging habitat assessment**: The quality of potential black cockatoo foraging habitat was noted based on structural vegetation mapping, with presence or absence of feed residue.
- **Roosting habitat survey**: Direct and indirect evidence of black cockatoos roosting within trees on site was noted if observed.

- **Suitable DBH tree and hollow survey:** This was restricted to four metres from the edge of seal, with a total study area of 9.47 ha. The area most likely to be impacted by the widening will be up to two metres from the edge of seal, however an additional two metres (four metres in total) was surveyed to ensure any potential habitat trees were identified should they be impacted.

  A ground based assessment of each tree was made using binoculars. It included GPS mapping (~2 metre accuracy with points adjusted against an aerial photo), notes made on tree species, size class and the number, height and size of hollows, evidence of use and breeding suitability, and approximate distance from edge of seal (up to two metres or between two to four metres).

  The hollows were assessed based on the likelihood of black cockatoos using the hollows for breeding. Criteria included:

  - *Tree with suitable DBH without hollows* – describes trees with a 50 cm DBH (or 75 cm for Karri) that do not have hollows.
  - *Tree with suitable DBH with unsuitable hollow* – describes trees with a 500 mm DBH (or 75 cm for Karri) that have hollows that are not suitable due to the size of its entry, internal dimensions, height off ground or angle.
  - *Tree with potentially suitable size hollow with no signs of use (confirmed).*
  - *Tree with potentially suitable size hollow with no signs of use (not confirmed).*
  - *Tree with suitable size hollow with no signs of use (confirmed).*
  - *Tree with potentially suitable size hollow with signs of use (not confirmed).*
  - *Tree with suitable size hollow with signs of use (confirmed).*
  - *Known nesting tree.*

  Suitability of the hollow for black cockatoo breeding also considered orientation, access, chamber size, and use by other animals. Confirmed / not confirmed indicates whether closer inspection has been carried out by drone or camera.

Twelve kilometres is referenced broadly within this document as a nominal distance in considering wider local vegetation and habitat values due to that distance being the maximum that black cockatoos will travel from their nesting site to forage (Commonwealth of Australia 2017).

2.4 Survey method considerations

Publications

Publications consulted for general distribution of fauna included, but was not limited to:

- A Complete Guide to Reptiles of Australia (Wilson and Swan, 2017)
- A Field Guide to the Mammals of Australia (Menkhorst and Knight, 2013)
- Field guide to frogs of Western Australia (Doughty and Tyler, 2009)
- Frogs of Western Australia (Thomson-Dans and Wardell-Johnson, 2002)
- Handbook Western Australian Birds Vol I (Johnstone and Storr, 1998)
- Michael Morcombe's Birds of Australia eGuide, (Michael Morcombe, 2011)
- Reptiles and Frogs in the Bush: Southwestern Australia (Bush et al., 2007)

- Scats, Tracks and Other Traces: A field guide to Australian mammals (Triggs, 2008)
- The Field Guide to the Birds of Australia (Pizzey and Knight, 2012)
- Waterbirds of South-west Wetlands (Thomson-Dans and Halse, 2001)
- Numerous online publications, journal articles and other general species references (see References section).

Taxonomy and nomenclature

The taxonomy and nomenclature used in this report follows several sources, depending on the faunal group. It primarily follows Naturemap (2021) but also the following:

- Amphibians: Bush et al. (2007)
- Aves: Pizzey and Knight (2007)
- Mammals: Menkhorst and Knight (2013)
- Reptiles: Wilson and Swan (2017)

Animal ethics

The survey conformed to Section 4 of the *Australian code of practice for the care and use of animals for scientific purposes* (National Health and Medical Research Council 2004). No animals were captured or collected during the survey.

2.5 Limitations

In accordance with relevant *Technical Guidance* (EPA 2020) survey limitations are shown below.

Table 2-4 Assessment of survey limitations

Aspect	Constraint	Comment
Competency / experience of the survey team	No	Suitably qualified individuals carried out the work - Shane Priddle (Ba Science; CEnvP No. 310) with over 20 years' experience conducting fauna surveys throughout NSW and WA.
Scope, e.g. where faunal groups were excluded from the survey	Negligible	The scope is adequate to provide information required to support a clearing assessment. Fish and invertebrates were not sampled in the field but were considered in the desktop assessment. Experts and DBCA were also consulted.
Adequacy of the survey intensity and proportion of survey achieved	No	Suitable survey effort has been adopted to identify the fauna constraints associated with the study area. A precautionary approach has also been adopted.
The proportion of the task achieved and further work	No	The surveys were completed adequately, to a sufficient level with respect to the scope.
Timing/weather/season	No	The surveys were completed in spring 2021. The survey timing and weather conditions were suitable to detect most target species. Breeding black cockatoos would also have been present, however

Aspect	Constraint	Comment
		older hollow chews and feed residue would still have been present and observable.
Disturbances that may have affected results of survey	No	There were no disturbances that affected the survey.
Intensity	No	Based on the results the survey is considered adequate to meet the project scope.
Completeness	No	The entire study area was surveyed, with detailed assessment within four metres of the seal.
Resources	No	The surveys were completed adequately.
Access problems;	No	Site was on public land and accessible.
Identification of hollows	Low	Ground-based counts of hollows are subjective, it is not possible to be certain that the feature is a hollow as seen from the ground. Limitations include the likelihood that some hollows may be missed, may not be observable or may be obscured, particularly hollows in branches and vertical hollows. Known limitations inherent in the ground survey of hollows include bias between different surveyors / survey times due to differing familiarity with tree types, levels of training / expertise, survey conditions such as weather and time of day, and survey technique (Gorrod & Keith 2008, Rayner et al. 2011). Poor visibility (such as overcast weather) is known to affect results also (Rayner et al. 2011). As well as providing inaccurate counts of hollow abundance, ground-based surveys provide incomplete or inaccurate information on hollow dimensions and use of hollows by fauna (Koch 2008). Generally, ground-based surveys lead to overestimation of hollows (Rayner et al. 2011, Author pers obs). The suitability of hollow may change over time. There is some risk, though low, that black cockatoos may be breeding in a hollow where evidence of use was not visible or hollow characteristics were atypical. It is also noted that not all active cockatoo hollows show signs of heavy chewing, and active or past breeding hollows therefore may be missed.

3 Desktop study

3.1 Local and regional context

3.1.1 Land use

Warner Glen Road is a circa 19 km local road servicing local farming properties and linking Bussell Highway in the west to Brockman Highway in the south. The road passes through a combination of landuses from largely cleared farmland, with ribbons of remnant native vegetation retained within the adjacent verge, and through extended sections of the Blackwood River and Forest Grove National Parks (NP). The private property boundaries are generally fenced, and the National Park areas are unfenced.

Most of the road verge has been maintained to a four metre wide maintenance zone (Photo 1). Many of the large senescing trees occur at least two or more metres beyond the road seal. There are still however places there are trees that have grown closer to the existing road seal.

Photo 1 Typical section of Warner Glen Road showing circa 4m wide existing maintenance zone.

3.1.2 Interim Biogeographic Regionalisation of Australia (IBRA) values

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies Australia's landscapes into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. IBRA also provides a planning framework for the systematic development of a comprehensive, adequate and representative National Reserve System, endorsed by all levels of government as a key tool for identifying land for conservation under Commonwealth's Australia's Strategy for the National Reserve System 2009-2030 (DE, 2017).

The Project occurs within the Southern Jarrah Forest (JAF02) sub-regions and Warren (WAR01) regions (no sub-regions).

The Jarrah Forest IBRA (JAF02) sub-region is characterised by duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri Forest on laterite gravels and, in the eastern part, by Wandoo - Marri woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands (Hearn et al 2002).

The Warren (WAR01) is described as dissected undulating country of the Leeuwin Complex, Southern Perth Basin (Blackwood Plateau), South-West intrusions of the Yilgarn Craton and western parts of the Albany Orogen with loamy soils supporting Karri Forest, laterites supporting Jarrah-Marri Forest, leached sandy soils in depressions and plains supporting low Jarrah woodlands and paperbark/sedge swamps, and Holocene marine dunes with Agonis flexuosa and Banksia woodlands and heaths.

3.1.3 DBCA managed lands

There are 17 State reserves within 12 km of the study area, with significant tracts of contiguous and connected State Forest and National Park located west, south and east of the project.

The study area is located adjacent to the Blackwood River NP from 9.43 to 11.65 SLK (RHS) and 16.45 to 18.24 SLK (LHS) and 16.45 to 17.30 SLK (RHS) and borders the Forest Grove NP between 7.96 to 8.15 SLK (LHS and RHS) and 9.43 to 11.70 SLK (LHS). The maintenance zone adjacent to the NP sections has been well maintained with few if any large trees located close to the road in these sections.

3.1.4 Habitat connectivity, linkage, or corridor values

In a local context there is approximately 47,585 ha of native vegetation mapped (or 54%) remaining within 12 km of the study area (87,775 ha) (Government of Western Australia 2020).

Linkages (SWREL) project identifies regional scale ecological linkages and aims to respond to the issues of fragmentation and climate change through land use planning policy and procedures. It also seeks to retain native vegetation and fauna habitat and reduce the loss of biodiversity and ecological function in the South West. The SWREL axis lines can be summarised as a series of vegetation patches which due to their proximity, act as habitat stepping stones thereby facilitating ecological processes and movement of organisms within and across the landscape (i.e. at the landscape scale) (Molloy et al 2009).

The project crosses areas of mapped and unmapped SWREL axis lines and buffers (Molloy et al 2009)

- *1a: with and edge touching or <100m from a linkage*
- *1b: with an edge touching or <100m from a natural area selected in 1a*
- *2b: with an edge touching or <100m from a natural area selected in 2a*

From a regional linkage perspective, the highest values occur where the project abuts the Blackwood River and Forest Grove NP. These areas have existing well managed maintenance zones with widths of approximately four metres.

3.2 Environmental values of the study area

3.2.1 Climate, landform and soils

The southwest of WA has a moderate Mediterranean climate with mild wet winters and hot dry summers (Hearn et al 2002). The following summary is based on data from the nearby Margaret River data station (Weatherzone 2021). The temperature ranges from an average maximum of 28°C in the hottest month of February to an average minimum of 8°C in August with an average annual rainfall of 1100 mm, with most of the rain falling between June and August (Weatherzone, 2021).

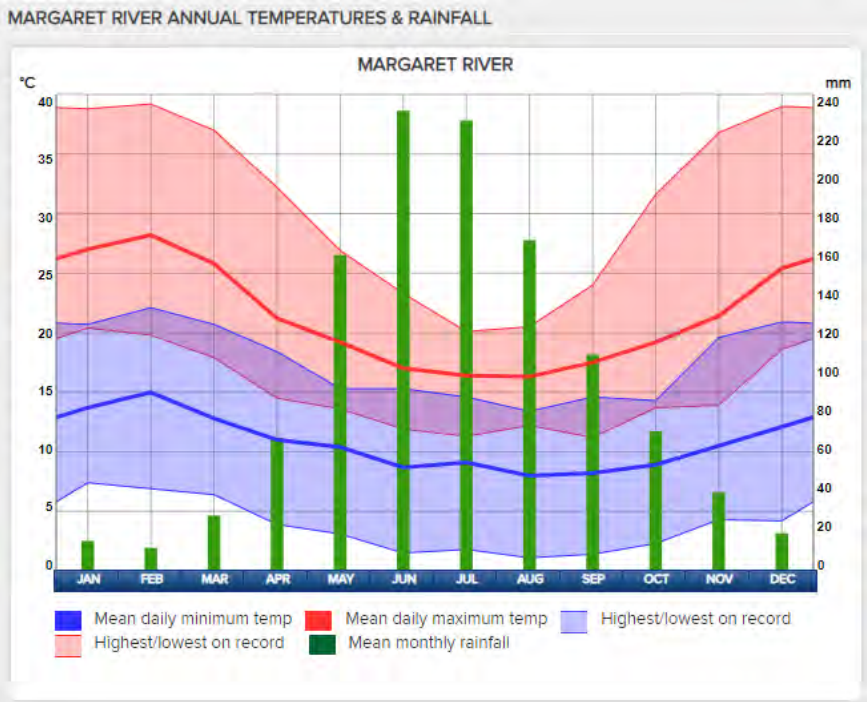

Figure 3 Annual temperatures and rainfall near the study area (Weatherzone 2021)

The study area occurs over low rolling topography and passes through numerous soil units, as described by Department of Agriculture and Food (Tille and Lantzke 1990):

- 214NpNL1 Nillup flats Phase Flats mainly with pale grey mottled (Mungite) soils.
- 214ThTRf Treeton fertile flats Phase Well drained valley flats and floodplains with deep alluvial soils, often red brown loams (i.e., Marybrook soils).
- 214ThTRh Treeton hillslopes Phase Slopes with gradients generally ranging from 2-15% and gravelly duplex (Forest Grove) and pale grey mottled (Munglte) soils.
- 214ThTRi3 Treeton ironstone slopes Phase Low slopes (gradients ranging from 2-10%) with shallow gravelly sands over laterite.
- 214ThTRv Treeton valley Phase Narrow V-shaped drainage depressions.
- 215SrBL1 Blackwood River flats Phase Flats with a variety of deep (mainly sandy) soils.
- 215SrBLd Blackwood River deep sands Phase Flats and low dunes with deep bleached sands.

- 215SrBLw Blackwood River wet flats Phase Flats and slight depressions which are winter wet. Mixed alluvial and sandy soils.
- 215SrW_RIVER Scott River Phase River
- 216CoCOi Cowaramup ironstone rises Phase Flats and gentle slopes (0-5% gradient) with some laterite outcrop and shallow gravelly sands over laterite.
- 216CoCOu Cowaramup, undifferentiated upland Phase Flats and gentles slopes (0-5% gradient) with gravelly duplex (Forest Grove) and pale grey mottled (Mungite) soils.
- 216WvWLh Wilyabrup, undifferentiated hillslope Phase Slopes with gradients generally 5-15%, but ranging from 2-30%, and gravelly soils (i.e. Forest Grove and Keenan Soils).

3.2.2 Wetlands and watercourses

The road crosses the Chapman Brook and Upper Chapman Brook (palusvale wetlands), Blackwood River, and several unnamed tributaries of the Blackwood River. The Upper Chapman Brook is in a degraded condition (mapped as Resource Enhancement) and the Chapman Brook is in better condition (Conservation Category) (Government of Western Australia, 2021). Culvert extensions will be required at the minor crossings and works will tie into the existing bridges where they occur (no impacts proposed).

The study area is located adjacent to and crosses the Spearwood Creek (DRAFT Proposed Ramsar Addition) a proposed RAMSAR site (List of Wetlands of International Importance) (Government of Western Australia, 2021). This proposed site is associated with White-bellied frog (*Geocrinia alba*) and Yellow-bellied frog (*Geocrinia vitellina*) habitat (Figure 3, Appendix A).

Photo 2 Chapman Brook (SLK 15.45)

Photo 3 Upper Chapman Brook (SLK 11.7)

Photo 4 Blackwood River (SLK 8.05)

3.2.3 Vegetation

Vegetation mapping over with the study area is described below.

Vegetation Associations

The site is predominately mapped as *Chapman 3 - Mainly jarrah and marri Eucalyptus marginata, Corymbia calophylla* Vegetation Association mapped by Beard (1981). It also passes through as small area of *Boranup 1 - Mainly karri Eucalyptus diversicolor or Tuart E. gomphocephala*, at the far western section of the site. Only 7.66 ha of vegetation within the 30.27 ha study area is mapped as remnant native vegetation (SLIP 2021).

Both Vegetation Associations 1 and 3 contain tree species that may develop large hollows. Hollow bearing trees are critical elements for many fauna species, including many arboreal mammals (such as phascogales and possums), bats and bird species (such as owls and black cockatoos). Animals can be selective in their use of tree hollows, preferentially using hollows of a particular size, shape and orientation. Many hollow dependant fauna are considered threatened, which is often at least partially attributed to a lack of suitable nesting sites (Koch 2008). Key structural species (Jarrah and Marri) of Chapman 3 Association are recognised as quality foraging habitat for black cockatoos.

3.3 Fauna records

3.3.1 Fauna recorded locally

The south west has generally been well surveyed. There were no results for a 10 km distance of the site however within the Index of Biodiversity Surveys for Assessment (IBSA, 2021). Desktop searches (Naturemap, 2021 and ALA, 2021) within a five kilometre study area, yielded 179 vertebrate terrestrial fauna species (Appendix C.1):

- 17 mammals,
- 140 birds,
- 12 reptiles, and
- 10 amphibians.

At least three of the listed fauna are introduced or naturalised species. Invertebrates, marine or aquatic dependant species (fish) are not included. Some near coastal or wetland taxa may be included in the list even though they may not occur within the study area.

This list is not exhaustive, nor would all species occur within the study area. Additional species are likely to be present locally including ferals such as *Vulpes vulpes* (Fox), *Felis catus* (Cat), *Mus musculus* (House Mouse), *Rattus rattus* (Black Rat) and possibly *Sus scrofa* (Pig). The reptile and bird results also appear to be slightly low.

3.3.2 Fauna of conservation significance

Based on the evaluation provided in Appendix D, there are 17 terrestrial vertebrate fauna of conservation significance that may occur locally (not necessarily within the study area). Additionally, five fish and three invertebrates of conservation significance may also potentially occur.

Important Bird Areas (IBAs) are areas identified by Birdlife International. IBAs are considered conservation priorities, sites able to be conserved in their entirety and are usually part of a protected-area network or recognised as having global bird conservation importance (Birdlife International, 2021). There are no IBAs nearby, the closest over 27 km away (Jalbarragup IBA).

The study area occurs within the breeding range of all three black cockatoo species (SEWPaC 2012). Detailed species profiles are provided below.

3.4 Black cockatoo species profiles

The black cockatoo species profiles and breeding requirements are provided to inform the assessment and provide context around the assessment results .

Baudin's cockatoo (*Calyptorhynchus baudinii*)
EN (EPBC Act), EN (BC Act)

Baudin's cockatoo is a large, iconic forest cockatoo endemic to the south west corner of WA. The species is likely to breed locally (SEWPaC 2012). It has suffered a substantial decline in number in the past 50 years. Direct causes of this decline include large numbers shot by orchardists, fragmentation of habitat and the impact of hollow competitors (Johnstone and Kirkby 2008). Depending on their region of origin, Baudin's cockatoo is a resident, a post nuptial nomad or migrant with the bulk of the population vacating the coldest parts of their range (i.e. the Karri forest block) in the autumn and migrating northwards during the non-breeding season. Small numbers also appear resident in a few places including Leeuwin – Naturaliste Ridge and Manjimup (Johnstone and Kirkby 2008). Flock sizes vary from small family groups to large aggregations at roosting sites. Breeding mainly takes place in forested areas from August to November (egg laying dates) (Tony Kirkby pers comm).

In the non-breeding season, Baudin's cockatoo is mainly an inhabitant of the Jarrah Marri Forest but is also frequently seen in farmland and orchards. It feeds on a variety of foods including nectar and seeds from hakeas and banksia spp. Also apples, persimmons, and macadamias. Overall, its main food is Marri from which it takes seeds, grubs, and nectar. Its long bill is adapted to removing seeds from Marri fruit capsules.

Roost sites are usually in smooth barked eucalypts (occasionally rough barked eucalypts, i.e. Marri, Jarrah and Blackbutt) including Wandoo, Flooded Gum, Bullich and smooth barked exotic eucalypts including plantations (Johnstone and Kirkby 2008).

Carnaby's cockatoo (*Calyptorhynchus latirostris*)
EN (EPBC Act), EN (BC Act)

The species has been recorded breeding locally (SEWPaC 2012) (SLIP 2021). It is a postnuptial nomad, tending to move west after breeding. Carnaby's cockatoo mainly occurs in or near eucalypt woodlands, especially those dominated by Wandoo or Salmon Gum, and sometimes reported in forests of Marri, Jarrah, Karri and Tuart.

Nesting hollows may be located anywhere over two metres from ground, mainly in the Wheatbelt (Cale 2003, SPRAT 2019, WA Museum 2010).

It is known to forage in native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as Banksia spp. Hakea spp. And Grevillea spp. It forages in pine plantations, eucalypt woodland and forest that contains foraging species, individual trees and small stands of these species (SEWPAC 2012).

This species is currently expanding its breeding range westward and south into the Jarrah Marri Forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain. This may be due to climate change. Breeding occurs mainly from early July to mid-December. Breeding success is largely dependent on suitable feeding habitat adjacent to the nest site to provide the necessary food for the survival of the chick, for example adjacent pine forest or remnant vegetation (Johnstone and Kirkby, Undated). Carnaby's cockatoo is also known to breed in Karri Forest at Porongurup, Walpole, Albany, Denmark and Mount Manypeaks.

Carnaby's cockatoos are known to roost in Jarrah, Marri, Blackbutt, Bullich, exotic eucalypt species and pines.

Forest Red-tailed Black Cockatoo (FRTBC) (*Calyptorhynchus banksii naso*)
VU (EPBC Act), VU (BC Act)

The FRTBC is a large, iconic forest cockatoo, endemic to the south-west corner of Western Australia. The species may breed locally (SEWPaC 2012).

Formerly common, but now rare to uncommon and patchily distributed, it has disappeared from about 30% of its former range. It has suffered a marked decline in numbers over the past 60 years. The main reasons for this decline include the destruction and fragmentation of habitat (especially Jarrah Marri Forest), the apparent decline in Marri along the eastern side of the Darling Scarp, logging, the impact of hollow competitors, fire and possibly climate change (Johnstone, Kirkby and Sarti 2013a, b). FRTBC occurs throughout the Jarrah Marri Karri forested areas but in recent years has been foraging out on to the Swan Coastal Plain feeding on the seeds of Cape Lilac. Group sizes vary from small family groups and pairs to larger gatherings at roost sites.

FRTBC nest in hollows Jarrah, Marri, Blackbutt, Bullich and Wandoo. Hollows have been recorded from 6.5 – 33 m above ground (Johnstone Kirkby and Sarti 2015). FRTBC have been recorded breeding in all months but with peaks in Spring and Autumn. There are also years when very little if any breeding takes place i.e. 2008 and 2009 (Johnstone and Kirkby unpublished data).

FRTBC feed mainly on the seeds of Jarrah and Marri but also Blackbutt, Albany Blackbutt, Sheoak, Snottygobble and introduced native and non-native species such as Lemon-scented Gum, Spotted Gum, Ilyarrie and Cape Lilac (SPRAT 2019).

FRTBC are known to roost in Jarrah, Marri, Blackbutt, Bullich and introduced eucalypt species.

3.5 Black cockatoo breeding requirements

All three black cockatoos rely on large hollows for breeding, typically >20 cm in diameter. Hollows take many years to form. The onset of hollow-formation is dependent on damage to the tree, from fire, animals (vertebrates or invertebrates), or dropping branches. Young and healthy trees can quickly heal after damage and subsequently trees less than 100 years old are unlikely to contain hollows.

SW Environmental and Kirkby (2019) note that for nesting, black cockatoos show a preference for:

- large senescing trees,
- hollows not angled more than 45 degrees,

- entrances of at least 12 cm but usually much larger (20-30 cm),
- deep or well sheltered hollows in main trunk or large branches which are able to provide a floor space of at least 30cm diameter or more.

All three species of black cockatoo are of similar size and utilise similar types of tree hollows when breeding. The actual species of tree is probably unimportant to each individual species, for example Carnaby's cockatoo use Marri, when in the Marri Forest and Wandoo when in the Wheatbelt. All three species are known to use the same individual hollows when not occupied in the breeding season by another black cockatoo species (Kirkby pers comm, 2019). Hollows suitable for use by black cockatoos are usually in trees at least 150 years old (Koch 2009).

Marri and Jarrah are considered by Commonwealth of Australia (2017) to be large enough to develop hollows once they are >50 cm DBH. Wheatbelt species such as Wandoo and Salmon Gum may develop hollows at 30 cm DBH.

While breeding, black cockatoos will generally forage within a 6–12 km radius of their nesting site. Following breeding, birds assemble into flocks and move through the landscape searching for food, usually foraging within six kilometres of a night roost (Commonwealth of Australia 2012).

4 Results

4.1 Fauna habitat

4.1.1 General fauna habitat

Key fauna habitat types are listed in Table 4-1 and mapped in Figure 4 (Appendix A). Most native vegetation types are Jarrah and Marri dominated. In considering the habitat quality categories in Table 2-1, broad fauna habitat quality within the study area was mostly Poor to Moderate adjacent to private cleared lands due to limited structural and species diversity, and Moderate to Good adjacent to NP sections.

Table 4-1 Fauna habitat types over the study area

Code	Fauna habitat type	Structural vegetation description	Fauna habitat quality	Area (ha)	Photo
1	Jarrah Marri Forest with areas of Karri over Peppermint	Forest or Open Forest *of Corymbia calophylla, Eucalyptus marginata* over shrubland of *Hovea elliptica, Bossiaea or Taxandria parviceps* and *Bossiaea linophylla ornata*, on gravelly sands or laterite. Also *Corymbia calophylla, Eucalyptus marginata* and *Eucalyptus diversicolor* over open woodland of *Agonis flexuosa* in areas of gravel and grey sand.	Good	10.82	 

2	Marri Open Forest	Open forest of *Corymbia calophylla* over shrubland of *Pteridium esculentum* (in partially disturbed areas). Shown in left side of photo.	Moderate	2.37	
3	Jarrah Marri Open Forest	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Banksia grandis* or *Mirbelia dilatata*, *Xanthorrhoea preissii* and *Logania vaginalis* or over sparse shrubland of *Kingia australis*, *Hovea elliptica* and *Podocarpus drouynianus* over shrubland of *Lepidosperma pubisquameum* and *Pteridium esculentum*.	Good	1.01	

4	Jarrah Marri Forest over Peppermint Woodland	Forest of *Corymbia calophylla* and *Eucalyptus marginata* over open woodland of *Agonis flexuosa* over shrubland.	Good	0.93	
R	Riparian	Shrubland of *Taxandria sp* and *Melaleuca incana* over sedgeland of *Hypolaena sp* and *Leptocarpus sp*	Moderate	0.29	

C	Cleared	Cleared or predominately cleared with paddock trees of mostly *of Corymbia calophylla* or *Eucalyptus marginata*.	Poor	3.25	
P	Planted	Planted	Poor	0.30	

						
W	Water	Water	N/A	0.14		N/A
C-R	Cleared road infrastructure	Road and other infrastructure.	N/A	11.72		N/A

4.1.2 Suitable DBH trees and hollows

Numerous large senescing trees occurred within the broader road reserve, many of which contained large hollows. These may be used by a range of hollow dependant fauna including many conservation significant species. A total of 140 suitable DBH trees were recorded within the study area (within four metres from the seal). Suitable DBH trees and trees with hollows are mapped in Figure 5 Appendix A, with the full dataset provided in Appendix E.

Ground surveys identified 18 trees with hollows, 14 with hollow apertures greater than 10 cm within the four metre wide study area. It is unlikely however that all of the hollows will actually be hollow – see Limitations in Section 2.5.

4.2 Fauna recorded

Twenty-nine species of fauna were observed within the study area (Table 4-2). The fauna recorded included 23 birds and two amphibians, four mammals. Most are common species, with the exceptions of the black cockatoos and Western Ringtail Possum which are species of conservation significance. Other faunal groups are likely to occur but are more cryptic, nocturnal or would not have been detected during the brief diurnal reconnaissance visit (such as bats and reptiles). In addition, a number of species may only use the site as a part of a larger area of occupancy, such as other bird species.

Table 4-2 Fauna recorded within the study area

Class	Family	Scientific Name	Vernacular Name	Status
AMPHIBIANS	MYOBATRACHIDAE	*Crinia georgiana*	Quacking Froglet	
	MYOBATRACHIDAE	*Crinia glauerti*	Glauert's Froglet	
AVES	ACANTHIZIDAE	*Acanthiza chrysorrhoa*	Yellow-Rumped Thornbill	
	ACANTHIZIDAE	*Acanthiza inornata*	Western Thornbill	
	ALCEDINIDAE	*Dacelo novaeguineae*	Kookaburra*	
	ANATIDAE	*Chenonetta jubata*	Australian Wood Duck	
	ARTAMIDAE	*Cracticus tibicen*	Australian Magpie	
	CACATUIDAE	*Calyptorhynchus banksii naso*	Forest Red-Tailed Black Cockatoo	T
	CACATUIDAE	*Calyptorhynchus baudinii*	Baudin's Cockatoo	T
	CACATUIDAE	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	T
	COLUMBIDAE	*Phaps chalcoptera*	Common Bronzewing	
	CORVIDAE	*Corvus coronoides*	Australian Raven	
	MALURIDAE	*Malurus splendens*	Splendid Fairy-Wren	
	MELIPHAGIDAE	*Anthochaera carunculata*	Red Wattlebird	
	MELIPHAGIDAE	*Anthochaera lunulata*	Western Wattlebird	
	MONARCHIDAE	*Grallina cyanoleuca*	Magpie-Lark	
	PACHYCEPHALIDAE	*Colluricincla harmonica*	Grey Shrike-Thrush	
	PACHYCEPHALIDAE	*Pachycephala pectoralis*	Golden Whistler	

Class	Family	Scientific Name	Vernacular Name	Status
	PARDALOTIDAE	*Pardalotus striatus*	Striated Pardalote	
	PETROICIDAE	*Microeca fascinans*	Jacky Winter	
	PETROICIDAE	*Petroica boodang*	Scarlet Robin	
	PSITTACIDAE	*Barnardius zonarius*	Australian Ringneck	
	PSITTACIDAE	*Platycercus icterotis*	Western Rosella	
	RHIPIDURIDAE	*Rhipidura albiscapa*	Grey Fantail	
	RHIPIDURIDAE	*Rhipidura leucophrys*	Willie Wagtail	
MAMMALS	LEPORIDAE	*Oryctolagus cuniculus*	Rabbit*	
	MACROPODIDAE	*Macropus fuliginosus*	Western Grey Kangaroo	
	PHALANGERIDAE	*Trichosurus vulpecula*	Common Brushtail Possum	
	PSEUDOCHEIRIDAE	*Pseudocheirus occidentalis*	Western Ringtail Possum	T

4.3 Fauna of conservation significance

4.3.1 Local records

Database searches and other sources identified 24 fauna of conservation significance, recorded or likely to occur within five kilometres of the study area (see Appendix C.2).

A threatened fauna evaluation table was prepared for conservation significant fauna based on the desktop assessment and site reconnaissance (Appendix D). It excludes marine, marine migratory and regionally extinct species and has been updated with other records where the species may occur. Fauna of conservation significance that possibly occur or were encountered within the study area are summarised in Table 4-3. Taxa in green are considered further in Section 4.3.2.

Table 4-3 Conservation significant fauna that may occur within the study area, based on habitat suitability.

Genus species	Vernacular	Status Federal	Stat. WA	Presence of habitat	Likelihood of occurrence
Geocrinia alba	White-bellied Frog	CR	EN	Marginal	Unlikely
Geocrinia vitellina	Orange-bellied Frog	VU	VU	Marginal	Unlikely
Botaurus poiciloptilus	Australasian Bittern	EN	EN	Marginal	Unlikely
Ixobrychus flavicollis	Black Bittern		P2	Nil	Unlikely
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	VU	Present - core	Present
Calyptorhynchus baudinii	Baudin's Cockatoo	EN	EN	Present - core	Present
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	EN	Present - core	Present
Falco peregrinus	Peregrine Falcon	-	OS	Present - supporting	Possible
Tyto novaehollandiae subsp. novaehollandiae	Masked Owl (southern subsp)	-	P3	Present - supporting	Possible

Genus species	Vernacular	Status Federal	Stat. WA	Presence of habitat	Likelihood of occurrence
Dasyurus geoffroii	Chuditch	VU	VU	Present - supporting	Possible
Phascogale tapoatafa	Southern Brush-tailed Phascogale	-	S	Present - supporting	Possible
Notamacropus irma	Western Brush Wallaby		P4	Present - supporting	Possible
Setonix brachyurus	Quokka	VU	VU	Marginal	Unlikely
Hydromys chrysogaster	Water Rat	-	P4	Present - supporting	Possible
Isoodon obesulus fusciventer	Southern Brown Bandicoot	-	P4	Present - supporting	Possible
Pseudocheirus occidentalis	Western Ringtail Possum	CR	CR	Present - core	Present
Galaxiella munda	Mud minnow, Western dwarf galaxias	-	VU	Present – supporting	Possible
Galaxiella nigrostriata	Black-stripe minnow	-	EN	Marginal	Unlikely
Geotria australis	Pouched Lamprey	-	P3	Present - supporting	Possible
Lepidogalaxias salamandroides	Salamanderfish	-	EN	Present - supporting	Possible
Nannatherina balstoni	Balston's Pygmy Perch	VU	VU	Present - supporting	Unlikely
Westralunio carteri	Carters Freshwater Mussel	VU	VU	Present - supporting	Possible
Engaewa pseudoreducta	Margaret River Burrowing Crayfish	CR	CR	Marginal	Unlikely
Engaewa reducta	Dunsborough Burrowing Crayfish	CR	CR	Marginal	Unlikely

4.3.2 Species profiles and site values

The following sections considers the value of the study area to fauna of conservation significance that possibly occur or were encountered within the study area.

Black cockatoos

BREEDING HABITAT AND ROOST SITES

There were a total of 140 suitable DBH trees counted within four metres of the seal that may develop hollows in the medium to longer term. Suitable DBH trees and trees with hollows are mapped in Figure 4, Appendix A.

Hollow suitability and likelihood of black cockatoo breeding are shown in Table 4-4, with full datasets provided in Appendix E (mapped in Figure 5, Appendix A). As noted, it is unlikely that all of the hollows will actually be hollow. Of the 140 trees, 14 trees (three Jarrah and 11 Marri) had hollow apertures greater

than 10 cm. Four trees were located within 2 m of the seal – the remaining 10 trees were approximately 2-4 m from the edge of seal. Of these trees, five had hollows that were considered unsuitable for black cockatoo breeding (due to other factors such as branch thickness, orientation, access, and chamber size etc. Eight trees had hollows potentially large enough and with suitable characteristics with no signs of use when viewed from the ground. One tree had possible wear or chews when viewed from the ground, which indicated it is possibly being used by black cockatoos or other fauna. Further work (such as camera pole or drone) would need to be carried out to confirm black cockatoo nesting status.

There was no evidence of roosts observed at the site.

Table 4-4 Summary of hollows within the study area. Black cockatoo breeding classifications are also provided. Trees with hollows <10cm diameter have been omitted.

Tree ID	Clearing	Spp	Dbh cm	Hollows	Black cockatoo breeding classification
11	OUT 2-4m	Jarrah	50_75	1	Tree with suitable DBH with unsuitable hollow
14	OUT 2-4m	Marri	75_100	1	Tree with suitable DBH with unsuitable hollow
18	IN 0-2m	Jarrah	50_75	2	Tree with potentially suitable size hollow with no signs of use (not confirmed).
21	IN 0-2m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
23	IN 0-2m	Marri	>100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
24	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
30	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
35	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
44	IN 0-2m	Marri	>100	1	Tree with potentially suitable size hollow with signs of use (not confirmed).
53	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
94	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
97	OUT 2-4m	Marri	>100	3	Tree with potentially suitable size hollow with no signs of use (not confirmed).
109	OUT 2-4m	Jarrah	50_75	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
125	OUT 2-4m	Marri	50_75	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).

FORAGING HABITAT

Feed residue from all three cockatoo species, chewed Marri cones and Jarrah nuts, was observed throughout the study area. Vegetation communities with Jarrah and or Marri as key overstorey components represent likely quality foraging habitat (Fauna habitat types 1-4). These account for 15.12 ha over the full road reserve. Paddock trees and some planted vegetation (e.g. pines) may also contribute to local feed resources. Foraging habitat is mapped in Figure 5, Appendix A.

The desktop study identified 17 State reserves within 12 km of the study area, with significant tracts of contiguous and connected State Forest and National Park located west, south and east of the project and approximately 47,585 ha of native vegetation mapped (or 54%) remaining within 12 km of the study

area (87,775 ha) (Government of Western Australia 2020). These areas would provide abundant feed resources locally, with the circa 15 ha within the road reserve relatively insignificant.

Peregrine Falcon (*Falco peregrinus*) OS

Peregrine Falcons occur in woodland, plains, gorges, wetlands but tend to breed either in stick-nests in trees or nest on cliff ledges. Hollows and large abandoned nests of other birds may be used where cliff ledges are limited. Breeds Aug-Dec. The diet of the Peregrine Falcon includes wood duck, pigeons and doves, galahs, rosellas and cockatoo, starlings and larks (Olsen et al. 2006).

Peregrine Falcons are wide ranging, with abundant habitat locally. They weren't observed during the site visits, but the road verge vegetation may contribute to a broader area of occupancy (supporting habitat). Clearing could result in direct impacts could occur to breeding pairs and offspring if they occur within the verge, though none were observed.

Masked Owl (southern subsp) (*Tyto novaehollandiae subsp. novaehollandiae*) P3

Inhabits forests, open woodlands and farmlands with large trees, including timber watercourses paperbark woodlands. Widespread but very sparse, they breed any time of the year when conditions are favourable with a nesting period of about three months (Pizzey and Knight 2007). Has been recorded locally with one record occurs 3.6 km to the west of the study area (DBCA database 2021).

Wide ranging, with abundant habitat locally. The road verge vegetation may contribute to a broader area of occupancy (supporting habitat). Clearing could result in direct impacts through the clearing of occupied hollows, however this could be mitigated through the use of a licensed fauna spotter prior to and during clearing.

Chuditch (*Dasyurus geoffroii*) VU, VU

Quolls may occupy a range of habitats though in the SW they are largely restricted to Jarrah forest (DEC 2010). Habitat critical to Western Quoll are large areas of undisturbed habitat which a sufficient variety of key food and other resources such as large hollow logs, burrows or small caves at ground level for denning. They occupy relatively large home ranges, with males utilizing over 15 km^2 and females, 3-4 km^2 (Orell & Morris 1994). One record occurs 1.6 km north west of the study area (DBCA database 2021)

Quolls have very large home ranges, with abundant habitat locally. The road verge vegetation may contribute to a broader area of occupancy (supporting habitat). Relatively mobile and unlikely to be affected by minor road works proposed.

Southern Brush-tailed Phascogale (*Phascogale tapoatafa*) CD (BC Act)

This arboreal species is found in a variety of forest types. Ideal habitat for this species consists of dry sclerophyll forest and open woodland (Jarrah, Marri, and mixed Jarrah Karri) that contain hollow bearing trees and sparse ground cover. Their many nesting sites include hollow tree limbs, rotten stumps and even birds' nests. Lactating females prefer a large tree cavity with a small entrance with a nest made of bark, feathers and fur. A female's home range covers 20 to 70 hectares, a male's home ranges over laps females and increases during breeding season (Strahan 1995).

Phascogales have very large home ranges, with abundant habitat locally. The road verge vegetation may contribute to a broader area of occupancy (supporting habitat). Clearing could result in direct impacts through the clearing of occupied hollows, however this could be mitigated through the use of a licensed fauna spotter prior to and during clearing.

Western Brush Wallaby (*Notamacropus irma*) P4

Optimum habitat for the Western Brush Wallaby includes open Jarrah Forest or woodland and seasonally wet flats with low grasses and scrubby thickets, but also areas of mallee and heathland. Common dietary flora includes *Carpobrotus edulis, Cynodon dactylon* and *Nuytsia floribunda*. Several record in NP, closest occurs 3.2 km to the east of the study area (DBCA database 2021).

Western Brush Wallaby have very large home ranges, with abundant habitat locally. The road verge vegetation may contribute to a broader area of occupancy (supporting habitat). Relatively mobile and unlikely to be affected by minor road works proposed.

Water Rat (*Hydromys chrysogaster*) P4

The Water rat is usually found in permanent fresh or brackish water but can be found in marine environments. Fresh water habitats include swamps, lakes, dams even urban drainage swamps. Typically forages close to the shoreline, restricting its movements to shallow water (up to two metres depth) (CSIRO, 2004).

There is suitable habitat for this species within the study area but only as part of a larger network. No evidence of this species was found during the site visits (footprint or middens).They may periodically pass through the drainage lines between better habitat offsite. Limited to no impacts will occur in the areas where they are most likely to occur (bridge crossings).

Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) P4

Bandicoot habitat consists of dense scrubby, often swampy vegetation with a dense cover up to one metre high particularly near watercourses/wetlands. It often feeds in adjacent forest (Jarrah and Wandoo) and woodlands that are burnt on a regular basis. Nests can be concealed next to or under

old logs, shrubs or piles of debris and are made up of ground litter piled up over a shallow depression providing internal chambers. Home ranges vary with population density and range from 5-8.6 ha for males and 1-6 ha for females (DEC 2010). Their searches for food often create distinctive conical holes in the soil though there were none observed in the study area (DEC 2010).

Bandicoot was not detected at the site. They may occur at the site as part of a larger connected habitat area, with abundant habitat locally. The road verge vegetation may contribute to a broader area of occupancy (supporting habitat). Relatively mobile and unlikely to be affected by minor road works proposed.

Western Ringtail Possum (*Pseudocheirus occidentalis)* CR, CR

Populations mostly inhabit Peppermint and Peppermint-Tuart associations from Bunbury to Albany (SPRAT 2018). In dense, coastal Peppermint forest, home ranges are about 0.5 hectares to 1.5 ha and in eucalypt forests about 2.5 ha. In the northern jarrah forests, home ranges are larger and have been recorded to at least 5.6 ha.

Peppermint leaves form the basis of the WRP diet in coastal areas (between 79-100% based on a study of WRP near Busselton by Jones et al. 1994), but when unavailable, the dominant myrtaceous species are preferred. In the inland forest, Jarrah and Marri the main food source.

WRP use a range of nest and shelter sites to avoid predators and exposure to the weather. Dreys are constructed in the canopy if hollows are not available. Adequate nest and shelter sites are necessary components of good quality habitat (Jones 1994, Shedley and Williams 2014).

Numerous local records (DBCA database 2021). Scat observed throughout the site in connected woodland/forest. WRP occur within the study area, probably in low densities based on the low number of scats. No dreys were identified so any WRP present are likely to be nesting in hollows. Clearing could result in direct impacts through the clearing of occupied hollows, however this could be mitigated through the use of a licensed fauna spotter prior to and during clearing.

Mud minnow, Western dwarf galaxias (*Galaxiella munda*) -, VU

Occur in slow-running, tea-coloured streams usually in sandy areas. Also found in swamps, small ponds and roadside ditches. Also lives in the vegetated shallows of some freshwater lakes. Water is typically acidic (pH 4.5-6.5) and darkly tannin-stained. An inhabitant of temporary waters, capable of aestivating in damp bottom sediments over summer (Allen et al 2002) (Smith et al 2002). Several local records including downstream of the Upper Chapman Brook (DBCA database 2021).

Pouched Lamprey (*Geotria australis*) -, P3

Found between Margaret River and Denmark. After metamorphosis, young adults migrate downstream to estuaries and coastal waters, where they feed parasitically by rasping flesh from other fishes with their toothy tongues. They eventually cease feeding and migrate back to freshwater to breed (Gomon and Bray, 2011). The species has been found or is likely to be found in the local catchment (DWER 2021).

Salamanderfish (*Lepidogalaxias salamandroides*), -, EN

Common within its restricted range in near-coastal wetlands between Augusta and Albany. It can occur in flowing streams within this range, however only generally in low abundance (DWER 2021). Primarily found in highly acidic, shallow, temporary (dry out in summer) pools and swamps in coastal heathland. Fish survive drying through summer months by burrowing into the substrate where they aestivate. They will remain in the damp sandy soils until rains re-submerge the habitat the following year. Diet consists mainly of microcrustaceans and insect larvae (DWER 2021). The species has been surveyed for but is with the closest local record about 2.7 km south of the study area, in the Blackwood River (DWER 2021).

Carters Freshwater Mussel (*Westralunio carteri*) VU, VU

Carters Freshwater Mussel is the only freshwater mussel found in southwest WA. It is a bivalve found in freshwater streams, rivers, ponds, wetlands and lakes inland from the coast mostly areas with muddy, silty and sandy bottoms and flowing permanent water. Tracks can be seen along banks and sandy/muddy patches of stream bed where they are present. Native fish are critical to the Mussel's lifecycle - larval mussels attach themselves to native fish to develop into juvenile mussels. Mussels move along the bottom using a muscular tongue-like appendage known as a foot. Unlike their marine and estuarine cousins, they do not attach to structures. This allows them to move with receding water levels and position themselves to the best feeding spots (Murdoch University, 2010). Modelled as likely to be found locally (DWER 2020), though not observed at the site and probably only likely to occur in Upper Chapman Brook and Blackwood River.

Mud minnow, Pouched Lamprey, Salamanderfish and Carters Freshwater Mussel are all aquatic species that have been recorded locally, within catchments crossing the study area. The project typically will not impact on the most important habitat, including flowing water where there is existing bridge infrastructure (Blackwood River SLK 8.05, Upper Chapman Brook SLK 11.7 and Chapman Brook SLK 15.45). The species above are unlikely to occur within the minor roadside culverts.

5 Conclusions and Recommendations

The following points summarise the fauna values of the Warner Glen Road study area (30.81 ha):

- The study area passes through a mix of NP and cleared farm land. In most locations the road reserve had an existing four metre wide maintenance zone
- Six fauna habitat types were identified within the study area:
    - Jarrah Marri Forest with areas of Karri over Peppermint (Good quality) 10.82 ha
    - Marri Open Forest (Moderate quality) 2.37 ha
    - Jarrah Marri Open Forest (Good quality) 1.01 ha
    - Jarrah Marri Forest over Peppermint Woodland (Good quality) 0.93 ha
    - Riparian (Moderate quality) 0.29 ha
    - Water 0.14 ha
- Other areas of disturbed or no fauna habitat include
    - Cleared or predominately cleared with paddock trees (Poor quality) 3.25 ha

  - Planted (Poor quality) 0.30 ha
  - Cleared road infrastructure (Poor quality) 11.72 ha
- Twenty-three species of fauna were recorded from the 179 that may occur based on desktop assessment. Evidence of conservation significant black cockatoos (all three species) and WRP was observed within the study area, from the 24 fauna of conservation significance that may occur locally.
- The habitat tree assessment was restricted to four metres from the edge of seal (total study area of 9.47 ha). It found
  - Numerous large senescing trees occurred within the broader road reserve, many of which contained large hollows. These may be used by a range of hollow dependant fauna including many conservation significant species.
  - A total of 140 suitable DBH trees were recorded within the study area (within four metres from the seal).
  - Eighteen trees contained hollows, 14 with hollow apertures greater than 10 cm. Four trees were located within 2 m of the seal – the remaining 10 trees were approximately 2-4 m from the edge of seal.
- Targeted black cockatoo surveys identified the following
  - The study area falls within the breeding range of all three black cockatoo species.
  - Of the 14 trees (three Jarrah and 11 Marri) with hollows >10 cm, five had hollows that were considered unsuitable for black cockatoo breeding (due to other factors such as branch thickness, orientation, access, and chamber size etc. Eight trees had hollows potentially large enough and with suitable characteristics for breeding but no signs of use when viewed from the ground. One tree (ID 44) had possible wear or chews when viewed from the ground, which indicated it is possibly being used by black cockatoos or other fauna. Further work (such as camera pole or drone) would need to be carried out to confirm black cockatoo nesting status.
  - There was no evidence of roosts observed within the study area.
  - Feed residue from all three cockatoo species. Fauna habitat types 1-4 may provide quality foraging habitat (15.12 ha over the full road reserve). Paddock trees and some planted vegetation may also contribute to local feed resources.
  - Habitat within the study area (circa 15 ha within the road reserve) only contributes to a very small proportion of available habitat locally. There are 17 State reserves within 12 km of the study area, with significant tracts of contiguous and connected State Forest and NP located west, south and east of the study area. Approximately 47,585 ha of native vegetation is mapped (or 54%) remaining within 12 km of the study area (87,775 ha) (Government of Western Australia 2020).
- Other fauna that may use the study area as part of a larger patch include Peregrine Falcon, Masked Owl (southern subsp), Chuditch, Southern Brush-tailed Phascogale, Western Brush Wallaby, Water Rat, Southern Brown Bandicoot and Western Ringtail Possum. Individual hollow dependant fauna are most likely to be impacted through the clearing of hollows.

- Mud minnow, Pouched Lamprey, Salamanderfish and Carters Freshwater Mussel may occur upstream or downstream in the larger drainage lines (Blackwood River, Upper Chapman Brook and Chapman Brook). The project will not impact on bridge infrastructure at these locations.

The following recommendations are made:

- Clearing should be minimised in areas of native vegetation.
- Road alignments and widening should be chosen to minimise impacts to hollows trees, then DBH trees, in that order. Alternative design measures should be considered where hollow trees are likely to be impacted (e.g. curbing, relocation of drains, etc) to enable the trees to be retained.
- Clearing should be conducted outside of spring to minimise impacts to breeding fauna. It is noted that not all fauna breed nest in spring (e.g. FRTBC).
- Culvert works should be carried out in the 'dry' months to minimise impacts offsite downstream through turbidity and sedimentation. Appropriate stormwater, erosion and sediment control should be implemented for any works associated with steep slopes or drainage lines.
- Further work (such as camera pole or drone) would need to be carried out to confirm black cockatoo nesting status or hollow status in Tree ID 18, 23, 30, 35, 44, 94, 97, 109, 125, if these trees are to be cleared.
- A licensed fauna spotter should be on site during the clearing of hollow trees to manage impacts on hollow dependant fauna.
- The final impact footprints should be checked against the significant impact criteria (DEWHA 2013; SEWPAC 2012) for black cockatoos and other matters of NES to determine the need to refer the project to DAWE.

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Appendix A Figures

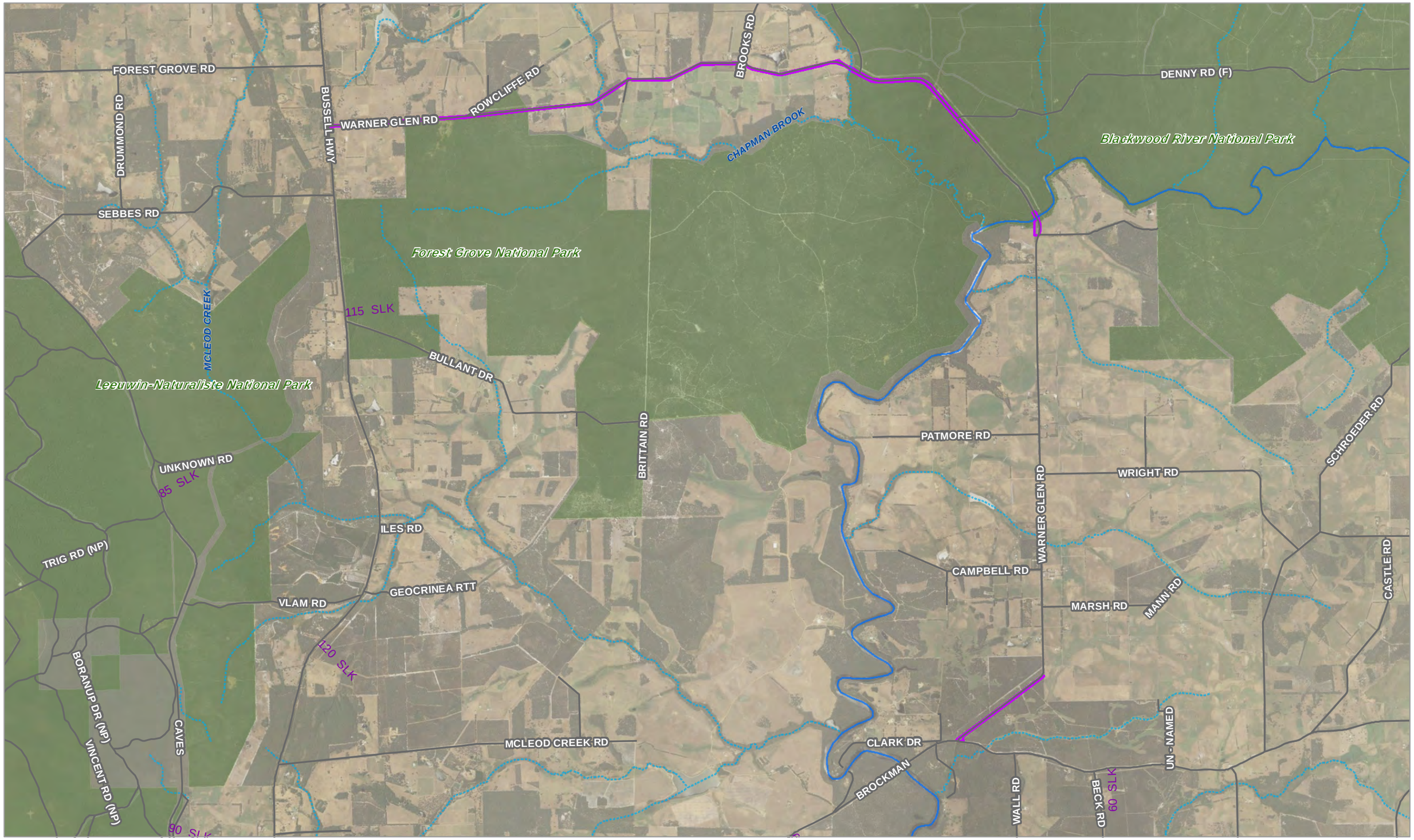
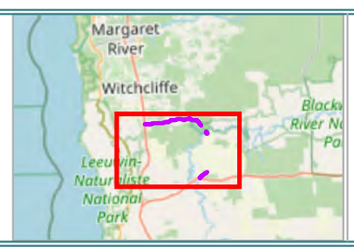


FIGURE 1 STUDY AREA

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 -8.1, 9.42 - 19.34 SLK

- Road
- Major watercourse
- Minor drainage line
- Warner Glen study area
- DBCA managed land



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N

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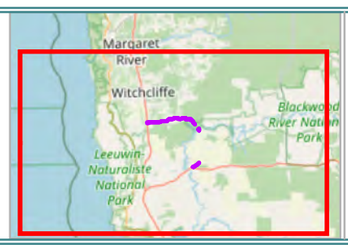
FIGURE 2 LOCALITY

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 -8.1, 9.42 - 19.34 SLK

- Road
- Major watercourse
- Minor drainage line
- Warner Glen study area
- 12 km locality
- DBCA managed land



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Date: 23/11/2021 Author: SP

Source: Base map © Esri and its data suppliers. SLIP Landgate (2021)

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GRID: GDA zone 50

N

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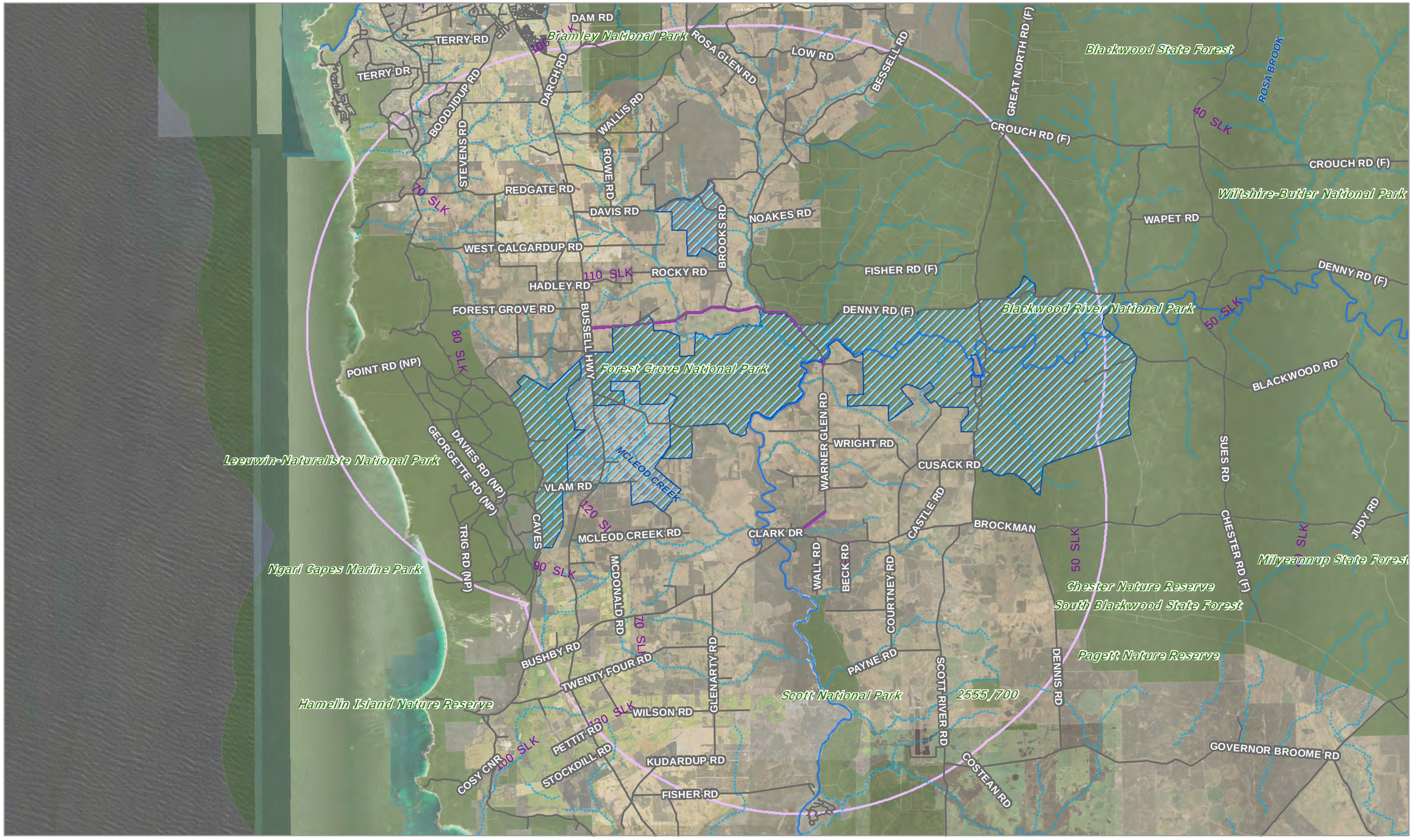

FIGURE 3 SPEARWOOD CREEK (DRAFT PROPOSED RAMSAR ADDITION)

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 -8.1, 9.42 - 19.34 SLK

- Road
- Major watercourse
- Minor drainage line
- Spearwood Creek (DRAFT Proposed Ramsar Addition)
- Warner Glen study area
- 12 km locality
- DBCA managed land

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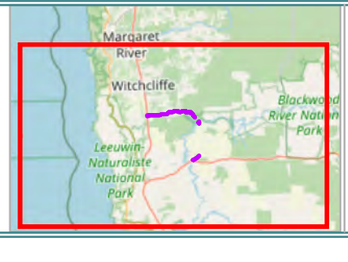

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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Hollow bearing tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m

Road
Warner Glen Road study area

Fauna habitat type
- 1
- C

DBCA managed land

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A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

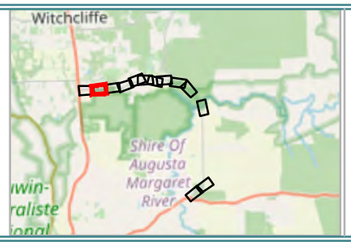
BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road

- Warner Glen Road study area

Fauna habitat type
- 1
- C
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



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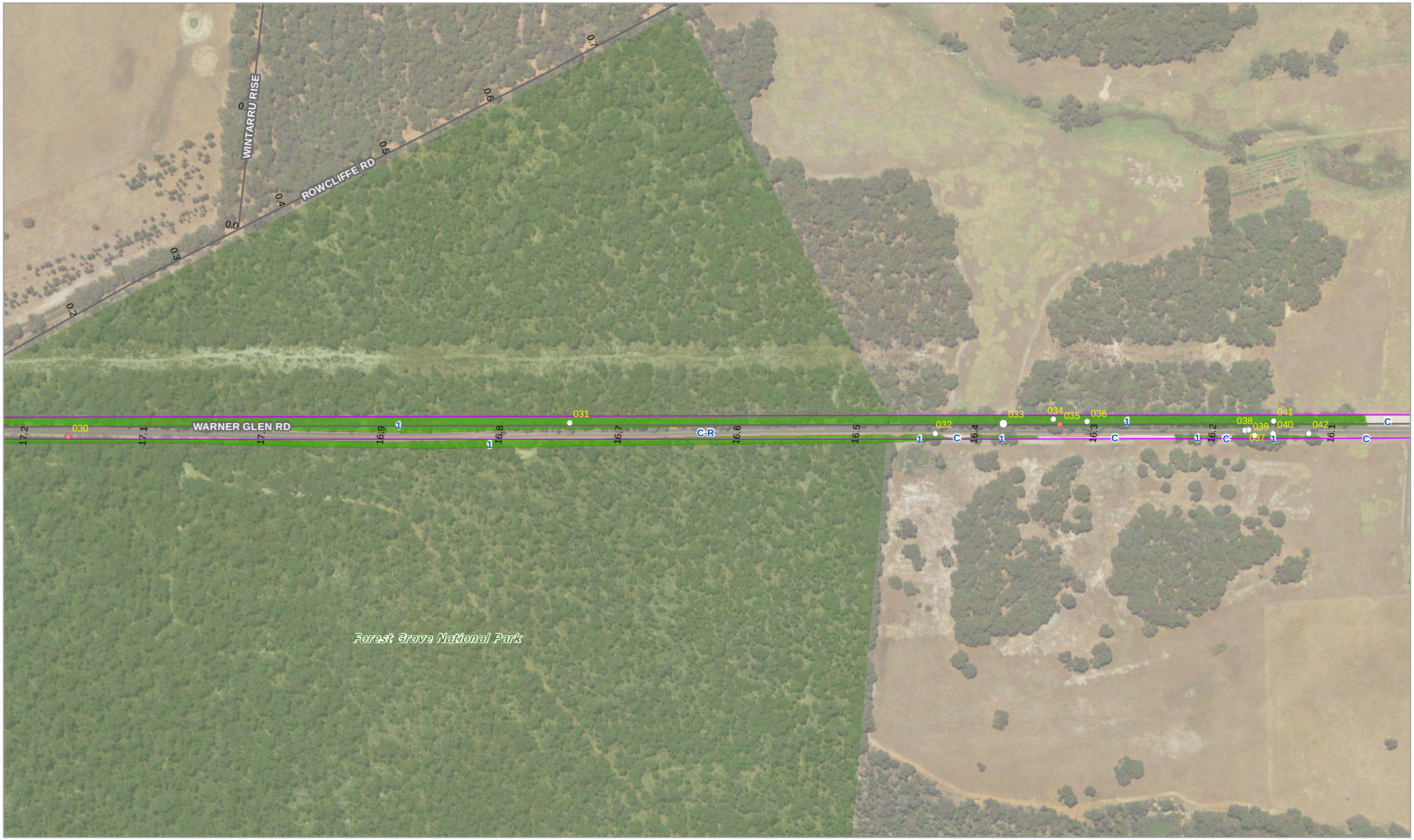

FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road

Warner Glen Road study area

Fauna habitat type
- 1
- C
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Hollow bearing tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Road

Warner Glen Road study area

Fauna habitat type
- 1
- 2
- 3

- C
- P
- R
- Minor drainage line
- DBCA managed land

Ref: SW348_
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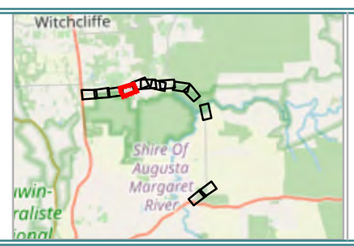

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

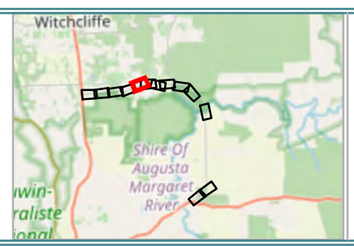
BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road

Warner Glen Road study area
P

Fauna habitat type
- 1
- 2
- C

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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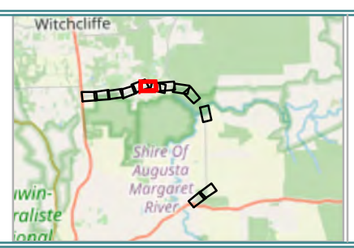
FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Road
- Warner Glen Road study area

Fauna habitat type
- 1
- 2
- C
- P

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
www.swenvironmental.com.au

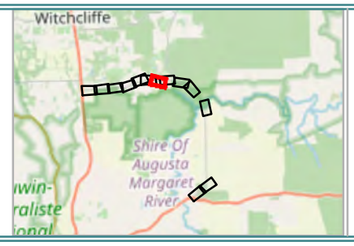
FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Road
- Warner Glen Road study area

Fauna habitat type
- 1
- 2
- C

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

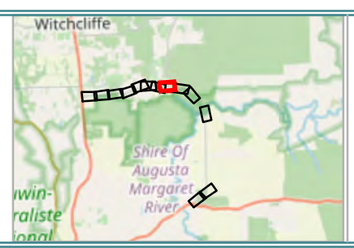
Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road

Warner Glen Road study area

Fauna habitat type
- 1
- 2
- 3

- C
- R
- Minor drainage line
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
www.swenvironmental.com.au

FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

— Road

Warner Glen Road study area

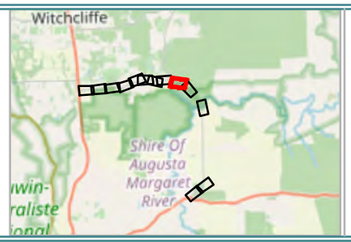
Fauna habitat type

1

3

DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

— Road

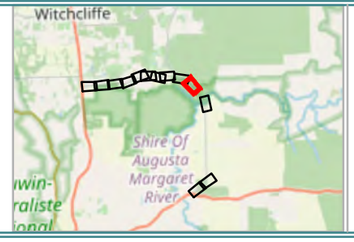
Warner Glen Road study area

Fauna habitat type

1

DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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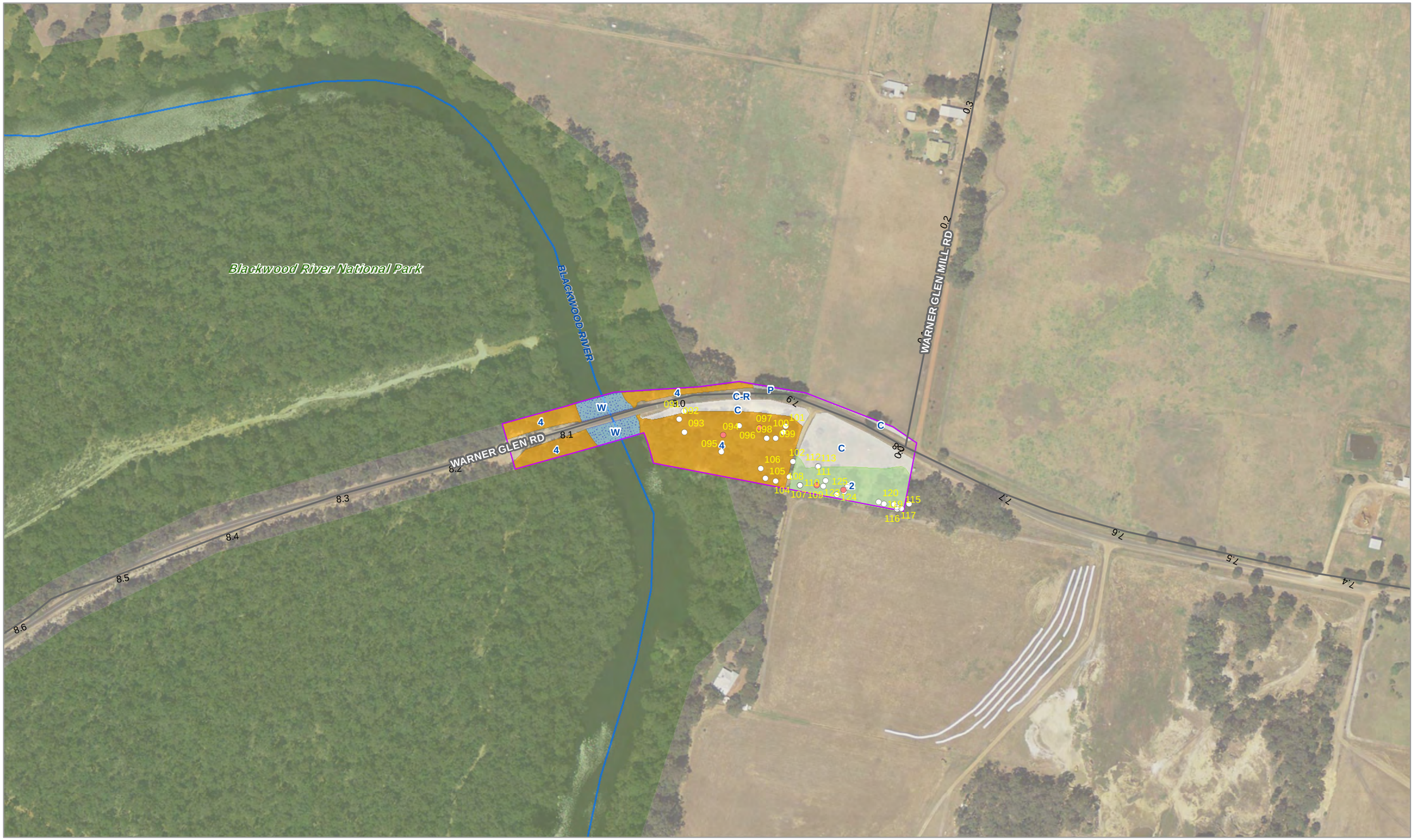


FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

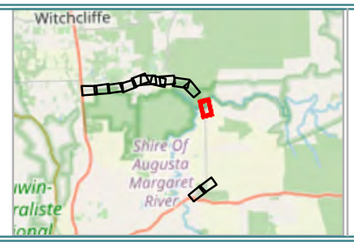
BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road
- Warner Glen Road study area

Fauna habitat type
- W
- 2
- 4
- C
- P

- Major watercourse
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 0-2 m
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road

Warner Glen Road study area

Fauna habitat type
- 2
- C

Ref: SW348_
Date: 24/11/2021 Author: SP

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 4 FAUNA HABITAT TYPES AND HABITAT TREES

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Habitat tree results
- Suitable DBH tree, 2-4 m
- Hollow bearing tree, 2-4 m
- Road
- Warner Glen Road study area

Fauna habitat type
- 2
- 3
- C
- P

Minor drainage line

Ref: SW348_
Date: 24/11/2021 Author: SP

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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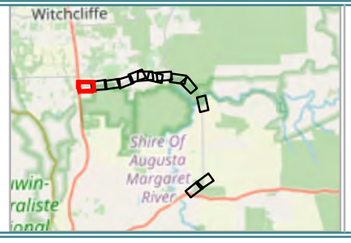
FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Distance from seal, Black cockatoo breeding classification

- 0-2 m, Tree with potentially suitable size hollow with no signs of use (not confirmed).
- 0-2 m, Tree with suitable DBH with unsuitable hollow
- 2-4 m, Tree with suitable DBH with unsuitable hollow
- Road
- Quality black cockatoo foraging habitat
- Warner Glen Road study area
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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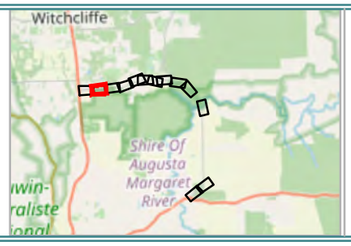
FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Distance from seal, Black cockatoo breeding classification

- 2-4 m, Tree with potentially suitable size hollow with no signs of use (not confirmed).
- 2-4 m, Tree with suitable DBH with unsuitable hollow
- Road
- Quality black cockatoo foraging habitat
- Warner Glen Road study area
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

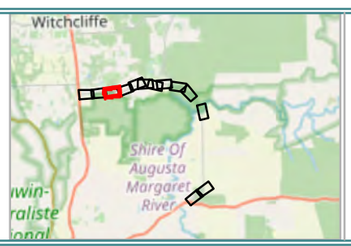
Distance from seal, Black cockatoo breeding classification

- 2-4 m, Tree with potentially suitable size hollow with no signs of use (not confirmed).

— Road

- Quality black cockatoo foraging habitat
- Warner Glen Road study area
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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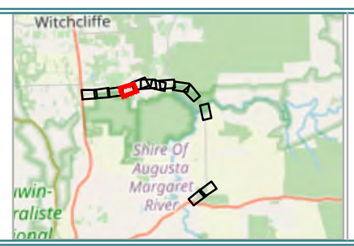
FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Distance from seal, Black cockatoo breeding classification

- 0-2 m, Tree with potentially suitable size hollow with signs of use (not confirmed).
- Road
- Quality black cockatoo foraging habitat
- Planted vegetation
- Warner Glen Road study area
- Minor drainage line
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

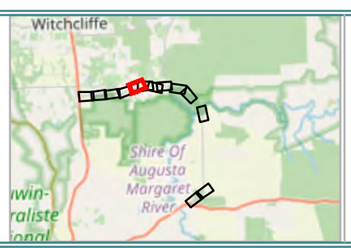
Distance from seal, Black cockatoo breeding classification

- 2-4 m, Tree with suitable DBH with unsuitable hollow

— Road

- Quality black cockatoo foraging habitat
- Planted vegetation
- Warner Glen Road study area

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

- Road
- Quality black cockatoo foraging habitat
- Planted vegetation
- Warner Glen Road study area

Ref: SW348_
Date: 24/11/2021 Author: SP

Source: Base map © Esri and its data suppliers. SLIP Landgate (2021)

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

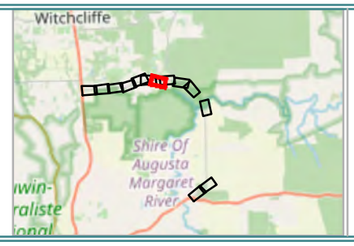
BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

— Road

Quality black cockatoo foraging habitat

Warner Glen Road study area

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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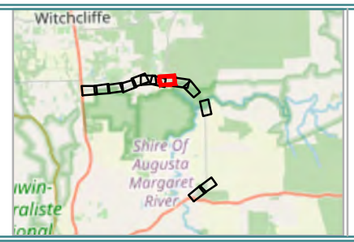
FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Distance from seal, Black cockatoo breeding classification

- 2-4 m, Tree with suitable DBH with unsuitable hollow
- Road
- Quality black cockatoo foraging habitat
- Warner Glen Road study area
- Minor drainage line
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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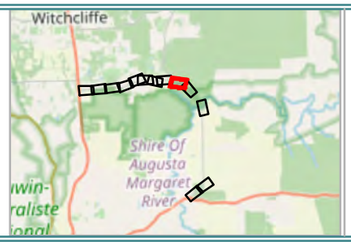
FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

- Road
- Quality black cockatoo foraging habitat
- Warner Glen Road study area
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

- Road
- Quality black cockatoo foraging habitat
- Warner Glen Road study area
- DBCA managed land

Ref: SW348_
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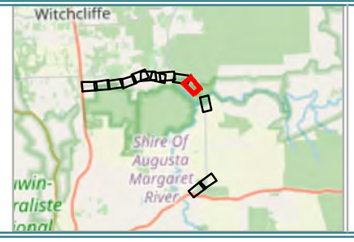

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Distance from seal, Black cockatoo breeding classification

- 2-4 m, Tree with potentially suitable size hollow with no signs of use (not confirmed).

— Road

- Quality black cockatoo foraging habitat
- Planted vegetation
- Warner Glen Road study area
- Major watercourse
- DBCA managed land

Ref: SW348_
Date: 24/11/2021 Author: SP

A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

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- 2-4 m, Tree with suitable DBH with unsuitable hollow
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A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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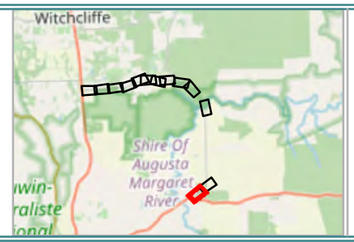
FIGURE 5 BLACK COCKATOO FORAGING HABITAT AND BREEDING POTENTIAL

BASIC AND TARGETED FAUNA SURVEY
WARNER GLEN ROAD, WARNER GLEN
0 - 1.6; 7.78 - 8.1, 9.42 - 19.34 SLK

Distance from seal, Black cockatoo breeding classification

- 2-4 m, Tree with suitable DBH with unsuitable hollow
- Road
- Quality black cockatoo foraging habitat
- Planted vegetation
- Warner Glen Road study area
- Minor drainage line

Ref: SW348_
Date: 24/11/2021 Author: SP



A3 @ 1:3000

0 10 20 40 m

GRID: GDA zone 50

SW environmental
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Appendix B Conservation codes

Fauna in WA may be afforded protection under the WA BC Act and or federal EPBC Act. Species listed as threatened or migratory under the above legislation are referred to collectively in this document as being 'conservation significant' or 'target' species. These terms include species and communities listed under the DBCA Priority lists.

BC Act

The WA BC Act and associated Regulations provide for the licensing and management of activities that affect biodiversity. The BC Act provides for the listing of threatened native animals (fauna) that need protection as critically endangered, endangered or vulnerable species because they are under identifiable threat of extinction (species).

The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* contain the lists of Threatened, Extinct and Specially Protected species under Part 2 of the BC Act. These are described below.

Threatened species and communities

- PD: Presumed totally destroyed (TECs only)
- CR: Critically endangered species
- EN: Endangered species
- VU: Vulnerable species

Extinct species

- EX: Extinct species
- EW: Extinct in the wild species

Specially protected species

- MI: Migratory species
- CD: Species of special conservation interest (conservation dependent fauna)
- OS: Other specially protected species

Priority species and communities

- Priority 1: Poorly-known species
- Priority 2: Poorly-known species
- Priority 3: Poorly-known species
- Priority 4: Rare, Near Threatened and other species in need of monitoring
- Priority Ecological Community (PEC): Where communities are considered rare but not (currently) threatened or there is insufficient information available for the community to be considered a TEC, communities can be listed as priority ecological communities (PECs).

A full description of conservation codes is provided in Appendix B.

EPBC Act

In accordance with Commonwealth legislation, the EPBC Act provides a list of 'Matters of National Environmental Significance' (NES), which includes significant fauna. Under the EPBC Act fauna matters of NES may be listed in any one of the following categories as defined in *Section 179* of the Act:

- Extinct,
- *Extinct in the wild,
- *Critically endangered,
- *Endangered,
- *Vulnerable,
- Conservation dependent.

*Only these categories are matters of NES under the Act.

The EPBC Act also lists migratory species that are recognized under international treaties including the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA) and the Bonn Convention (The Convention on the conservation of Migratory Species of Wild Animals). The EPBC Act is regulated by the DAWE.

IUCN Red List

The IUCN Red List is an inventory of the global conservation status of species and used to assist DBCA and other agencies in attributing a given threatened species status. It does not have any statutory authority and is not considered in detail in this assessment.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

CONSERVATION CODES

For Western Australian Flora and Fauna

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.

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 wild. 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 species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; 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 dependent 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.

1 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.

2 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.

3 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.

4 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.

[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).

Appendix C Potential fauna list and fauna recorded

Appendix C.1 Fauna within 10 km (Naturemap and ALA, 2021)

Class	Family	Scientific Name	Vernacular Name	Recorded	Status	WA Status	EPBC Status
AMPHIBIA	LIMNODYNASTIDAE	*Heleioporus eyrei*	Moaning Frog				
AMPHIBIA	LIMNODYNASTIDAE	*Limnodynastes dorsalis*	Sand Frog				
AMPHIBIA	MYOBATRACHIDAE	*Crinia georgiana*	Quacking Froglet	X call			
AMPHIBIA	MYOBATRACHIDAE	*Crinia glauerti*	Glauert's Froglet	X call			
AMPHIBIA	MYOBATRACHIDAE	*Crinia pseudinsignifera*	False Western Froglet				
AMPHIBIA	MYOBATRACHIDAE	*Geocrinia alba*	White-bellied Frog		T	CR	EN
AMPHIBIA	MYOBATRACHIDAE	*Geocrinia leai*	Ticking Frog				
AMPHIBIA	MYOBATRACHIDAE	*Geocrinia vitellina*	Orange-bellied Frog		T	VU	VU
AMPHIBIA	MYOBATRACHIDAE	*Metacrinia nichollsi*	Nicholl's Toadlet				
AMPHIBIA	MYOBATRACHIDAE	*Pseudophryne guentheri*	Gunther's Toadlet				
AVES	ACANTHIZIDAE	*Acanthiza apicalis*	Inland Thornbill				
AVES	ACANTHIZIDAE	*Acanthiza chrysorrhoa*	Yellow-Rumped Thornbill	X			
AVES	ACANTHIZIDAE	*Acanthiza inornata*	Western Thornbill	X			
AVES	ACANTHIZIDAE	*Gerygone fusca*	Western Gerygone				
AVES	ACANTHIZIDAE	*Sericornis frontalis*	White-Browed Scrubwren				
AVES	ACANTHIZIDAE	*Smicrornis brevirostris*	Weebill				
AVES	ACCIPITRIDAE	*Accipiter cirrocephalus*	Collared Sparrowhawk				
AVES	ACCIPITRIDAE	*Accipiter fasciatus*	Brown Goshawk				
AVES	ACCIPITRIDAE	*Aquila audax*	Wedge-Tailed Eagle				
AVES	ACCIPITRIDAE	*Circus approximans*	Swamp Harrier				
AVES	ACCIPITRIDAE	*Circus assimilis*	Spotted Harrier				
AVES	ACCIPITRIDAE	*Elanus axillaris*	Black-Shouldered Kite				
AVES	ACCIPITRIDAE	*Haliaeetus leucogaster*	White-Bellied Sea-Eagle				
AVES	ACCIPITRIDAE	*Haliastur sphenurus*	Whistling Kite				
AVES	ACCIPITRIDAE	*Hamirostra isura*	Square-Tailed Kite				
AVES	ACCIPITRIDAE	*Hieraaetus morphnoides*	Little Eagle				
AVES	ACROCEPHALIDAE	*Acrocephalus australis*	Australian Reed Warbler				
AVES	AEGOTHELIDAE	*Aegotheles cristatus*	Australian Owlet-Nightjar				
AVES	ALCEDINIDAE	*Dacelo novaeguineae*	Kookaburra*	X			
AVES	ALCEDINIDAE	*Todiramphus sanctus*	Sacred Kingfisher				

Class	Family	Scientific Name	Vernacular Name	Recorded	Status	WA Status	EPBC Status
AVES	ANATIDAE	*Anas castanea*	Chestnut Teal				
AVES	ANATIDAE	*Anas gracilis*	Grey Teal				
AVES	ANATIDAE	*Anas platyrhynchos*	Mallard Duck				
AVES	ANATIDAE	*Anas superciliosa*	Pacific Black Duck				
AVES	ANATIDAE	*Biziura lobata*	Musk Duck				
AVES	ANATIDAE	*Chenonetta jubata*	Australian Wood Duck	X			
AVES	ANATIDAE	*Cygnus atratus*	Black Swan				
AVES	ANATIDAE	*Tadorna tadornoides*	Australian Shelduck				
AVES	ANHINGIDAE	*Anhinga novaehollandiae*	Australasian Darter				
AVES	ARDEIDAE	*Ardea pacifica*	White-Necked Heron				
AVES	ARDEIDAE	*Botaurus poiciloptilus*	Australasian Bittern		T	EN	EN
AVES	Ardeidae	*Egretta sacra*	Eastern Reef Egret				
AVES	ARDEIDAE	*Ixobrychus flavicollis*	Black Bittern		P2		
AVES	ARDEIDAE	*Nycticorax caledonicus*	Nankeen Night-Heron				
AVES	ARTAMIDAE	*Artamus cinereus*	Black-Faced Woodswallow				
AVES	ARTAMIDAE	*Artamus cyanopterus*	Dusky Woodswallow				
AVES	ARTAMIDAE	*Cracticus tibicen*	Australian Magpie	X			
AVES	ARTAMIDAE	*Cracticus torquatus*	Grey Butcherbird				
AVES	ARTAMIDAE	*Strepera versicolor*	Grey Currawong				
AVES	CACATUIDAE	*Calyptorhynchus banksii naso*	Forest Red-Tailed Black Cockatoo	X feed residue	T	VU	VU
AVES	CACATUIDAE	*Calyptorhynchus baudinii*	Baudin's Cockatoo	X feed residue	T	EN	EN
AVES	CACATUIDAE	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	X feed residue	T	EN	EN
AVES	CAMPEPHAGIDAE	*Coracina maxima*	Ground Cuckoo-shrike				
AVES	CAMPEPHAGIDAE	*Coracina novaehollandiae*	Black-Faced Cuckoo-Shrike				
AVES	CAMPEPHAGIDAE	*Lalage sueurii*	White-Winged Triller				
AVES	CAPRIMULGIDAE	*Eurostopodus argus*	Spotted Nightjar				
AVES	CASUARIIDAE	*Dromaius novaehollandiae*	Emu				
AVES	CHARADRIIDAE	*Charadrius ruficapillus*	Red-capped Dotterel				
AVES	CHARADRIIDAE	*Elseyornis melanops*	Black-fronted Dotterel				
AVES	CHARADRIIDAE	*Thinornis cucullatus*	Hooded Plover				
AVES	CHARADRIIDAE	*Vanellus tricolor*	Banded Lapwing				
AVES	CLIMACTERIDAE	*Climacteris rufus*	Rufous Treecreeper				
AVES	COLUMBIDAE	*Ocyphaps lophotes*	Crested Pigeon				
AVES	COLUMBIDAE	*Phaps chalcoptera*	Common Bronzewing	X			
AVES	COLUMBIDAE	*Phaps elegans*	Brush Bronzewing				
AVES	COLUMBIDAE	*Streptopelia senegalensis*	Laughing Turtle-Dove*				

Class	Family	Scientific Name	Vernacular Name	Recorded	Status	WA Status	EPBC Status
AVES	CORVIDAE	*Corvus bennetti*	Little Crow				
AVES	CORVIDAE	*Corvus coronoides*	Australian Raven	X			
AVES	CUCULIDAE	*Cacomantis flabelliformis*	Fan-Tailed Cuckoo				
AVES	CUCULIDAE	*Cacomantis pallidus*	Pallid Cuckoo				
AVES	CUCULIDAE	*Chrysococcyx lucidus*	Shining Bronze-Cuckoo				
AVES	FALCONIDAE	*Falco berigora*	Brown Falcon				
AVES	FALCONIDAE	*Falco cenchroides*	Nankeen Kestrel				
AVES	FALCONIDAE	*Falco longipennis*	Little Falcon				
AVES	FALCONIDAE	*Falco peregrinus*	Peregrine Falcon		OS		
AVES	HAEMATOPODIDAE	*Haematopus fuliginosus*	sooty oystercatcher				
AVES	HAEMATOPODIDAE	*Haematopus longirostris*	Australian Pied Oystercatcher				
AVES	HIRUNDINIDAE	*Hirundo neoxena*	Welcome Swallow				
AVES	HIRUNDINIDAE	*Petrochelidon ariel*	Fairy Martin				
AVES	HIRUNDINIDAE	*Petrochelidon nigricans*	Tree Martin				
AVES	LARIDAE	*Chlidonias hybrida*	Whiskered tern				
AVES	LARIDAE	*Chroicocephalus novaehollandiae*	Silver Gull				
AVES	LARIDAE	*Hydroprogne caspia*	Caspian Tern				
AVES	LARIDAE	*Larus dominicanus*	Dominican Gull				
AVES	LARIDAE	*Larus pacificus*	Pacific gull				
AVES	LARIDAE	*Onychoprion anaethetus*	Bridled Tern				
AVES	LARIDAE	*Thalasseus bergii*	Crested Tern				
AVES	MALURIDAE	*Malurus elegans*	Red-Winged Fairy-Wren				
AVES	MALURIDAE	*Malurus splendens*	Splendid Fairy-Wren	X			
AVES	MALURIDAE	*Stipiturus malachurus*	Southern Emu-Wren				
AVES	MEGALURIDAE	*Cincloramphus mathewsi*	Rufous Songlark				
AVES	MEGALURIDAE	*Megalurus gramineus*	Little Grassbird				
AVES	MELIPHAGIDAE	*Acanthorhynchus superciliosus*	Western Spinebill				
AVES	MELIPHAGIDAE	*Anthochaera carunculata*	Red Wattlebird	X			
AVES	MELIPHAGIDAE	*Anthochaera lunulata*	Western Wattlebird	X			
AVES	MELIPHAGIDAE	*Epthianura albifrons*	White-Fronted Chat				
AVES	MELIPHAGIDAE	*Gavicalis virescens*	Singing Honeyeater				
AVES	MELIPHAGIDAE	*Gliciphila melanops*	Tawny-Crowned Honeyeater				
AVES	MELIPHAGIDAE	*Lichmera indistincta*	Brown Honeyeater				
AVES	MELIPHAGIDAE	*Melithreptus brevirostris*	Brown-Headed Honeyeater				
AVES	MELIPHAGIDAE	*Melithreptus chloropsis*	Gilbert's Honeyeater				
AVES	MELIPHAGIDAE	*Melithreptus lunatus*	White-Naped Honeyeater				

Class	Family	Scientific Name	Vernacular Name	Recorded	Status	WA Status	EPBC Status
AVES	MELIPHAGIDAE	*Phylidonyris niger*	White-Cheeked Honeyeater				
AVES	MELIPHAGIDAE	*Phylidonyris novaehollandiae*	New Holland Honeyeater				
AVES	MEROPIDAE	*Merops ornatus*	Rainbow Bee-Eater				
AVES	MONARCHIDAE	*Grallina cyanoleuca*	Magpie-Lark	X			
AVES	MONARCHIDAE	*Myiagra inquieta*	Restless Flycatcher				
AVES	NEOSITTIDAE	*Daphoenositta chrysoptera*	Varied Sittella				
AVES	PACHYCEPHALIDAE	*Colluricincla harmonica*	Grey Shrike-Thrush	X			
AVES	PACHYCEPHALIDAE	*Falcunculus frontatus*	Crested Shrike-Tit				
AVES	PACHYCEPHALIDAE	*Pachycephala occidentalis*	Western Whistler				
AVES	PACHYCEPHALIDAE	*Pachycephala pectoralis*	Golden Whistler	X call			
AVES	PACHYCEPHALIDAE	*Pachycephala rufiventris*	Rufous Whistler				
AVES	PARDALOTIDAE	*Pardalotus punctatus*	Spotted Pardalote				
AVES	PARDALOTIDAE	*Pardalotus striatus*	Striated Pardalote	X call			
AVES	PELECANIDAE	*Pelecanus conspicillatus*	Australian Pelican				
AVES	PETROICIDAE	*Eopsaltria georgiana*	White-Breasted Robin				
AVES	PETROICIDAE	*Eopsaltria griseogularis*	Western Yellow Robin				
AVES	PETROICIDAE	*Microeca fascinans*	Jacky Winter	X			
AVES	PETROICIDAE	*Petroica boodang*	Scarlet Robin	X			
AVES	PHALACROCORACIDAE	*Microcarbo melanoleucos*	Little Pied Cormorant				
AVES	PHALACROCORACIDAE	*Phalacrocorax carbo*	Great Cormorant				
AVES	PHALACROCORACIDAE	*Phalacrocorax sulcirostris*	Little Black Cormorant				
AVES	PHALACROCORACIDAE	*Phalacrocorax varius*	Pied Cormorant				
AVES	PHASIANIDAE	*Coturnix pectoralis*	Stubble Quail				
AVES	PODICIPEDIDAE	*Poliocephalus poliocephalus*	Hoary-Headed Grebe				
AVES	PODICIPEDIDAE	*Tachybaptus novaehollandiae*	Australasian Grebe				
AVES	PSITTACIDAE	*Barnardius zonarius*	Australian Ringneck	X			
AVES	PSITTACIDAE	*Neophema elegans*	Elegant Parrot				
AVES	Psittacidae	*Neophema petrophila*	Rock Parrot				
AVES	PSITTACIDAE	*Parvipsitta porphyrocephala*	Purple-Crowned Lorikeet				
AVES	PSITTACIDAE	*Platycercus icterotis*	Western Rosella	X			
AVES	PSITTACIDAE	*Platycercus spurius*	Red-Capped Parrot				
AVES	RALLIDAE	*Fulica atra*	Eurasian Coot				
AVES	RALLIDAE	*Gallinula tenebrosa*	Dusky Moorhen				
AVES	RALLIDAE	*Porphyrio porphyrio*	Purple Swamphen				
AVES	RALLIDAE	*Porzana fluminea*	Australian Spotted Crake				
AVES	RALLIDAE	*Porzana tabuensis*	Spotless Crake				

Class	Family	Scientific Name	Vernacular Name	Recorded	Status	WA Status	EPBC Status
AVES	RECURVIROSTRIDAE	*Himantopus himantopus*	Pied Stilt				
AVES	RECURVIROSTRIDAE	*Recurvirostra novaehollandiae*	Red-necked Avocet				
AVES	RHIPIDURIDAE	*Rhipidura albiscapa*	Grey Fantail	X			
AVES	RHIPIDURIDAE	*Rhipidura leucophrys*	Willie Wagtail	X			
AVES	STRIGIDAE	*Ninox novaeseelandiae*	Southern Boobook				
AVES	THRESKIORNITHIDAE	*Platalea flavipes*	Yellow-Billed Spoonbill				
AVES	THRESKIORNITHIDAE	*Threskiornis molucca*	Australian White Ibis				
AVES	THRESKIORNITHIDAE	*Threskiornis spinicollis*	Straw-Necked Ibis				
AVES	TIMALIIDAE	*Zosterops lateralis*	Silvereye				
AVES	TURNICIDAE	*Turnix varius*	Painted Button-Quail				
AVES	TYTONIDAE	*Tyto alba*	Barn Owl				
AVES	TYTONIDAE	*Tyto novaehollandiae*	Masked Owl		P3		
FISH	GALAXIIDAE	*Galaxiella munda*	Mud Minnow		T	VU	
FISH	GALAXIIDAE	*Galaxiella nigrostriata*	Black-stripe minnow		T	EN	
FISH	GEOTRIIDAE	*Geotria australis*	Pouched Lamprey		P3		
FISH	LEPIDOGALAXIIDAE	*Lepidogalaxias salamandroides*	Salamanderfish		T	EN	
FISH	PERCICHTHYIDAE	*Nannatherina balstoni*	Balston's Pygmy Perch		T	VU	VU
INVERTEBRATE	HYRIIDAE	*Westralunio carteri*	Carter's Freshwater Mussel		T	VU	VU
INVERTEBRATE	PARASTACIDAE	*Engaewa pseudoreducta*	Margaret River Burrowing Crayfish		T	CR	CR
INVERTEBRATE	PARASTACIDAE	*Engaewa reducta*	Dunsborough Burrowing Crayfish		T	CR	CR
MAMMALIA	BURRAMYIDAE	*Cercartetus concinnus*	Western Pygmy-Possum				
MAMMALIA	DASYURIDAE	*Dasyurus geoffroii*	Chuditch		T	VU	VU
MAMMALIA	DASYURIDAE	*Phascogale tapoatafa*	Brush-Tailed Phascogale		CD		
MAMMALIA	DASYURIDAE	*Sminthopsis fuliginosus*	Dusky Dunnart				
MAMMALIA	LEPORIDAE	*Oryctolagus cuniculus*	Rabbit*	X			
MAMMALIA	MACROPODIDAE	*Macropus fuliginosus*	Western Grey Kangaroo	X			
MAMMALIA	MACROPODIDAE	*Notamacropus irma*	Western Brush Wallaby		P4		
MAMMALIA	MACROPODIDAE	*Setonix brachyurus*	Quokka		T	VU	VU
MAMMALIA	MURIDAE	*Hydromys chrysogaster*	Water-Rat		P4		
MAMMALIA	PERAMELIDAE	*Isoodon fusciventer*	Southern Brown Bandicoot		P4		
MAMMALIA	PHALANGERIDAE	*Trichosurus vulpecula*	Common Brushtail Possum	X scat			
MAMMALIA	PSEUDOCHEIRIDAE	*Pseudocheirus occidentalis*	Western Ringtail Possum	X scat	T	CR	CR
MAMMALIA	VESPERTILIONIDAE	*Falsistrellus mackenziei*	Western False Pipistrelle		P4		
MAMMALIA	VESPERTILIONIDAE	*Nyctophilus geoffroyi*	Lesser Long-eared Bat				
MAMMALIA	VESPERTILIONIDAE	*Nyctophilus gouldii*	Gould's Wattled Bat				
MAMMALIA	VESPERTILIONIDAE	*Nyctophilus major*	Greater Long-eared Bat				

Class	Family	Scientific Name	Vernacular Name	Recorded	Status	WA Status	EPBC Status
MAMMALIA	VESPERTILIONIDAE	*Nyctophilus morio*	Chocolate Wattled Bat				
REPTILIA	ELAPIDAE	*Notechis scutatus*	Tiger Snake				
REPTILIA	ELAPIDAE	*Pseudonaja affinis*	Dugite				
REPTILIA	GEKKONIDAE	*Christinus marmoratus*	Marbled Gecko				
REPTILIA	PYGOPODIDAE	*Pygopus lepidopodus*	Common Scaly-Foot				
REPTILIA	SCINCIDAE	*Acritoscincus trilineatus*	Western Three-Lined Skink				
REPTILIA	SCINCIDAE	*Ctenotus catenifer*	Chain-striped South-west Ctenotus				
REPTILIA	SCINCIDAE	*Hemiergis gracilipes*	South-Western Mulch-Skink				
REPTILIA	SCINCIDAE	*Hemiergis peronii*	Lowlands Earless Skink				
REPTILIA	SCINCIDAE	*Lerista elegans*	Elegant Slider				
REPTILIA	SCINCIDAE	*Morethia lineoocellata*	West Coast Morethia Skink				
REPTILIA	SCINCIDAE	*Tiliqua rugosa*	Bobtail				
REPTILIA	VARANIDAE	*Varanus rosenbergi*	Heath Monitor				

Appendix C.2Naturemap and PMST database results

Australian Government

Department of Agriculture, Water and the Environment

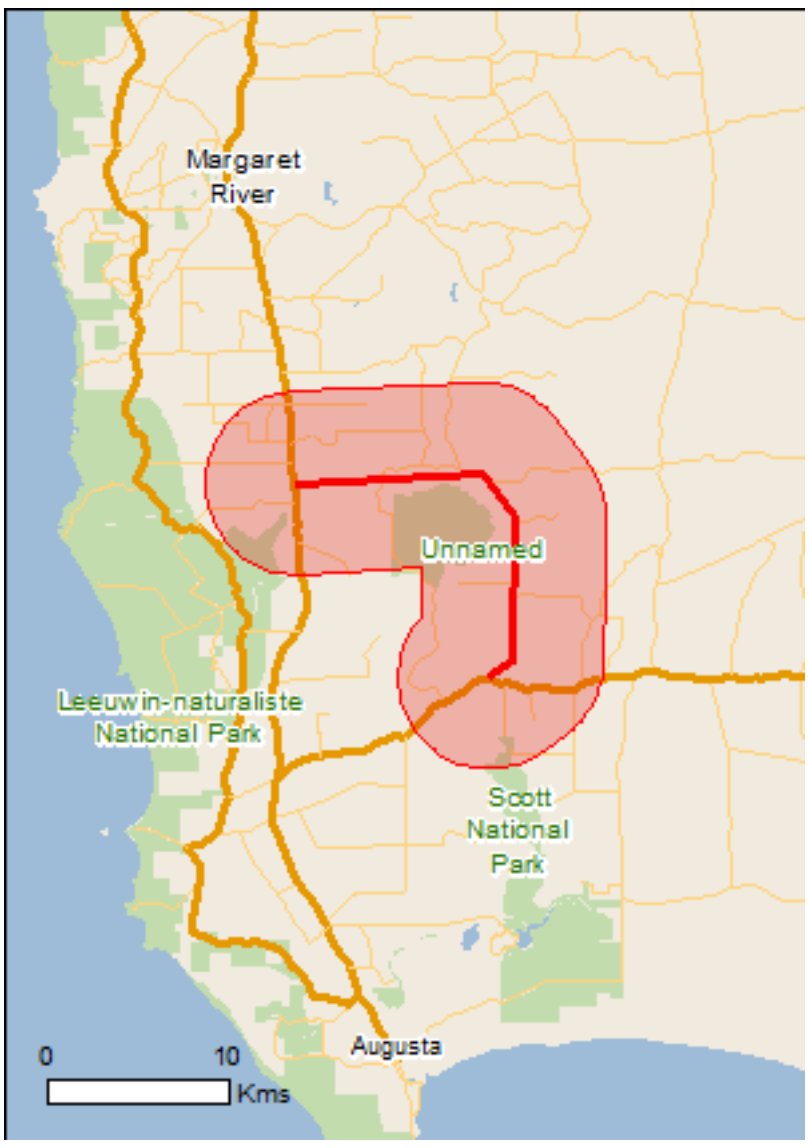
EPBC Act Protected Matters Report

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

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

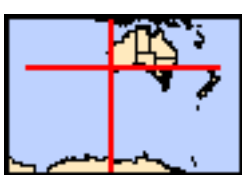
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 18/10/21 17:00:57



Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	46
Listed Migratory Species:	28

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	31
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	21
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area
Crustaceans		
Engaewa reducta Dunsborough Burrowing Crayfish [82675]	Critically Endangered	Species or species habitat known to occur within area
Fish		
Galaxiella nigrostriata Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat may occur within area
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Geocrinia alba White-bellied Frog, Creek Frog [26181]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat likely to occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		

Name	Status	Type of Presence
[Banksia nivea subsp. uliginosa](#) Swamp Honeypot [82766]	Endangered	Species or species habitat likely to occur within area
[Banksia squarrosa subsp. argillacea](#) Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat likely to occur within area
[Boronia exilis](#) Scott River Boronia [64844]	Endangered	Species or species habitat known to occur within area
[Caladenia hoffmanii](#) Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat likely to occur within area
[Drakaea micrantha](#) Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
[Gastrolobium papilio](#) Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
[Grevillea brachystylis subsp. australis](#) [55525]	Vulnerable	Species or species habitat likely to occur within area
[Lambertia echinata subsp. occidentalis](#) Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area
[Lambertia orbifolia](#) Roundleaf Honeysuckle [15725]	Endangered	Species or species habitat likely to occur within area
[Leptomeria dielsiana](#) Diels' Currant Bush [5146]	Vulnerable	Species or species habitat known to occur within area
[Reedia spathacea](#) Reedia [2995]	Critically Endangered	Species or species habitat known to occur within area
[Verticordia plumosa var. ananeotes](#) Tufted Plumed Featherflower [23871]	Endangered	Species or species habitat may occur within area
[Verticordia plumosa var. vassensis](#) Vasse Featherflower [55804]	Endangered	Species or species habitat may occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray		Species or species habitat may occur within

Name	Threatened	Type of Presence
[84995]		area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	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
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat likely to occur within area
Thinornis rubricollis		
Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Mammals		
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat may occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Blackwood River	WA
Forest Grove	WA
Leeuwin-Naturaliste	WA
Scott	WA
Unnamed WA46400	WA

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species

[Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Blackwood River (Lower Reaches) and Tributaries System	WA

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-34.080443 115.108812,-34.076178 115.200136,-34.093523 115.216272,-34.152923 115.215242,-34.159742 115.203913

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.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

NatureMap
Mapping Western Australia's biodiversity

Warner Glen

Created By Guest user on 18/10/2021

Kingdom Animalia
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Line'
Vertices 34° 04' 47" S,115° 06' 29" E 34° 04' 40" S,115° 08' 57" E 34° 04' 21" S,115° 10' 03" E 34° 04' 33" S,115° 11' 58" E 34° 05' 38" S,115° 12' 60" E 34° 09' 09" S,115° 12' 55" E 34° 09' 39" S,115° 12' 08" E

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
2.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
4.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
5.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
6.	33946	*Engaewa reducta (Dunsborough Burrowing Crayfish)*		T	
7.	34026	*Galaxiella munda (mud minnow, western dwarf galaxias)*		T	
8.	25403	*Geocrinia alba (White-bellied Frog)*		T	
9.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
10.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
11.	24557	*Leipoa ocellata (Malleefowl)*		T	
12.	47983	*Lepidogalaxias salamandroides (Salamanderfish)*		T	
13.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
14.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
15.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
16.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
17.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	

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

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

Appendix D Threatened fauna evaluation

Table E.1 provides an evaluation of the presence of habitat and the likelihood of occurrence for conservation significant (target) fauna species. The species list was derived from database searches (ALA, Naturemap and PMST reporting tool, 2021), literature and expert consultation, and assessed against habitat observed within the study area. The potential to be impacted depends on the final nature of the final impacts proposed, habitat utilised by the target species and the likelihood of occurrence.

The presence of habitat is broken into four categories:

- **Present - core:** Potential or known habitat present within the study area. Consists of "habitat critical to the survival of a species" which refers to core areas that are necessary for activities such as foraging, breeding, roosting, or dispersal, necessary for the long-term maintenance of the species to maintain genetic diversity and long term evolutionary development (Department of the Environment 2013) or habitat types recognised in recovery plans or guidelines.
- **Present - supporting:** Likely to provide dispersal, transitory or supporting habitat that may support core / critical habitat areas, such as small areas of lesser quality habitat where an animal has a large home range.
- **Marginal:** Habitat present is not typical but may be suitable, or habitat is typical, but condition and microhabitat requirements of species are not present.
- **Absent:** No potential or known habitat is present within the project area.

There are four categories for likelihood of occurrence:

- **Nil:** Species known or predicted to occur within the locality but no suitable habitat within the project area.
- **Unlikely:** Species known or predicted within the locality. Suitable habitat may be present in the project area, but the proximity of nearest records suggests it is unlikely to occur.
- **Possible:** Suitable habitat present and the species could occur in the project area based on the proximity of nearest records.
- **Present:** Species was recorded during the field investigations.

Some fauna have been excluded as they are not relevant to the proposal or would not be impacted:

- Marine (e.g. seals, dolphins, whales, penguins).
- Marine migratory species (e.g. Albatrosses) or where breeding is in the northern hemisphere, e.g. those from the family Scolopacidae: Sandpipers and other shorebirds and waders.
- Species considered regionally extinct (e.g. Malleefowl, Noisy Scrub-bird, Heath Mouse).
- Aquatic (Blue-billed Duck) where there are no large waterbodies.

Conservation status is as per the (federal) EPBC Act and (WA) DBCA Parks and Wildlife Service's Threatened and Priority Fauna List last updated 10/04/2019, under the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* made by the Minister for Environment under *section 14(4)* Part 2 of *Biodiversity Conservation Regulations 2018*. Refer to Appendix B for Conservation Codes.

Table E.1 Evaluation of the presence of habitat and the likelihood of occurrence for conservation fauna significant species within the study area

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
AMPHIBIANS	MYOBATRACHIDAE *Geocrinia alba*	White-bellied Frog	CR	EN	The study aera is located centrally within the species distribution, with the closest being a 1994 record 400m upstream of Warner Glen Road 14.2 SLK (DBCA search 2021). Records appear to occur within the McCleod Creek and Chapman Brook catchments of the Blackwood River. The distribution of the White-bellied Frog is extremely restricted and fragmented and is contained within an area north and west of the Blackwood River between Margaret River and Augusta in the extreme south-west of Western Australia (Roberts et al. 1999). The extent of occurrence of the species is approximately 130 km^2. The area of occupancy for the White-bellied Frog is less than 2.5 km^2 (Roberts et al. 1999). *Geocrinia alba* inhabit swampy flows along drainage depressions in an area of subdued topography (relief < 80m) near the junction of the Leeuwin-Naturaliste Ridge and Blackwood Plateau. Breeding sites are typically associated with sandy soils, dense overstorey vegetation dominated by *Homalospermum firmum, Agonis linearifolia, Astartea fascicularis*, and a dense ground layer of rhizomatous vegetation, usually composed of *Pseudoloxocarya sp., Loxocarya sp*. and *Tetrarrhena laevis* (DPAW 2014). Kim Williams (DBCA, co-authored the species' Recovery Plan (DPAW 2015)) indicated that local public and private lands have been searched and that there are no known populations in the road reserve or close by that could be affected downstream of the road (pers. comms. 6/08/2021).	Marginal - near Upper Chapman Brook crossing	Unlikely
	Geocrinia vitellina	Orange-bellied Frog	VU	VU	Closest record is just over 5 km to the east. *Geocrinia vitellina* extent of occurrence is calculated to be 6 km^2 with an area of occupancy based on suitable habitat estimated at 0.08 km^2. The entire range of *G. vitellina* lies within the Blackwood River	Marginal	Unlikely

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					National Park, an area managed by Department of Parks and Wildlife and relatively free from major modification (DPAW 2015).		
AVES	ARDEIDAE *Botaurus poiciloptilus*	Australasian Bittern	EN	EN	The Australasian Bittern occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. In the south-west it is found in beds of tall rush mixed with, or near, short fine sedge or open pools. The species also occurs around swamps, lakes, pools, rivers and channels fringed with lignum (*Muehlenbeckia* sp.), canegrass (*Eragrostis* sp.) or other dense vegetation. The species occasionally ventures into areas of open water or onto banks. In the SW WA, it is confined to a relatively small number of regularly occupied locations. These locations probably number less than 70, including: less than five north of Perth; less than 10 in the greater Perth metropolitan area; less than 10 south to Busselton; less than 10 in the Lake Muir district; less than 10 from Augusta to Walpole; less than 10 around Albany; and less than 10 around Esperance and Cape Arid. Most of these sites are discrete basin/sumpland wetlands with local catchments, and many depend on the surface expression of groundwater (SPRAT 2017).	Marginal - near Upper Chapman Brook crossing	Unlikely
	Ixobrychus flavicollis	Black Bittern		P2	Found in both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation, e.g. shadowy leafy waterside trees: casurinas, eucalypts, paperbarks, tidal creeks and mudflats. In the case that permanent water is present, the species may also occur in flooded grassland or adjacent forest and woodland. It nests on a sheltered horizontal branch over water (Pizzey and Knight 2007). There are no records within 10 km (DBCA data search 2021)).	Nil	Unlikely
	CACATUIDAE *Calyptorhynchus banksii naso*	Forest Red-tailed Black Cockatoo	VU	VU	The Forest Red-tailed Black Cockatoo inhabits the dense Jarrah, Karri and Marri forests receiving more than 600 mm rainfall annually (SPRAT 2018). The FRTBC occurs within the same habitat as the Baudin's Cockatoo. FRTBC nest in Jarrah, Karri,	Present - core	Present Feed residue observed

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					Marri and Wandoo favouring large top entry hollows with entrances ranging over 12 cm in diameter and hollow depth one to five metres) (SEWPaC, 2012) (Johnson and Kirkby, Undated). It breeds between February to December (with a peak between October and December, also a peak in some years in April–May) probably every two years – on the Swan Coastal Plain breeding has been recorded in November–December (Johnson and Kirkby, Undated). The species predominately feeds on seeds from Marri and Jarrah fruits and Blackbutt, Albany Blackbutt, Forest Sheoak, Snottygobble and the non-indigenous native Spotted Gum and Cape Lilac within its home range of about 116-187 ha (SPRAT 2018).		
	Calyptorhynchus baudinii	Baudin's Cockatoo	EN	EN	Baudin's Cockatoo is mainly found in eucalypt forests, especially Jarrah -Marri forest, Karri forest, and less frequently in woodlands of Wandoo, Blackbutt, Flooded Gum Yate, partly cleared farmlands and urban areas including roadside trees and house gardens. This cockatoo forages at all levels of the forest from the canopy to the ground, often feeding in the understorey on proteaceous trees and shrubs, especially Banksia, and in orchards both in trees and on dropped or fallen fruit on the ground (Johnson and Kirkby, Undated). Preferred roosts are in areas with a dense canopy close to permanent sources of water (SPRAT 2018). The range of the species during the non-breeding season (breeds in August though to late December) may be determined by the distribution of Marri, and that nesting might be confined to areas in which Karri occurs (SPRAT 2018). It is known to nest in hollows of Eucalypts usually at some height (Pizzey and Knight 2007), often 30-50m above ground (Jupp 2000). Tree hollows usually have an entrance of 30-40cm, >30cm deep and are mostly vertical (SPRAT 2018) (Johnson and Kirkby, Undated).	Present - core	Present Feed residue observed

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
	Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	EN	This species is a postnuptial nomad, moving west after breeding. Carnaby's Cockatoo mainly occurs in or near eucalypt woodlands, especially those dominated by Wandoo or Salmon Gum, and sometimes reported in forests of Marri, Jarrah, Karri and Tuart. Nesting hollows may be located anywhere from 2 m to >10 m from ground, mainly in the Wheatbelt (Cale 2003, SPRAT 2009, WA Museum 2010). It is known to forage in native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as Banksia spp. (including Dryandra spp.), Hakea spp. and Grevillea spp. Forages in pine plantations, eucalypt woodland and forest that contains foraging species. Also individual trees and small stands of these species (SEWPAC 2012). This species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain. This may be due to climate change. Breeding occurs mainly from early July to mid-December. Breeding success is largely dependent on suitable feeding habitat adjacent to the nest site to provide the necessary food for the survival of the chick, for example adjacent pine forest or remnant vegetation (Johnson and Kirkby, Undated).	Present - core	Present Feed residue observed
	FALCONIDAE *Falco peregrinus*	Peregrine Falcon	-	OS	Peregrine Falcons occur in woodland, plains, gorges, wetlands but tend to breed either in stick-nests in trees or nest on cliff ledges. It appears that hollows and large abandoned nests of other birds may be used where cliff ledges are limited. Breeds Aug-Dec. Where good habitat occurs, and the density of Peregrine Falcons is high, active nests may occur within 2.5km of each other. The diet of the Peregrine Falcon includes wood duck, pigeons and doves, galahs, rosellas and cockatoo, starlings and larks (Olsen et al. 2006). One record occurs 2.1 km to the west of the study area (DBCA database 2021).	Present - supporting	Possible

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
	STRIGIDAE *Tyto novaehollandiae subsp. novaehollandiae*	Masked Owl (southern subsp)	-	P3	Inhabits forests, open woodlands and farmlands with large trees, including timber watercourses paperbark woodlands. Widespread but very sparse, they breed any time of the year when conditions are favourable with a nesting period of about three months (Pizzey and Knight 2007). One record occurs 3.6 km to the west of the study area (DBCA database 2021).	Present - supporting	Possible
MAMMALS	DASYURIDAE *Dasyurus geoffroii*	Chuditch	VU	VU	Quolls may occupy a range of habitats including forest, woodland and desert, though in the SW they are largely restricted to Jarrah forest or scattered through the southern and eastern wheat belt (DEC 2010). Current records indicated that this only represents approximately 5% of their former range. Habitat critical to Western Quoll are large areas of undisturbed habitat which a sufficient variety of key food and other resources such as large hollow logs, burrows or small caves at ground level for denning. To be suitable as den sites, logs must have a diameter of at least 30 cm but usually greater than 50 cm, a hollow diameter of 7–20 cm and generally 1m long (Orell & Morris 1994). Annually, an adult female Chuditch will utilise an estimated average of 66 logs and 110 burrows within her home range. A large amount of den sites is required for both sexes. They occupy relatively large home ranges, with males utilizing over 15 km^2 and females, 3-4 km^2 (Orell & Morris 1994). One record occurs 1.6 km north west of the study area (DBCA database 2021).	Present - supporting	Possible
	Phascogale tapoatafa	Southern Brush-tailed Phascogale	-	S	This arboreal species is found in a variety of forest types. Ideal habitat for this species consists of dry sclerophyll forest and open woodland (Jarrah, Marri, and mixed Jarrah Karri) that contain hollow bearing trees and sparse ground cover. Their many nesting sites include hollow tree limbs, rotten stumps and even birds' nests. Lactating females prefer a large tree cavity with a small entrance with a nest made of bark, feathers and fur. A female's home range covers 20 to 70 hectares, a male's home ranges over laps females and increases during breeding	Present - supporting	Possible

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					season. It is predominantly carnivorous, foraging on arthropods, invertebrates, small vertebrates and nectar (Strahan 1995).		
	MACROPODIDAE *Notamacropus irma*	Western Brush Wallaby		P4	Optimum habitat for the Western Brush Wallaby includes open Jarrah forest or woodland and seasonally wet flats with low grasses and scrubby thickets, but also areas of mallee and heathland. Common dietary flora includes *Carpobrotus edulis, Cynodon dactylon* and *Nuytsia floribunda*. Several record in NP, closest occurs 3.2 km to the east of the study area (DBCA database 2021).	Present - supporting	Possible
	Setonix brachyurus	Quokka	VU	VU	The understorey structure of the habitats currently used by Quokka consist of dense, low vegetation that provides refuge from predation (Hayward 2002). The mainland habitats include dense riparian vegetation (Hayward et al. 2005), but also (from SPRAT 2017) • heath and shrubland, • Swamp Peppermint (*Taxandria linearifolia*) dominated swamps in Jarrah forest, • swampy shrublands, • swordgrass-dominated understorey, • regrowth areas of the Karri forest, • Bullich swamp forest, • Paperbark (Melaleuca spp.) swamp. A low density of near-surface fuel, a complex vegetation structure and a varied fire-age mosaic best predict the probability of occupancy of quokka in the southern forest (DEC 2013). The Bullich swamp forest in the drainage line in the southern site has similarities to southern forest habitats. No records within the Blackwood or Forest Grove NPs. Nearby	Marginal, through the drainage lines	Unlikely

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					records only within the Leeuwin Naturaliste NP about 7 km to the west (DBCA database 2021).		
	MURIDAE *Hydromys chrysogaster*	Water Rat	-	P4	The Water rat is usually found in permanent fresh or brackish water but can be found in marine environments. Fresh water habitats include swamps, lakes, dams even urban drainage swamps. Typically forages close to the shoreline, restricting its movements to shallow water (up to 2 m in depth) (CSIRO, 2004). One record occurs 1.8 km north west of the study area (DBCA database 2021). No evidence observed.	Present - supporting	Possible
	PERAMELIDAE *Isoodon obesulus fusciventer*	Southern Brown Bandicoot	-	P4	Bandicoot habitat consists of dense scrubby, often swampy vegetation with a dense cover up to one metre high particularly near watercourses/wetlands. It often feeds in adjacent forest (Jarrah and Wandoo) and woodlands that are burnt on a regular basis. Nests can be concealed next to or under old logs, shrubs or piles of debris and are made up of ground litter piled up over a shallow depression providing internal chambers. Home ranges vary with population density and range from 5-8.6 ha for males and 1-6 ha for females (DEC 2010). Feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous fungi. Their searches for food often create distinctive conical holes in the soil (DECC 2010). Only records are west of Bussell Highway (DBCA database 2021). No evidence observed.	Present - supporting	Possible
	PSEUDOCHEIRIDAE *Pseudocheirus occidentalis*	Western Ringtail Possum	CR	CR	In dense, coastal Peppermint forest, home ranges are about 0.5 hectares to 1.5 ha and in eucalypt forests about 2.5 ha. In the northern jarrah forests, home ranges are larger and have been recorded to at least 5.6 ha. Peppermint leaves form the basis of the WRP diet in coastal areas (between 79-100% based on a study of WRP near Busselton by Jones et al. 1994), but when unavailable, the dominant myrtaceous species are preferred. In the inland forest,	Present - core	Present Scats observed

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					Jarrah and Marri the main food source. Garden plant varieties are also exploited in urban areas. WRP use a range of nest and shelter sites to avoid predators and exposure to the weather. Dreys are constructed in the canopy if hollows are not available. Adequate nest and shelter sites are necessary components of good quality habitat (Jones 1994, Shedley and Williams 2014). Numerous local records (DBCA database 2021). Scat observed throughout the site in connected woodland/forest.		
FISH	GALAXIIDAE *Galaxiella munda*	Mud minnow, Western dwarf galaxias	-	VU	Occur in slow-running, tea-coloured streams usually in sandy areas. Also found in swamps, small ponds and roadside ditches. Also lives in the vegetated shallows of some freshwater lakes. Water is typically acidic (pH 4.5-6.5) and darkly tannin-stained. An inhabitant of temporary waters, capable of aestivating in damp bottom sediments over summer (Allen et al 2002) (Smith et al 2002). Several local records including downstream of the Upper Chapman Brook (DBCA database 2021).	Present – supporting Upper Chapman Brook and potentially other crossings	Possible
	Galaxiella nigrostriata	Black-stripe minnow	-	EN	Largely restricted to near-coastal wetlands from Augusta to Albany, although populations are also known near Bunbury and in the Ellen Brook catchment north of Perth. The existence of these satellite populations suggests that the minnow previously occurred in other wetlands along the Swan Coastal Plain, and perhaps were displaced as wetlands have been lost or degraded as the area was developed (e.g. salinisation, eutrophication, sedimentation, water abstraction), and in response to invasion of exotic species and due to a drying climate. Occupies the same ephemeral habitats as the salamanderfish and, like that species, is also capable of burrowing and aestivating (a state of dormancy similar to hibernation,	Marginal through the drainage lines	Unlikely

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					characterised by inactivity and a lowered metabolic rate) to survive the dry summer. Previous local surveys have not found the species nor is it likely to occur (DWER 2020). No nearby records.		
	GEOTRIIDAE *Geotria australis*	Pouched Lamprey	-	P3	Found between Margaret River and Denmark. After metamorphosis, young adults migrate downstream to estuaries and coastal waters, where they feed parasitically by rasping flesh from other fishes with their toothy tongues. They eventually cease feeding and migrate back to freshwater to breed (Gomon and Bray, 2011). The species has been found or is likely to be found in the local catchment (DWER 2021).	Present - supporting Upper Chapman Brook and Blackwood River	Possible
	LEPIDOGALAXIIDAE *Lepidogalaxias salamandroides*	Salamanderfish	-	EN	Common within its restricted range in near-coastal wetlands between Augusta and Albany, although the species has undergone a severe reduction in the extent of occurrence and area of occupancy in the last two decades which has coincided with an extensive period of severe drying of the region. It can occur in flowing streams within this range, however only generally in low abundance (DWER 2021).. Primarily found in highly acidic, shallow, temporary (dry out in summer) pools and swamps in coastal heathland. Fish survive drying through summer months by burrowing into the substrate where they aestivate. They will remain in the damp sandy soils until rains re-submerge the habitat the following year. Diet consists mainly of microcrustaceans and insect larvae (DWER 2021). The species has been surveyed for but is with the closest local record about 2.7 km south of the study area, in the Blackwood River (DWER 2021).	Present - supporting Blackwood River	Possible

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
	PERCICHTHYIDAE *Nannatherina balstoni*	Balston's Pygmy Perch	VU	VU	Balston's Pygmy Perch is a small freshwater fish that grows to a maximum length of around 90 mm (commonly 60 mm). This species is brownish dorsally and silver below, usually with a prominent brown mid-lateral stripe and a series of vertical brown bars on sides giving a cross-hatched pattern Balston's Pygmy Perch inhabits acidic, tannin-stained freshwater pools, streams and lakes in peat flats within 30 km of the coast of south-west WA, preferring shallow water, and commonly associated with tall sedge thickets and inundated riparian vegetation (SPRAT 2018) (Bray et al. 2018). Associated with slow-flowing, low salinity, acidic and tannin-stained waters, and complex instream habitat – recorded locally (DWER 2020). No nearby records within 10 km (DBCA database 2021).	Present - supporting Blackwood River	Unlikely
INVERTEBRATES	HYRIIDAE *Westralunio carteri*	Carters Freshwater Mussel	VU	VU	Carters Freshwater Mussel is the only freshwater mussel found in southwest WA. It is a bivalve found in freshwater streams, rivers, ponds, wetlands and lakes inland from the coast mostly areas with muddy, silty and sandy bottoms and flowing permanent water. Tracks can be seen along banks and sandy/muddy patches of stream bed where they are present. Native fish are critical to the Mussel's lifecycle - larval mussels attach themselves to native fish to develop into juvenile mussels. Mussels move along the bottom using a muscular tongue-like appendage known as a foot. Unlike their marine and estuarine cousins, they do not attach to structures. This allows them to move with receding water levels and position themselves to the best feeding spots (Murdoch University, 2010). Modelled as likely to be found locally (DWER 2020), though not observed at the site and probably only likely to occur in Upper Chapman Brook and Blackwood River.	Present - supporting Upper Chapman Brook and Blackwood River	Possible
	PARASTACIDAE *Engaewa pseudoreducta*	Margaret River Burrowing Crayfish	CR	CR	The Margaret River Burrowing Crayfish is endemic to south-west WA and occurs in two subpopulations, Treeton and Payne Road.	Marginal	Unlikely

Class	Family Genus species	Vernacular	Status Federal	Stat. WA	Requirements	Presence of habitat	Likelihood of occurrence
					At Treeton, it occurs in and adjoining State Forest No. 62 (Burnham 2014), in swampy headwaters of a tributary of the Margaret River, Osmington, about 9km north west of the site (Naturemap 2020). A burrow was found in the Bramley National Park. It is known from two sites in the area with individuals collected in 2003 and 2007 (Burnham et al. 2012). At Payne Road, the species occurs in Carbunup River catchment (south-east of Dunsborough), 16 km north of the Treeton Reserve sites (Burnham et al. 2012). No characteristic chimneys were observed though the species' cryptic, burrowing nature, the difficulty seeing and accessing burrows in often dense vegetation make it difficult to survey for.		Extremely restricted range.
	Engaewa reducta	Dunsborough Burrowing Crayfish	CR	CR	The Dunsborough Burrowing Crayfish uses a variety of habitats that provide moist sandy/loamy soils and an accessible water table. These include vegetated seepages, swamp plains and swampy headwaters of streams (CALM 2008) (Burnham et al 2012). There are several local records within the Blackwood River NP and one 2020 record near the Campbell Road / Warner Glen Road intersection (DBCA database 2021). There are several species - *E. pseudoreducta, E. reducta, E. similis* and *E. subcoerulea.* Kim Williams (DBCA) indicated that Engaewa burrows can potentially occur anywhere the soil and habitat conditions are suitable, however none of the threatened species are known to occur on Warner Glen or Hamlin Bay Roads. Note there are other non-threatened species (pers. comms. 6/08/2021).	Marginal	Unlikely Extremely restricted range.

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Appendix E Habitat Tree Survey Results

Table 6-1 Summary of hollows based on black cockatoo breeding habitat requirements

Y proj	X proj	Tree ID	Clearing	Spp	Dbh cm	Hollows	Classification
6227407	326214	**10**	IN 0-2m	Jarrah	75_100	2	Tree with suitable DBH with unsuitable hollow
6227407	326199	**11**	OUT 2-4m	Jarrah	50_75	1	Tree with suitable DBH with unsuitable hollow
6227385	325914	**14**	OUT 2-4m	Marri	75_100	1	Tree with suitable DBH with unsuitable hollow
6227371	325689	**18**	IN 0-2m	Jarrah	50_75	2	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6227362	325594	**21**	IN 0-2m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
6227352	325522	**22**	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
6227354	325504	**23**	IN 0-2m	Marri	>100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6227422	326474	**24**	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
6227500	327521	**30**	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6227599	328362	**35**	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6227646	328790	**44**	IN 0-2m	Marri	>100	1	Tree with potentially suitable size hollow with signs of use (not confirmed).
6228017	329891	**53**	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow
6228185	332796	**90**	OUT 2-4m	Marri	75_100	1	Tree with suitable DBH with unsuitable hollow
6225958	335455	**94**	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6225929	335468	**97**	OUT 2-4m	Marri	>100	3	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6225871	335430	**109**	OUT 2-4m	Jarrah	50_75	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6225847	335431	**125**	OUT 2-4m	Marri	50_75	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).
6219240	335170	**131**	OUT 2-4m	Marri	75_100	2	Tree with suitable DBH with unsuitable hollow

Table 6-2 Suitable DBH trees within the study area (note hollow 3 information not shown)

Y proj	X proj	Tree ID	Clearing	Spp	Dbh cm	Hollows	Classification	h1 size cm	h1 type	h1 height	h2 size	h2 type	h2 height
6227422	326453	**1**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227423	326449	**2**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227421	326443	**3**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227416	326375	**4**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227411	326305	**5**	OUT 2-4m	Jarrah	50_75	0	Tree with suitable DBH without hollows						
6227410	326273	**6**	OUT 2-4m	Jarrah	50_75	0	Tree with suitable DBH without hollows						
6227408	326243	**7**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227408	326237	**8**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227406	326229	**9**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227407	326214	**10**	IN 0-2m	Jarrah	75_100	2	Tree with suitable DBH with unsuitable hollow	<10cm	Knot angle suitable	10_15m	<10cm	Knot angle suitable	10_15m
6227407	326199	**11**	OUT 2-4m	Jarrah	50_75	1	Tree with suitable DBH with unsuitable hollow	10_15cm	Spout angle suitable	10_15m			
6227399	326147	**12**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227392	326055	**13**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
6227385	325914	**14**	OUT 2-4m	Marri	75_100	1	Tree with suitable DBH with unsuitable hollow	20cm+	Vertical	<10m			
6227381	325885	**15**	OUT 2-4m	Marri	75_100	0	Tree with suitable DBH without hollows						
6227379	325868	**16**	OUT 2-4m	Karri	75_100	0	Tree with suitable DBH without hollows						

622737	325784	**17**	OUT 2-4m	Karri	>100	0	Tree with suitable DBH without hollows						
622737	325689	**18**	IN 0-2m	Jarrah	50_75	2	Tree with potentially suitable size hollow with no signs of use (not confirmed).	10_15 cm	Spout angle suitable	10_15 m	10_15 cm	Knot angle suitable	<10m
622736	325679	**19**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622736	325637	**20**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
622736	325594	**21**	IN 0-2m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow	20cm +	Vertical	10_15 m			
622735	325522	**22**	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow	<10cm	Spout angle suitable	<10m			
622735	325504	**23**	IN 0-2m	Marri	>100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).	20cm +	Vertical	>15m			
622742	326474	**24**	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow	10_15 cm	Vertical	<10m			
622743	326526	**25**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
622744	326638	**26**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622748	327219	**27**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622749	327290	**28**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622750	327451	**29**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622750	327521	**30**	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).	20cm +	Vertical	<10m			
622755	327945	**31**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622758	328257	**32**	OUT 2-4m	Jarrah	50_75	0	Tree with suitable DBH without hollows						
622759	328313	**33**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
622760	328355	**34**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622759	328362	**35**	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).	15_20 cm	Vertical	>15m			
622760	328384	**36**	OUT 2-4m	Blackbutt	50_75	0	Tree with suitable DBH without hollows						

622761	328519	**37**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622761	328522	**38**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622760	328528	**39**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622761	328543	**40**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622762	328542	**41**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622761	328573	**42**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622764	328809	**43**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
622764	328790	**44**	IN 0-2m	Marri	>100	1	Tree with potentially suitable size hollow with signs of use (not confirmed).	10_15 cm	Spout angle suitable	>15m			
622765	328838	**45**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622765	328936	**46**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622765	328955	**47**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622767	329020	**48**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622777	329276	**49**	OUT 2-4m	Blackbutt	50_75	0	Tree with suitable DBH without hollows						
622780	329324	**50**	OUT 2-4m	Blackbutt	50_75	0	Tree with suitable DBH without hollows						
622801	329720	**51**	OUT 2-4m	Blackbutt	50_75	0	Tree with suitable DBH without hollows						
622801	329750	**52**	OUT 2-4m	Dead	50_75	0	Tree with suitable DBH without hollows						
622801	329891	**53**	OUT 2-4m	Marri	50_75	1	Tree with suitable DBH with unsuitable hollow	10_15 cm	Knot angle suitable	<10m			
622800	329922	**54**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622804	330300	**55**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
622805	330326	**56**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						

622805	330333	**57**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622806	330345	**58**	IN 0-2m	Blackbutt	50_75	0	Tree with suitable DBH without hollows							
622806	330354	**59**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622808	330385	**60**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622809	330397	**61**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows							
622810	330422	**62**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622813	330483	**63**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622813	330497	**64**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622814	330501	**65**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622822	330687	**66**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622823	330765	**67**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622824	330874	**68**	OUT 2-4m	Jarrah	50_75	0	Tree with suitable DBH without hollows							
622823	330872	**69**	OUT 2-4m	Jarrah	50_75	0	Tree with suitable DBH without hollows							
622823	330929	**70**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622824	330967	**71**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622823	330985	**72**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622823	331022	**73**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622823	331130	**74**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622821	331331	**75**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
622814	331539	**76**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							

622810	331901	**77**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622811	331949	**78**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
622811	331954	**79**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622813	332030	**80**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622813	332031	**81**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622816	332152	**82**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622816	332144	**83**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622815	332124	**84**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622818	332246	**85**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622820	332301	**86**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622821	332355	**87**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622824	332444	**88**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622824	332473	**89**	OUT 2-4m	Marri	75_100	0	Tree with suitable DBH without hollows						
622818	332796	**90**	OUT 2-4m	Marri	75_100	1	Tree with suitable DBH with unsuitable hollow	<10cm	Knot angle suitable	<10m			
622599	335468	**91**	OUT 2-4m	Flooded gum	50_75	0	Tree with suitable DBH without hollows						
622599	335461	**92**	OUT 2-4m	Flooded gum	50_75	0	Tree with suitable DBH without hollows						
622599	335451	**93**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622595	335455	**94**	OUT 2-4m	Marri	75_100	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).	20cm+	Vertical	<10m			
622595	335441	**95**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622594	335466	**96**	OUT 2-4m	Marri	75_100	0	Tree with suitable DBH without hollows						

622592	335468	**97**	OUT 2-4m	Marri	>100	3	Tree with potentially suitable size hollow with no signs of use (not confirmed).	20cm +	Knot angle suitable	>15m	15_20 cm	Knot angle suitable	>15m
622592	335460	**98**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622591	335462	**99**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622590	335468	**100**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622590	335473	**101**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622589	335446	**102**	OUT 2-4m	Jarrah	75_100	0	Tree with suitable DBH without hollows						
622589	335432	**103**	OUT 2-4m	Marri	>100	0	Tree with suitable DBH without hollows						
622590	335426	**104**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622591	335427	**105**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622592	335434	**106**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622588	335427	**107**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622588	335427	**108**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622587	335430	**109**	OUT 2-4m	Jarrah	50_75	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).	15_20 cm	Vertical	<10m			
622586	335430	**110**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622586	335435	**111**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622587	335446	**112**	OUT 2-4m	Dead	50_75	0	Tree with suitable DBH without hollows						
622587	335446	**113**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622579	335431	**114**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622579	335426	**115**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622579	335424	**116**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						

622580	335426	**117**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622583	335428	**118**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622581	335427	**119**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622581	335427	**120**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622584	335436	**121**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622584	335434	**122**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622584	335429	**123**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
622585	335426	**124**	OUT 2-4m	Marri	75_100	0	Tree with suitable DBH without hollows						
622584	335431	**125**	OUT 2-4m	Marri	50_75	1	Tree with potentially suitable size hollow with no signs of use (not confirmed).	10_15 cm	Vertical	10_15 m			
621949	335499	**126**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
621946	335472	**127**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
621945	335442	**128**	OUT 2-4m	Marri	75_100	0	Tree with suitable DBH without hollows						
621942	335400	**129**	IN 0-2m	Marri	50_75	0	Tree with suitable DBH without hollows						
621932	335279	**130**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
621924	335170	**131**	OUT 2-4m	Marri	75_100	2	Tree with suitable DBH with unsuitable hollow	<10cm	Knot angle suitable	>15m	10_15 cm	Spout angle NOT suitable	>15m
621918	335087	**132**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
621902	334876	**133**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
621900	334851	**134**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
621897	334811	**135**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						
621894	334769	**136**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows						

621892	334742	**137**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
621889	334697	**138**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
621885	334646	**139**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							
621885	334641	**140**	OUT 2-4m	Marri	50_75	0	Tree with suitable DBH without hollows							