# Basic and Targeted Fauna Survey

## Proposed dam on Lots 9951 and 9952, Boorara Brook

JULY 2024

## Version control

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**Statement of limitations**

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**Common terms/acronyms**

| | |
|---|---|
| BC Act | WA *Biodiversity Conservation Act 2016* |
| DCCEEW | Federal Department of Climate Change, Energy, the Environment and Water |
| 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 / Study area | A 10 km buffer around the Survey area |
| NP | National Park |
| Project | The proposed action |
| Survey area | Proposed dam site at Lots 9951 and 9952, Boorara Brook |
| 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

Marvelus Berry Developments Pty Ltd is planning a new circa 6.41 ha dam on Lots 9951 and 9952 (Deposited Plan 203883), Boorara Brook, approximately eight kilometres south of Northcliffe, within the Shire of Manjimup. SW Environmental was commissioned to carry out a Basic[1] survey and targeted black cockatoo survey[2] of the proposed dam site. The survey was restricted to terrestrial vertebrate fauna. Threatened aquatic fauna and invertebrates were considered through desktop assessment only.

Field work consisted of a site reconnaissance visit on 23rd and 24th of May 2024 by SW Environmental Principal, Shane Priddle. The proposed dam site contained two existing dams, cleared areas, and mostly degraded regrowth riparian native vegetation. Most of the site has a history of cattle grazing, apart from an area to the east of a powerline easement which has been fenced off. The Boorara - Gardner National Park occurs to the east and downstream of the site. The proposed dam includes a minor, unnamed tributary of the Gardner River, parts of which were flowing at the time of the survey.

In a local context (10 km study area), there is extensive habitat remaining, with 75 % of land mapped as native vegetation (25,870 ha) and 62 % (21,400 ha) gazetted DBCA land (SLIP 2024). The dam is within an area mapped as a*: with an edge touching or <100 m from a linkage mapped SWREL buffers* (Molloy et al 2009). These have a high habitat connectivity, linkage and corridor importance at the patch and landscape scales.

Desktop searches for fauna that may occur within the study area (10 km) yielded 218 vertebrate terrestrial species, with nine being introduced or naturalised. Twenty terrestrial vertebrate fauna of conservation significance may occur locally (not necessarily within the study area). Additionally, four fish and four invertebrates of conservation significance may also occur.

Key structural habitat types were recorded:

1. Peppermint open forest and woodland (regrowth) 1.23 ha
2. Karri over Peppermint tall open forest (regrowth) 1.67 ha
3. Karri tall open forest over Karri oak shrub layer 1.17 ha
4. Remnant Marri Karri Jarrah forest over Peppermint and native shrubs 0.65 ha

C Cleared or paddock trees 1.84 ha

FD Existing farm dam 0.91 ha

[1] Environmental Protection Authority 2020, Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment, EPA, Western Australia.

[2] Black cockatoos collectively refers to

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

Fauna habitat quality was moderate over the areas of vegetation due to the narrow drainage line width. Cleared areas and paddock trees were assigned poor habitat quality, being actively grazed and offering limited habitat opportunities to most fauna. Areas of good quality habitat were where vegetation was in a good or better condition, with relatively intact structural and species diversity, less edge effects, including the Karri patch (with older, larger trees) to the north east of the dam site and the remnant vegetation to the east of the powerline.

Twenty species of fauna were observed within the survey area (15 birds and five mammals). Western ringtail possum (threatened) may occur within the northern dam site, within the vegetation to the east of the powerline. Baudin's cockatoo, FRTBC and Southern brown bandicoot are both conservation significant fauna and were recorded.

There were a total of 45 suitable DBH trees recorded within the survey area (2 dead, 1 Jarrah, 16 Marr, 26 Karri – 17 which were over 75 cm DBH), with only one of which identified as hollow bearing, a Jarrah (ID 21) within the remnant vegetation east of the powerline. Karri are unlikely to develop large hollows until they are at least 75 cm DBH. No roosts were observed within the survey area, nor are there any recorded within the DBCA database (DBCA 2024).

Foraging habitat quality was considered low or would not be defined as *quality foraging habitat*, except for the 1.12 ha of remnant vegetation to the east of the powerline, which contained a variety of plants used by black cockatoo for foraging (Banksia, Jarrah, Marri etc). Baudin's cockatoo and FRTBC feed residue, chewed Marri cones, were observed throughout the area. A flock of approximately 10 FRTBC were observed foraging at this location.

Although not confirmed from the site, suitable habitat occurs for Water Rat (*Hydromys chrysogaster*) (-, P4). The following species occur locally, however habitat is considered unsuitable within most of the proposed dam site, with the exception of the remnant patch east of the powerline in the northern dam site (possibly suitable):

- Southern Brush-tailed Phascogale (*Phascogale tapoatafa*) -, S
- Quokka (*Setonix brachyurus*) VU, VU
- Western Ringtail Possum (*Pseudocheirus occidentalis*) CR, CR
- Mud minnow, Western dwarf galaxias (*Galaxiella munda*) -, VU
- Black-stripe minnow (*Galaxiella nigrostriatal*) -, EN
- Salamanderfish (*Lepidogalaxias salamandroides*) -, EN

None of the fauna above were identified within the remaining, degraded parts of the survey area. A possible WRP drey was identified on the eastern edge of remnant vegetation, though it may have been a White-browed Babbler (*Pomatostomus superciliosus*) nest, which are found in similar habitat.

# 1 Introduction

## 1.1 Background

Marvelus Berry Developments Pty Ltd 'the proponent' is planning to construct a new circa 6.41 ha dam to service an existing commercial strawberry farm on Lot 9951 and Lot 9952 deposited Plan 203883, Boorara Brook. Lots 9951 and 9952 are located approximately eight kilometres (km) south of Northcliffe, within the Shire of Manjimup. The survey area and 'study area' (within 10 km of the survey area) are shown in Figures A.1 and A.2 (Appendix A).

The proponent has submitted a Clearing Permit application to the Department of Water and Environmental Regulation (DWER). This Fauna Survey report identifies fauna and habitat values within the survey area and will be used to guide the project design to and inform environmental assessment.

## 1.2 Scope of work

SW Environmental was commissioned to carry out a Basic[3] survey comprising of habitat assessment and likelihood of occurrence for conservation significant fauna, along with a targeted black cockatoo survey[4]. 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 (EPA 2020) 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,
- Consultation, reporting, mapping, and recommendations.

[3] Environmental Protection Authority 2020, Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment, EPA, Western Australia.

[4] Black cockatoos collectively refers to

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

## 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. Refer to Appendix B for further detail and 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 Climate Change, Energy, the Environment and Water (DCCEEW) | 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 as 'conservation significant' or 'target' species. These terms include species 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).
- Commonwealth *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered), Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable), Calyptorhynchus baudinii, and Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC 2012).

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

# 2 Methods

## 2.1 Desktop study

A desktop study of fauna within and near the survey 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 survey area and the importance of the site to them. Common (non-target) species are also considered more generally.

Species lists from Atlas of Living Australia (ALA, 2024), Birdata (BirdLife Australia, 2024) and Naturemap (DBCA 2024) (Appendix C.1) were compiled for within 10 km of the survey area. This was supplemented by database searches from the Protected Matters Search Tool, also within 10 km (Appendix C.2). Data from the Government of WA's Shared Land Information Platform (SLIP, 2024) was queried along with relevant management plans, recovery plans, books, scientific journals and other publications, previous survey reports (Index of Biodiversity Surveys for Assessments (IBSA, 2024)) and expert consultation. Landgate aerial photography was supplemented by a 5 cm resolution orthophoto derived from drone surveys undertaken on 23.05.2024.

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 the survey area (SLIP 2024).

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 survey area included a total of approximately 6.41 ha. Field work consisted of a site reconnaissance visit on 23rd and 24th of May 2024 by SW Environmental Principal, Shane Priddle. The field visit was undertaken to validate the desktop study and ground truth fauna habitat. Fauna habitat types were documented based on structural vegetation and soil mapping where significant changes occurred. Fauna habitat quality was based on the criteria in Tables 2-1 to 2-3. Evidence of fauna (e.g., scat searches, diggings or feed residue), and fauna sightings were also noted. Targeted black cockatoo searches were also carried out in line with the methodology outlined in Section 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, midstory, canopy).<br>• Forest/woodland: abundant hollow-bearing trees, including those with or likely to develop large hollows. Mature trees offer more foraging resources (nectar/seed).<br>• Presence of shelter/refuges at ground level (dense understorey plants, tussock, rocky outcrop, hollow logs).<br>• High habitat complexity (ecotones between vegetation types or habitat mosaic). This increases the range of foraging and shelter opportunities within a habitat.<br>• Presence of key foraging and microhabitat components for target species.<br>• Little to no obvious weed invasion or evidence of grazing.<br>• 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.<br>• Forest/woodland: low to moderate abundance of hollow-bearing trees or trees likely to develop hollows.<br>• Some shelter and refuge present for ground dwelling fauna.<br>• Some habitat complexity (ecotones between vegetation types or areas forming a habitat mosaic).<br>• Marginal presence of key microhabitat components for target species.<br>• 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.<br>• Little or no shelter and refuge for ground dwelling fauna.<br>• Forest/woodland: not likely to support hollow-bearing trees.<br>• Lack of key foraging and microhabitat components for target species.<br>• May have evidence of weed invasion or grazing.<br>• 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

Field survey methodology was based on the Commonwealth referral guidelines for black cockatoos (DAWE, 2022; SEWPaC 2012) and black cockatoo species profiles provided in the desktop study (Section 3.4). The species profiles are based on literature review and previous consultation and work 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 based on known feed species and structural vegetation mapping, with presence or absence of feed residue.
- **Roosting habitat survey**: Direct and indirect evidence of black cockatoo roosts within trees on site was noted if observed.

- **Suitable DBH tree and hollow survey:** DBH refers to Diameter at Breast Height, described below. A ground based assessment of each tree was made using binoculars. Trees were mapped by GPS (~2 m accuracy), with notes made on tree species and DBH size class. The number of hollows, aperture size, angle, height, breeding suitability and evidence of use were also recorded. 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 50 cm DBH (or 75 cm for Karri) that have hollows that are not suitable due to the entrance size, 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.

  For the majority of tree species in the Southwest, suitable DBH Trees are those with a DBH >50 cm, as they are considered large enough to start developing large hollows important for recruitment (SEWPAC 2012). Trees >75 cm are generally large enough to be senescing and are therefore more likely to contain large hollows. Although Karri were still recorded at greater than 50 cm, based on previous survey experience, the minimum 'large tree' size class for Karri should be raised from 50cm to 75cm DBH, as a Karri with a 50cm DBH are likely to be less than 100 years old and considered too small and of insufficient age to develop the large hollows required by black cockatoos for breeding. See section 3.2 for further discussion.

Ten kilometres is referenced within this document as a nominal distance in considering local habitat values, due to that distance being considered near the maximum 12 km identified in literature that black cockatoos travel from their nesting site to forage (Commonwealth of Australia 2017).

## 2.4 Survey references

### Publications

Publications consulted for general distribution of fauna included, but were 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).

### Local technical surveys

Technical fauna surveys relevant to the project in a regional habitat context include

- Biota (2020). Regional Population Assessment of the Western Ringtail Possum. Unpublished report for Main Roads Western Australia.
- SW Environmental (2020) Targeted Fauna (black cockatoo, Quokka and Wester Ringtail Possum) Survey Proposed Record Brook Reservoir. Unpublished report for Stream Environment and Water.
- SW Environmental (2020) Black Cockatoo Survey Proposed Southern Forests Irrigation Scheme. Unpublished report for Stream Environment and Water.
- 360 Environmental (2019) Southern Forest Irrigation Scheme: Detailed Level 2 Terrestrial Vertebrate Fauna Survey. Includes pipeline and reservoir site.
- Bamford and Chuk (2016) Manjimup Irrigation Project - Fauna Assessment. Includes pipeline and reservoir site.
- Greenbushes Targeted Vertebrate and SRE Invertebrate Fauna Survey - Talison Lithium Limited 12 April 2018 (Biologic, 2018)
- Report on fauna monitoring objectives, targets and performance measures – March 2016 (Forest Products Commission Western Australia, 2016)
- Greenbushes Level 1 Fauna Survey - Talison Lithium Limited 2011 (Biologic, 2011)

### Taxonomy and nomenclature

The taxonomy and nomenclature used in this report follow several sources, depending on the faunal group. It primarily follows Naturemap (2024) 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. Surveys were also carried out under Scientific Use License *Animal Welfare Act 2002* Licence to use animals for scientific purposes: Licence No: U285/ 2022-2024 and Wildlife Animal Ethics Committee (WAEC) Permit: WAEC 22-08-88.

## 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) nearly over 25 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. |
| Adequacy of the survey intensity and proportion of survey achieved | No | Suitable survey effort has been adopted to identify the fauna constraints associated with impacting the survey area. A precautionary approach has also been adopted. |
| The proportion of the task achieved and further work | No | The survey was completed adequately, to a sufficient level with respect to the scope. |
| Timing/weather/season | No | Survey timing (autumn 2024) and weather conditions were suitable to detect most target species. FRTBC may breed in autumn and spring. White tailed black cockatoos however would not have been breeding at the time of the survey though older evidence (chewed hollow entries) and feed residue would have still been still visible. |
| Disturbances that may have affected results of survey | No | There were no disturbances that affected the survey. |
| Intensity | No | Survey intensity was considered adequate to meet the scope. |
| Completeness | Negligible | The entire study area was surveyed. The study area was on private land and generally accessible. Dense vegetation, however, hindered the completed survey effort to some degree, as discussed below. |
| Resources | No | The survey was completed adequately. |
| Access problems; | No | Site was on private land and accessible. |
| Identification of hollows | Low | Within Karri Forest, but also in other forest types, dense understorey vegetation can prohibit movement around the forest floor when measuring trees or searching for hollows. Karri trees are also typically very tall, meaning hollows can be difficult to identify or inspect for usage from ground level, particularly if they have a vertical orientation or are located in the canopy. These factors reduced confidence that all trees were >50 cm DBH were recorded.<br>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, or may be obscured, particularly vertical hollows or hollows in trees that aren't accessible.<br>Known limitations inherent in the ground survey of hollows include bias between different surveyors or 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 |

| Aspect | Constraint | Comment |
|---|---|---|
| | | (Gorrod & Keith 2008, Rayner et al. 2011). Poor visibility such as overcast weather is known to affect results also (Rayner et al. 2011).<br>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).<br>Hollow characteristics change over time. There is some risk that black cockatoos may be breeding in a hollow where evidence of use was not visible or hollow characteristics were atypical. 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*

The proposed dam site contained existing smaller dams within the footprint. It also contained cleared areas with paddock trees with historic cattle grazing, and generally degraded regrowth riparian native vegetation. The area to the east of the powerline easement has been fenced off and is part of a larger intact remnant vegetation patch. Adjacent land uses include freehold agriculture, pasture for cattle grazing and commercial orchards with narrow (20-50 m) vegetated corridors along road verges and drainage lines. The Boorara - Gardner National Park (NP) occurs to the east and downstream of the survey area. See Figures 1 and 2 (Appendix A).

### *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 Warren (WAR01) region, 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 (Hearn et al 2002).

### *3.1.3 DBCA managed lands, habitat connectivity, linkage, or corridor values*

The Boorara - Gardner NP occurs downstream, 300 m to the east of the survey area (Figures 1 and 2, Appendix A). At a regional scale, the survey area occurs centrally within an extensive broader NP system across a large continuous tract of land extending over 100 km to the east, west and 15 km south to the Southern Ocean. Within the study area (10 km) 62 % (21,409 ha) of the local land is gazetted DBCA land (SLIP 2024).

The South West Regional Ecological Linkages (SWREL) project (Molloy et al 2009) 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 are a series of vegetation patches which, due to their proximity, act as habitat stepping stones facilitating ecological processes and movement of organisms within and across the landscape (i.e. at the landscape scale) (Molloy et al 2009). In a local context, there is extensive habitat remaining – 75 %

of land is mapped as native vegetation, including regrowth (25,868 ha) (SLIP 2024) within the study area (10 km). The survey area is within an area mapped as a: *with an edge touching or <100 m from a linkage* mapped SWREL buffers (Molloy et al 2009). These have a high habitat connectivity, linkage and corridor importance at the patch and landscape scales.

## 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). Manjimup is generally windy all year round, with short, warm, and dry summers and long, cold, and wet winters.

From the nearby Shannon (Site 009968) data station (BoM 2024), around 25 km from the survey area, the temperature ranges from a long-term average maximum of 26.8°C in the hottest month of February to an average minimum of 6.7°C in August, with a long-term average annual rainfall of 988 mm, with most of the rain falling between June and August (BoM 2024). Over the course of the year, the temperature typically varies from 6°C to 28°C and is rarely below 2°C or above 35°C.

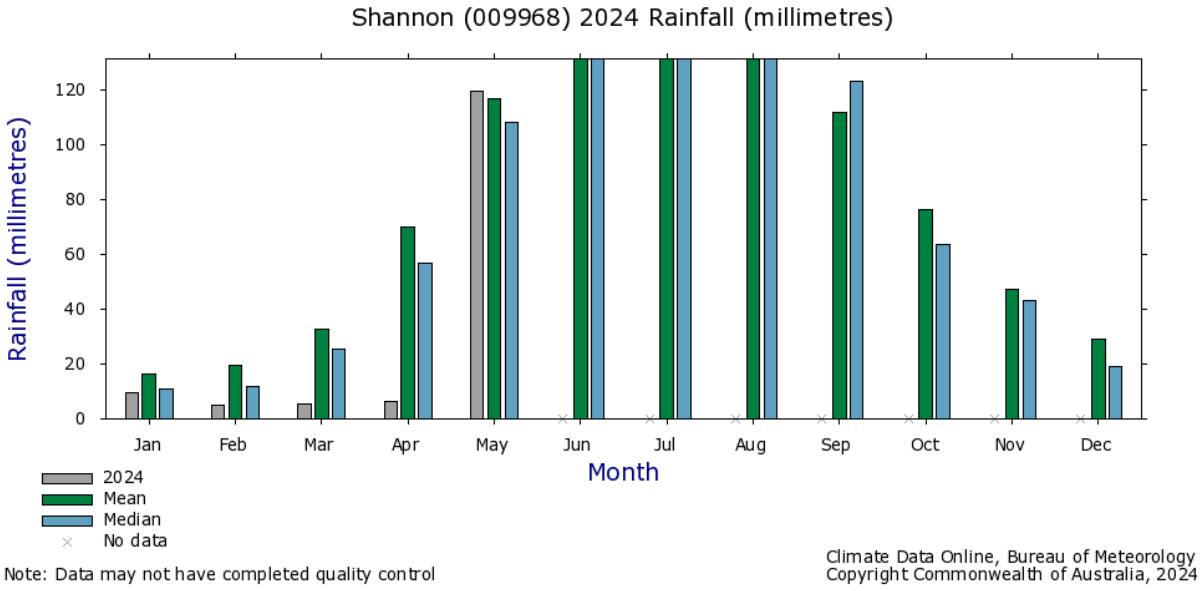


**Figure 1 Annual rainfall near the study area (Shannon (Site 009968) data station; BoM 2024)**

The study area occurs over a low, rolling topography and crosses the following soil map units (Tille and Lantzke 1990, SLIP 2024):

- 254PvV2 Major Valleys V2 Subsystem (Pimelia): Valleys in granitic areas; 20-40 m relief; smooth, moderate slopes; narrow terrace (majority of the site).
- 254NfCOy Collis yellow duplex Phase: Gravelly yellow duplex soils; Jarrah-Marri forest (small section of the site).

### *3.2.2 Wetlands and watercourses*

The survey area is not associated with any mapped wetlands being outside of DBCA's Consanguineous Wetlands Suites and Geomorphic Wetlands datasets. A minor, unnamed tributary of the Gardner River occurs along the proposed dam site and was flowing at the time of the survey though turbid and degraded west of the powerline easement. East of the powerline easement was in better condition.


**Photo 3-1 Portion of the proposed dam site (blue) showing existing farm dams and riparian vegetation. Estimate only and not to scale.**


**Photo 3-2 Existing dam with degraded fringing vegetation.**


**Photo 3-3 Existing farm dam with cleared banks**


**Photo 3-4 Narrow drainage line flowing at the time of the survey, with turbid intermittent pools.**

### *3.2.3 Vegetation mapping*

The survey area contained remnant vegetation (SLIP 2024), mapped by Beard (1981) as Vegetation Association *Nornalup 1144 – Mainly karri Eucalyptus diversicolor or Tuart E. gomphocephala*. Vegetation Associations 1144 contains trees species that are known to develop large hollows.

## 3.3 Fauna records

### *3.3.1 Fauna recorded locally*

Desktop searches for fauna that may occur or have been recoded within the study area (10 km) yielded 218 vertebrate terrestrial fauna species (Appendix C.1):

- 12 amphibians.

- 151 birds,
- 31 mammals, and
- 24 reptiles

At least nine of the listed fauna are introduced or naturalised species. Invertebrates and marine or aquatic dependant species (fish) are not included in the list. Marine or coastal (such as waders or shorebirds) specialists have been excluded, given that the survey area is in an upland terrestrial setting and some wetland taxa may be included in the list, even though they may not occur at the survey site.

### *3.3.2 Fauna of conservation significance*

Based on the evaluation provided in Appendix D, there are 20 terrestrial vertebrate fauna of conservation significance that may occur locally (not necessarily within the study area). Additionally, four fish and four invertebrates of conservation significance may also potentially occur.

There are no Important Bird Areas within the locality (areas identified by Birdlife International as conservation priorities) (Birdlife International, 2023). The study area occurs within the breeding distribution of all three black cockatoo species (SEWPaC 2012), but on the southern edge of the breeding distribution for Carnaby's cockatoo. Detailed species profiles are provided below.

## 3.4 Black cockatoo species profiles

The black cockatoo species profiles below provide context around the survey methods and results.

### *3.4.1 Black cockatoo profiles*

**Baudin's cockatoo (*Zanda 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 breeds 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 a migrant, with the bulk of the population vacating the coldest parts of their range (i.e. the Karri forest) in the autumn and migrating northwards during the non-breeding season. Small numbers also appear resident in a few places, including the 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., 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 (*Zanda latirostris*)**
EN (EPBC Act), EN (BC Act)

The species 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). 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.

It is known to forage in native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as Banksia, Hakea, and Grevillea spp. It forages in pine plantations, Eucalypt woodland and forest, individual trees and small stands of these species (SEWPAC 2012). Carnaby's cockatoos are known to roost in Jarrah, Marri, Blackbutt, Bullich, exotic eEucalypt 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 and nesting along the Swan Coastal Plain. 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 and Cape Lilac (SPRAT 2019). FRTBC are known to roost in Jarrah, Marri, Blackbutt, Bullich and introduced Eucalypt species.

### *3.4.2 Black cockatoo breeding requirements*

All three black cockatoos rely on large hollows for breeding, typically >20cm in diameter, which 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 (Koch 2009).

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

- large senescing trees,
- spout hollows that are not angled more than 45 degrees from vertical,
- entrances of at least 12 cm but usually much larger (20-30cm),
- deep or well sheltered hollows in main trunk or large branches which are able to provide a floor space of at least 30 cm diameter or more.

All three species of black cockatoo are of similar size and utilise similar types of hollows when breeding. The actual species of tree is probably unimportant to each individual species, for example, Carnaby's cockatoo use marri 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). Marri and Jarrah trees are considered by the 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 generally may develop hollows at 30 cm DBH, and Karri at 75 cm.

Hollows suitable for use by black cockatoos are usually in trees at least 120 years old, usually much older. Literature supporting this includes suitable breeding hollows in:

- trees over 150 years old (Koch 2009),
- Marri trees of a mean age of about 200 years and Jarrah 300 years, with an average tree age being inhabited at 400 for Marri and 500 years old for Jarrah (Inions et al. 1989),
- Marri trees aged between 140 and 410 years of age (Johnstone et al 2015),
- Jarrah trees aged between 120 and 150 years (Whitford et al 2013),
- Marri trees aged around 450 years, used by the medium sized Long-billed Corella (smaller than black cockatoos) (Mawson et al. 1994),
- Jarrah tree over 1000 years (as stags) (Wayne 2005).

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 A.3 (Appendix A). There are four main structural habitat types, all over clay and white sandy loam soils.

1. Peppermint open forest and woodland (regrowth) 1.23 ha
2. Karri over Peppermint tall open forest (regrowth) 1.67 ha
3. Karri tall open forest over Karri oak shrub layer 1.17 ha
4. Remnant Marri Karri Jarrah forest over Peppermint and native shrubs 0.65 ha

C Cleared or paddock trees 1.84 ha

FD Existing farm dam 0.91 ha

Fauna habitat quality was moderate over most of the vegetated areas, due to the relatively narrow drainage line, and degraded nature of site. Cleared areas were generally of poor habitat quality, being actively grazed and offering limited habitat opportunities. The areas of good quality habitat were where vegetation was in a good or better condition, with relatively intact structural and species diversity, and less edge effects, including the Karri patch (with larger trees) to the north east of the survey area and the remnant vegetation to the east of the powerline.

**Table 4-1 Fauna habitat types within the survey area**

| Code | Fauna habitat type | Fauna habitat quality | Area (ha) | Photo |
|---|---|---|---|---|
| **1** | Peppermint open forest and woodland (regrowth) | Moderate | 1.23 ha |   |
| **2** | Karri over Peppermint tall open forest (regrowth) | Moderate | 1.67 ha |   |

| | | | | |
|---|---|---|---|---|
| **3** | Karri tall open forest over Karri oak shrub layer | Good | 1.17 ha |  |
| **4** | Remnant Marri Karri Jarrah forest over Peppermint and native shrubs | Good | 0.65 ha |  |

| | | | | |
|---|---|---|---|---|
| **C** | Cleared or paddock trees | Poor | 1.84 ha |  |
| **FD** | Existing farm dam | Moderate | 0.91 ha |  |

### *4.1.2 Suitable DBH trees and hollows*

There were a total of 45 suitable DBH trees (2 dead, 1 Jarrah, 16 Marri, 26 Karri – 17 which were over 75 cm DBH) within the survey area. Only one of which was recorded with a hollow, being a Jarrah (ID 21) within the remnant vegetation east of the powerline. As noted, Karri are unlikely to develop large hollows until they are at least 75 cm DBH.

## 4.2 Fauna recorded

Twenty species of fauna were observed within the survey areas (Table 4-2). The fauna recorded included 15 birds and five mammals. Western ringtail possum (threatened) may also occur within the vegetation to the east of the powerline. Baudin's cockatoo, FRTBC and Southern brown bandicoot are conservation significant fauna and were recorded.

Numerous other animals are likely to occur but are more cryptic, nocturnal or would not have been detected during the brief diurnal reconnaissance visit (such as bats, many reptiles and frogs which may not have been calling). In addition, many species may only use the site as a part of a larger area of occupancy, especially given that the survey area is close to the NP. The existing farm dams may also provide water sources for fauna, particularly birds, that were not recorded during the site visit.

**Table 4-2 Fauna recorded within the study area**

| Family | Scientific Name | Vernacular Name | Status |
|---|---|---|---|
| ACANTHIZIDAE | *Acanthiza inornata* | Western Thornbill | |
| ALCEDINIDAE | *Dacelo novaeguineae* | Laughing Kookaburra* | |
| ANATIDAE | *Anas superciliosa* | Pacific Black Duck | |
| ARTAMIDAE | *Cracticus tibicen* | Australian Magpie | |
| CACATUIDAE | *Calyptorhynchus banksii naso* | Forest Red-Tailed Black Cockatoo | T |
| | *Zanda baudinii* | Baudin's Cockatoo | T |
| MELIPHAGIDAE | *Anthochaera carunculata* | Red Wattlebird | |
| | *Phylidonyris novaehollandiae* | New Holland Honeyeater | |
| PACHYCEPHALIDAE | *Colluricincla harmonica* | Grey Shrike-Thrush | |
| | *Pachycephala rufiventris* | Rufous Whistler | |
| PSITTACIDAE | *Barnardius zonarius* | Australian Ringneck | |
| | *Platycercus icterotis* | Western Rosella | |
| RHIPIDURIDAE | *Rhipidura albiscapa* | Grey Fantail | |
| | *Rhipidura leucophrys* | Willie Wagtail | |
| TIMALIIDAE | *Zosterops lateralis* | Silvereye | |
| BOVIDAE | *Bos taurus* | Cow * | |
| CANIDAE | *Vulpes vulpes* | Fox* | |
| LEPORIDAE | *Oryctolagus cuniculus* | Rabbit* | |
| MACROPODIDAE | *Macropus fuliginosus* | Western Grey Kangaroo | |
| PERAMELIDAE | *Isoodon fusciventer* | Southern Brown Bandicoot | P4 |

## 4.3 Fauna of conservation significance

### *4.3.1 Local records*

Desktop assessment identified 28 fauna of conservation significance, recorded or likely to occur within the study area (10 km) (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 may occur are summarised in Table 4-3. Taxa with 'likelihood of occurrence' in green are considered further in Section 4.3.2.

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

| Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| CACATUIDAE<br>*Calyptorhynchus banksii naso* | Forest Red-tailed Black Cockatoo | VU | VU | Present - supporting | Present |
| *Zanda baudinii* | Baudin's Cockatoo | EN | EN | Present - supporting | Present |
| *Zanda latirostris* | Carnaby's Cockatoo | EN | EN | Present - supporting | Possible |
| *Phascogale tapoatafa* | Southern Brush-tailed Phascogale | - | S | Present - supporting | Unlikely, occasional visitor,<br>**Possible in the remnant patch east of the powerline** |
| *Setonix brachyurus* | Quokka | VU | VU | Marginal | Unlikely, occasional visitor,<br>**Possible in the remnant patch east of the powerline** |
| MURIDAE<br>*Hydromys chrysogaster* | Water Rat | - | P4 | Present - core | Possible |
| PERAMELIDAE<br>*Isoodon obesulus fusciventer* | Southern Brown Bandicoot | - | P4 | Present - core | Present |
| PSEUDOCHEIRIDAE<br>*Pseudocheirus occidentalis* | Western Ringtail Possum | CR | CR | Marginal | Unlikely, occasional visitor,<br>**Possible in the remnant patch east of the powerline** |
| VESPERTILIONIDAE<br>*Falsistrellus mackenziei* | Western False Pipistrelle | - | P4 | Present - core | Possible |
| GALAXIIDAE<br>*Galaxiella munda* | Mud minnow, Western dwarf galaxias | - | VU | Present - supporting | Unlikely but may occur offsite upstream and downstream,<br>**Possible in the remnant patch east of the powerline** |

| Family<br>Genus species | Vernacular | Status<br>Federal | Stat.<br>WA | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|
| *Galaxiella nigrostriata* | Black-stripe minnow | - | EN | Present - supporting | Unlikely but may occur offsite upstream and downstream,<br>**Possible in the remnant patch east of the powerline** |
| LEPIDOGALAXIIDAE<br>*Lepidogalaxias salamandroides* | Salamanderfish | - | EN | Present - supporting | Unlikely but may occur offsite upstream and downstream,<br>**Possible in the remnant patch east of the powerline** |

### *4.3.2 Species profiles and site values*

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

**Black cockatoos**

BREEDING HABITAT AND ROOST SITES

There were a total of 45 suitable DBH trees recorded within the survey area. Only one of which was identified as hollow bearing, a Jarrah (ID 21) within the remnant vegetation east of the powerline in the northern site. As noted, Karri are unlikely to develop large hollows until they are at least 75 cm DBH. Suitable DBH trees and trees with hollows are mapped in Figure A.3, Appendix A. No roosts were observed within the survey area, nor are there any recorded within the DBCA database (DBCA 2024).

FORAGING HABITAT

Foraging habitat quality was considered low, or would not be defined as *quality foraging habitat* over either site, except for the 1.12 ha of remnant vegetation to the east of the powerline which contained a variety of plants used by black cockatoo for foraging (Banksia, Jarrah, Marri etc). Baudin's cockatoo and FRTBC feed residue, chewed Marri cones, were observed throughout the area. A flock of approximately 10 FRTBC were observed foraging.

The desktop study identified that approximately 62 % (21,400 ha) of the local land (10 km) is gazetted DBCA land with the Boorara - Gardner and D' Entrecasteaux NPs immediately adjacent (SLIP 2024). Further, there is extensive habitat remaining within 10 km of the survey area, approximately 75 % of land is mapped as native vegetation, including regrowth (25,870 ha) (SLIP 2024). Much - though not all - of this vegetation may provide suitable black cockatoo foraging habitat.

**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 (DEC 2010).

Southern Brown Bandicoot diggings were detected within the survey area during fieldwork. It is likely that the species is utilising the site as part of a larger, connected habitat patch. Impacts would be associated with direct loss of habitat, and existing populations are likely to be pushed downstream and into the NP areas, should any clearing occur.

**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. The species typically forages close to the shoreline, restricting its movements to shallow water (up to 2 m in depth) (CSIRO, 2004).

Although not confirmed from the site, suitable habitat for the Water rat occurs. Water rats may utilise the drainage line both directly and as supporting habitat to move between other habitat patches. Clearing may contribute to habitat loss and existing populations are likely to be pushed downstream and into the NP areas.

**Southern Brush-tailed Phascogale (*Phascogale tapoatafa*) -, S**

**Quokka (*Setonix brachyurus*) VU, VU**

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

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

**Black-stripe minnow (*Galaxiella nigrostriatal*) -, EN**

**Salamanderfish (*Lepidogalaxias salamandroides*) -, EN**

Although the six species listed above occur locally, except for the remnant patch east of the powerline, habitat is considered unsuitable over most of the survey area. The remnant patch (0.65 ha) may provide habitat for one or more of the above species. A possible WRP drey was identified on the eastern edge of the remnant vegetation. The author is experienced in surveying for WRP and it is possible that the observed drey was a White-browed Babbler (*Pomatostomus superciliosus*) nest, which are found in similar habitat. They often occur in noisy, social groups, and create very similar nest to WRP dreys, though normally there are several in close proximity. They could have been present downstream and not accessible during the survey. Fish were not specifically sampled for, though none were observed. Brush-tailed Phascogale habitat was considered marginal due to lack of hollows. Where habitat was potentially suitable (e.g. Peppermint Forest for WRP, or understorey for Quokka) there was no evidence of these species occurring (scats, runnels, dreys or hollows).

# 5 Conclusions

The following points summarise the fauna values of the survey area:

- The survey area included the proposed 6.41 ha dam site, comprised of existing dams, cleared areas and degraded riparian native vegetation. A fenced area to the east of a powerline easement is part of a larger, intact remnant vegetation patch. The Boorara - Gardner NP occurs to the east and downstream of the site.
- In a local context (10 km), 75 % of land is mapped as native vegetation and 62 % gazetted DBCA land (SLIP 2024). These areas have high habitat connectivity, linkage and corridor importance at the patch and landscape scales (Molloy et al 2009).
- A minor, unnamed tributary of the Gardner River passes through the site, and was flowing at the time of the survey.
- Desktop searches for fauna that may occur within study area found 218 vertebrate terrestrial species, including 20 terrestrial vertebrate fauna of conservation significance. Additionally, four fish and four invertebrates of conservation significance may also occur.
- Four key structural habitat types were recorded.
    - 1. Peppermint open forest and woodland (regrowth) 1.23 ha
    - 2. Karri over Peppermint tall open forest (regrowth) 1.67 ha
    - 3. Karri tall open forest over Karri oak shrub layer 1.17 ha
    - 4. Remnant Marri Karri Jarrah forest over Peppermint and native shrubs 0.65 ha
    - C  Cleared or paddock trees 1.84 ha
    - FD Existing farm dam 0.91 ha
- Fauna habitat quality was moderate in the vegetated areas. Cleared areas were assigned poor habitat quality. Areas of good quality habitat were where vegetation was in a good or better condition with intact structural and species diversity, less edge effects, including the north eastern Karri patch and remnant vegetation east of the powerline.
- Twenty species of fauna were observed, including 15 birds and five mammals. WRP may occur within the vegetation to the east of the powerline. Baudin's cockatoo, FRTBC and Southern brown bandicoot are conservation significant and were recorded.
- There were a total of 45 suitable DBH trees (2 dead, 1 Jarrah, 16 Marr, 26 Karri – 17 which were over 75 cm DBH) recorded within the survey area. Only one of which was identified as hollow bearing, a Jarrah (ID 21) from the remnant vegetation east of the powerline.
- No roosts were observed within the survey area, nor are there any recorded within the DBCA database (DBCA 2024).
- Foraging habitat quality was considered low, or would not be defined as *quality foraging habitat*, except for the 0.65 ha of remnant vegetation to the east of the powerline, which contained a variety of plants used by black cockatoo for foraging (Banksia, Jarrah, Marri etc). Baudin's cockatoo and FRTBC feed residue, chewed Marri cones, were observed throughout the area. A flock of approximately 10 FRTBC were observed foraging east of the powerline.

- Although not confirmed from the site suitable habitat occurs for Water Rat (*Hydromys chrysogaster*) (-, P4).
- The following species occur locally, however habitat is considered unsuitable within the most of the survey area, except for the remnant patch east of the powerline (possibly suitable):
    - Southern Brush-tailed Phascogale (*Phascogale tapoatafa*) -, S
    - Quokka (*Setonix brachyurus*) VU, VU
    - Western Ringtail Possum (*Pseudocheirus occidentalis*) CR, CR
    - Mud minnow, Western dwarf galaxias (*Galaxiella munda*) -, VU
    - Black-stripe minnow (*Galaxiella nigrostriatal*) -, EN
    - Salamanderfish (*Lepidogalaxias salamandroides*) -, EN

  None of the fauna above were identified within the remaining, degraded parts of the survey area. A possible WRP drey was identified on the eastern edge of remnant vegetation though may have been a White-browed babbler (*Pomatostomus superciliosus*) nest, which are very similar in appearance.

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# Appendix A Figures

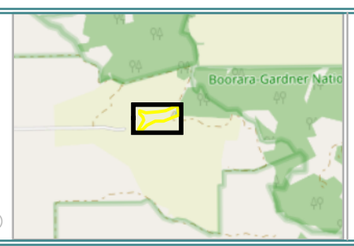
ANDREWS RD

## FIGURE A.1 SURVEY AREA

Survey area
Road
Minor drainage line

**PROPOSED DAM AT LOTS 9951 AND 9952, BOORARA BROOK**

Ref: SW515
Date: 9/07/2024 Author: SP




A3 @ 1:1500

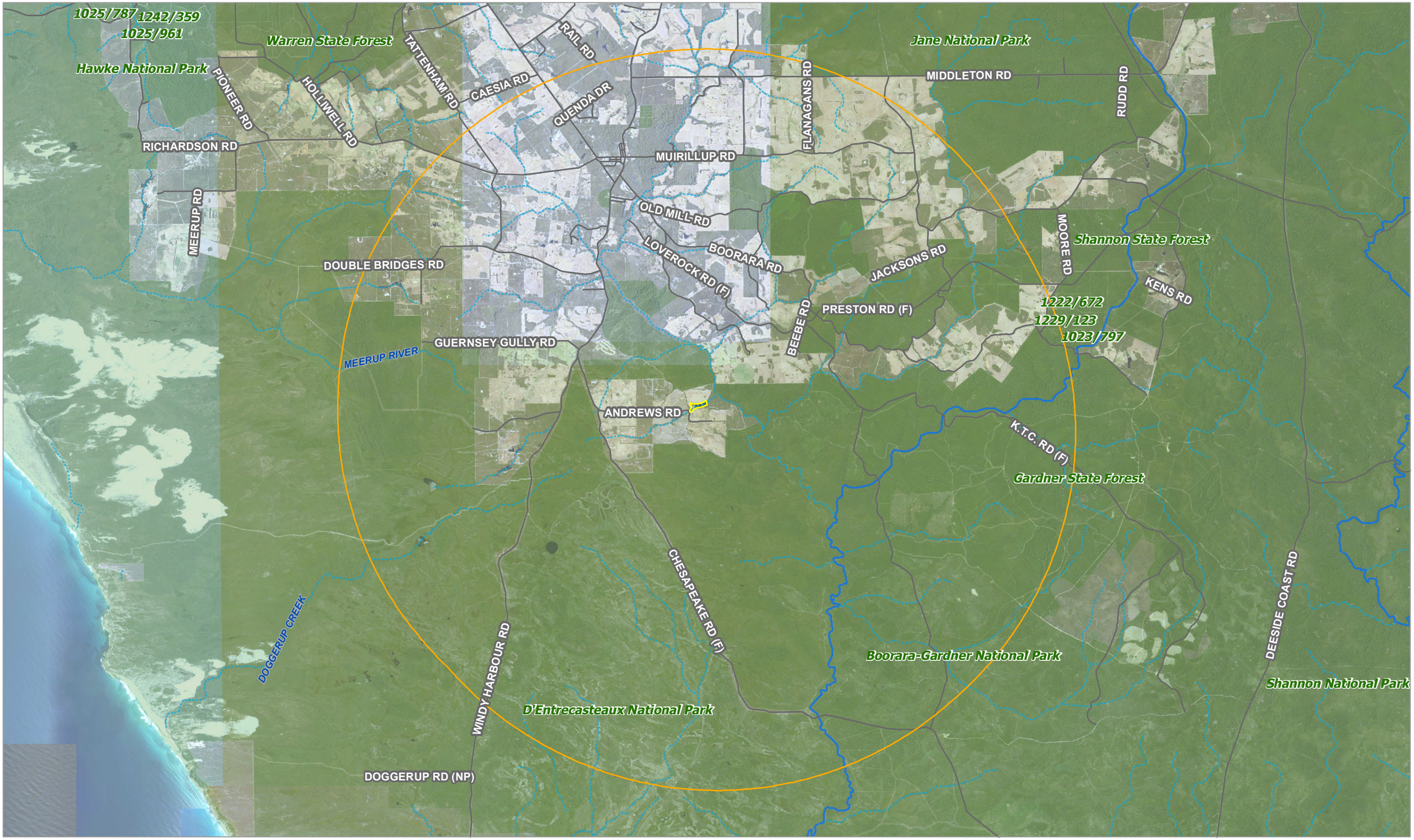
0 5 10 20 m

GRID: GDA zone 50

N

SW environmental
www.swenvironmental.com.au

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




## FIGURE A.2 LOCALITY

**PROPOSED DAM AT LOTS 9951 AND 9952, BOORARA BROOK**

Ref: SW515
Date: 9/07/2024 Author: SP

- Survey area
- Study area (10 km)
- Road
- Minor drainage line
- Major watercourse
- DBCA managed land

A3 @ 1:100000

0 0.5 1 2 km

GRID: GDA zone 50

N

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

## FIGURE A.3 SUITABLE DBH TREES

**PROPOSED DAM AT LOTS 9951 AND 9952, BOORARA BROOK**

Ref: SW515
Date: 9/07/2024 Author: SP

Survey area
Hollows, Tree DBH
Possible drey
50-75 cm
75-100 cm
100-125 cm
125 + cm
Hollow bearing tree, 80 cm
Road
Minor drainage line

ANDREWS RD

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

A3 @ 1:1500
0 5 10 20 m
GRID: GDA zone 50
N

SW environmental
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## FIGURE A.4 FAUNA HABITAT TYPES

PROPOSED DAM AT LOTS 9951
AND 9952, BOORARA BROOK

Ref: SW515
Date: 9/07/2024 Author: SP

Survey area

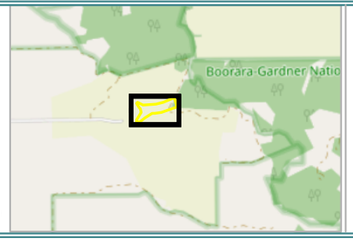
Fauna habitat

- C. Cleared or paddock trees
- FD. Existing farm dam
- 1. Peppermint open forest and woodland (regrowth) 1.23 ha
- 2. Karri over Peppermint tall open forest (regrowth) 1.67 ha
- 3. Karri tall open forest over Karri oak shrub layer 1.17 ha
- 4. Remnant Marri Karri Jarrah forest over Peppermint and native shrubs 0.65 ha

Road

Minor drainage line

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




A3 @ 1:1500

0 5 10 20 m

GRID: GDA zone 50

N

SW environmental
www.swenvironmental.com.au

ANDREWS RD

## FIGURE A.5 FAUNA HABITAT QUALITY

PROPOSED DAM AT LOTS 9951
AND 9952, BOORARA BROOK

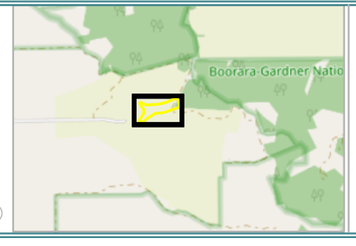
Ref: SW515
Date: 9/07/2024 Author: SP

- Survey area

Vegetation condition (EPA 2016), Fauna habitat quality

- Cleared or completely degraded, Poor
- Degraded, Moderate
- Degraded to good, Moderate
- Good to very good, Moderate
- Excellent, Good
- Existing farm dam, Moderate
- Road
- Minor drainage line

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




A3 @ 1:1500

0 5 10 20 m

GRID: GDA zone 50

N

SW environmental
www.swenvironmental.com.au

# 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 *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2023)* under 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 DCCEEW.

### 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.

# Appendix C Potential fauna list and fauna recorded

**Appendix C.1 Fauna that may occur within the locality of Lots 9951 and 9952 Boorara Brook (10 km) and fauna recorded**

| Class | Family | Scientific Name | Vernacular Name | Status | WA Status | Federal Status | Survey area | ALA 2024 | NatureMap 2023 | Bird data 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| AMPHIBIA | HYLIDAE | *Litoria adelaidensis* | Slender Tree Frog | | | | | x | x | |
| AMPHIBIA | HYLIDAE | *Litoria moorei* | Moore's Frog | | | | | x | x | |
| AMPHIBIA | LIMNODYNASTIDAE | *Heleioporus eyrei* | Moaning Frog | | | | | x | x | |
| AMPHIBIA | LIMNODYNASTIDAE | *Limnodynastes dorsalis* | Sand Frog | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Anstisia rosea* | Karri Frog | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Crinia georgiana* | Quacking Froglet | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Crinia glauerti* | Glauert's Froglet | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Crinia pseudinsignifera* | False Western Froglet | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Crinia subinsignifera* | Small Western Froglet | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Geocrinia leai* | Ticking Frog | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Metacrinia nichollsi* | Nicholl's Toadlet | | | | | x | x | |
| AMPHIBIA | MYOBATRACHIDAE | *Pseudophryne guentheri* | Gunther's Toadlet | | | | | x | x | |
| AVES | ACANTHIZIDAE | *Acanthiza apicalis* | Inland Thornbill | | | | | x | x | x |
| AVES | ACANTHIZIDAE | *Acanthiza chrysorrhoa* | Yellow-Rumped Thornbill | | | | | x | x | x |
| AVES | ACANTHIZIDAE | *Acanthiza inornata* | Western Thornbill | | | | x | x | x | x |
| AVES | ACANTHIZIDAE | *Gerygone fusca* | Western Gerygone | | | | | x | x | x |
| AVES | ACANTHIZIDAE | *Sericornis frontalis* | White-Browed Scrubwren | | | | | x | x | x |
| AVES | ACANTHIZIDAE | *Smicrornis brevirostris* | Weebill | | | | | | | x |
| AVES | ACCIPITRIDAE | *Accipiter cirrocephalus* | Collared Sparrowhawk | | | | | | | |
| AVES | ACCIPITRIDAE | *Accipiter fasciatus* | Brown Goshawk | | | | | x | x | x |
| AVES | ACCIPITRIDAE | *Aquila audax* | Wedge-Tailed Eagle | | | | | x | x | x |
| AVES | ACCIPITRIDAE | *Circus approximans* | Swamp Harrier | | | | | x | x | x |
| AVES | ACCIPITRIDAE | *Elanus axillaris* | Black-Shouldered Kite | | | | | | | |
| AVES | ACCIPITRIDAE | *Haliastur sphenurus* | Whistling Kite | | | | | x | x | x |
| AVES | ACCIPITRIDAE | *Hamirostra isura* | Square-Tailed Kite | | | | | | x | |
| AVES | ACCIPITRIDAE | *Hieraaetus morphnoides* | Little Eagle | | | | | | x | x |
| AVES | ACROCEPHALIDAE | *Acrocephalus australis* | Australian Reed Warbler | | | | | | | |
| AVES | AEGOTHELIDAE | *Aegotheles cristatus* | Australian Owlet-Nightjar | | | | | x | x | x |
| AVES | ALCEDINIDAE | *Dacelo novaeguineae* | Laughing Kookaburra* | | | | x | x | | x |
| AVES | ALCEDINIDAE | *Todiramphus sanctus* | Sacred Kingfisher | | | | | x | x | x |
| AVES | ANATIDAE | *Anas gracilis* | Grey Teal | | | | | x | | |
| AVES | ANATIDAE | *Anas rhynchotis* | Australian Shoveler | | | | | | | |
| AVES | ANATIDAE | *Anas superciliosa* | Pacific Black Duck | | | | x | x | x | x |
| AVES | ANATIDAE | *Aythya australis* | Hardhead | | | | | | | |
| AVES | ANATIDAE | *Biziura lobata* | Musk Duck | | | | | | | |
| AVES | ANATIDAE | *Chenonetta jubata* | Australian Wood Duck | | | | | x | x | x |
| AVES | ANATIDAE | *Cygnus atratus* | Black Swan | | | | | | | |

| Class | Family | Scientific Name | Vernacular Name | Status | WA Status | Federal Status | Survey area | ALA 2024 | NatureMap 2023 | Bird data 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| AVES | ANATIDAE | *Oxyura australis* | Blue-Billed Duck | | | | | | | |
| AVES | ANATIDAE | *Tadorna tadornoides* | Australian Shelduck | | | | | x | x | x |
| AVES | ANHINGIDAE | *Anhinga novaehollandiae* | Australasian Darter | | | | | | | |
| AVES | ARDEIDAE | *Ardea modesta* | Eastern Great Egret | | | | | | | |
| AVES | ARDEIDAE | *Ardea novaehollandiae* | White-Faced Heron | | | | | | x | |
| AVES | ARDEIDAE | *Ardea pacifica* | White-Necked Heron | | | | | x | x | x |
| AVES | ARDEIDAE | *Botaurus poiciloptilus* | Australasian Bittern | **T** | **EN** | **EN** | | | x | |
| AVES | ARDEIDAE | *Ixobrychus flavicollis* | Black Bittern | **P2** | | | | | | |
| AVES | ARDEIDAE | *Ixobrychus minutus* | Little Bittern | **P4** | | | | | x | |
| AVES | ARDEIDAE | *Nycticorax caledonicus* | Nankeen Night-Heron | | | | | | | |
| AVES | ARTAMIDAE | *Artamus cinereus* | Black-Faced Woodswallow | | | | | | | |
| AVES | ARTAMIDAE | *Artamus cyanopterus* | Dusky Woodswallow | | | | | x | x | x |
| AVES | ARTAMIDAE | *Cracticus nigrogularis* | Pied Butcherbird | | | | | | | |
| AVES | ARTAMIDAE | *Cracticus tibicen* | Australian Magpie | | | | x | | x | |
| AVES | ARTAMIDAE | *Cracticus torquatus* | Grey Butcherbird | | | | | x | | x |
| AVES | ARTAMIDAE | *Strepera versicolor* | Grey Currawong | | | | | x | x | x |
| AVES | BURHINIDAE | *Burhinus grallarius* | Bush Stone-curlew | | | | | x | | |
| AVES | CACATUIDAE | *Cacatua roseicapilla* | Galah | | | | | | | |
| AVES | CACATUIDAE | *Calyptorhynchus banksii naso* | Forest Red-Tailed Black Cockatoo | **T** | **VU** | **VU** | x | | x | |
| AVES | CACATUIDAE | *Zanda baudinii* | Baudin's Cockatoo | **T** | **EN** | **EN** | **x Feed** | x | x | x |
| AVES | CACATUIDAE | *Zanda latirostris* | Carnaby's Cockatoo | **T** | **EN** | **EN** | | x | x | x |
| AVES | CAMPEPHAGIDAE | *Coracina novaehollandiae* | Black-Faced Cuckoo-Shrike | | | | | x | x | x |
| AVES | CAMPEPHAGIDAE | *Lalage sueurii* | White-Winged Triller | | | | | | | |
| AVES | CASUARIIDAE | *Dromaius novaehollandiae* | Emu | | | | | x | x | x |
| AVES | CHARADRIIDAE | *Elseyornis melanops* | Black-fronted Dotterel | | | | | x | x | x |
| AVES | CHARADRIIDAE | *Vanellus miles* | Masked Lapwing | | | | | | | |
| AVES | CHARADRIIDAE | *Vanellus tricolor* | Banded Lapwing | | | | | | | |
| AVES | CLIMACTERIDAE | *Climacteris rufus* | Rufous Treecreeper | | | | | x | x | x |
| AVES | COLUMBIDAE | *Ocyphaps lophotes* | Crested Pigeon | | | | | | | |
| AVES | COLUMBIDAE | *Phaps chalcoptera* | Common Bronzewing | | | | | x | x | x |
| AVES | COLUMBIDAE | *Phaps elegans* | Brush Bronzewing | | | | | x | | x |
| AVES | COLUMBIDAE | *Streptopelia senegalensis* | Laughing Turtle-Dove* | | | | | | | |
| AVES | CORVIDAE | *Corvus coronoides* | Australian Raven | | | | | x | x | x |
| AVES | CUCULIDAE | *Cacomantis flabelliformis* | Fan-Tailed Cuckoo | | | | | x | x | x |
| AVES | CUCULIDAE | *Cacomantis pallidus* | Pallid Cuckoo | | | | | | x | |
| AVES | CUCULIDAE | *Chrysococcyx basalis* | Horsfield's Bronze-Cuckoo | | | | | | | |
| AVES | CUCULIDAE | *Chrysococcyx lucidus* | Shining Bronze-Cuckoo | | | | | | | |
| AVES | ESTRILDIDAE | *Stagonopleura oculata* | Red-Eared Firetail | | | | | x | x | x |
| AVES | FALCONIDAE | *Falco berigora* | Brown Falcon | | | | | x | x | x |
| AVES | FALCONIDAE | *Falco cenchroides* | Nankeen Kestrel | | | | | x | x | x |
| AVES | FALCONIDAE | *Falco longipennis* | Australian Hobby | | | | | x | x | x |

| Class | Family | Scientific Name | Vernacular Name | Status | WA Status | Federal Status | Survey area | ALA 2024 | NatureMap 2023 | Bird data 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| AVES | FALCONIDAE | *Falco peregrinus* | Peregrine Falcon | **OS** | | | | | | |
| AVES | HIRUNDINIDAE | *Hirundo neoxena* | Welcome Swallow | | | | | **x** | **x** | **x** |
| AVES | HIRUNDINIDAE | *Petrochelidon ariel* | Fairy Martin | | | | | | **x** | |
| AVES | HIRUNDINIDAE | *Petrochelidon nigricans* | Tree Martin | | | | | **x** | **x** | **x** |
| AVES | LARIDAE | *Chroicocephalus novaehollandiae* | Silver Gull | | | | | **x** | | |
| AVES | MALURIDAE | *Malurus elegans* | Red-Winged Fairy-Wren | | | | | **x** | **x** | **x** |
| AVES | MALURIDAE | *Malurus lamberti* | Variegated Fairy-Wren | | | | | | | |
| AVES | MALURIDAE | *Stipiturus malachurus* | Southern Emu-Wren | | | | | | | |
| AVES | MEGALURIDAE | *Cincloramphus cruralis* | Brown Songlark | | | | | **x** | **x** | **x** |
| AVES | MEGALURIDAE | *Cincloramphus mathewsi* | Rufous Songlark | | | | | **x** | **x** | **x** |
| AVES | MEGALURIDAE | *Megalurus gramineus* | Little Grassbird | | | | | | | |
| AVES | MEGAPODIIDAE | *Leipoa ocellata* | Malleefowl | **T** | **VU** | **VU** | | | **x** | |
| AVES | MELIPHAGIDAE | *Acanthorhynchus superciliosus* | Western Spinebill | | | | | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Anthochaera carunculata* | Red Wattlebird | | | | **x** | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Anthochaera lunulata* | Western Wattlebird | | | | | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Epthianura albifrons* | White-Fronted Chat | | | | | | | **x** |
| AVES | MELIPHAGIDAE | *Gavicalis virescens* | Singing Honeyeater | | | | | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Gliciphila melanops* | Tawny-Crowned Honeyeater | | | | | | | |
| AVES | MELIPHAGIDAE | *Lichmera indistincta* | Brown Honeyeater | | | | | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Melithreptus brevirostris* | Brown-Headed Honeyeater | | | | | | | **x** |
| AVES | MELIPHAGIDAE | *Melithreptus chloropsis* | Gilbert's Honeyeater | | | | | **x** | **x** | |
| AVES | MELIPHAGIDAE | *Melithreptus lunatus* | White-Naped Honeyeater | | | | | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Phylidonyris niger* | White-Cheeked Honeyeater | | | | | **x** | **x** | **x** |
| AVES | MELIPHAGIDAE | *Phylidonyris novaehollandiae* | New Holland Honeyeater | | | | **x** | **x** | **x** | **x** |
| AVES | MEROPIDAE | *Merops ornatus* | Rainbow Bee-Eater | | | | | | | |
| AVES | MONARCHIDAE | *Grallina cyanoleuca* | Magpie-Lark | | | | | **x** | **x** | **x** |
| AVES | MONARCHIDAE | *Myiagra inquieta* | Restless Flycatcher | | | | | **x** | **x** | **x** |
| AVES | MOTACILLIDAE | *Anthus australis* | Australian Pipit | | | | | **x** | | |
| AVES | NECTARINIIDAE | *Dicaeum hirundinaceum* | Mistletoebird | | | | | | | |
| AVES | NEOSITTIDAE | *Daphoenositta chrysoptera* | Varied Sittella | | | | | **x** | | **x** |
| AVES | PACHYCEPHALIDAE | *Colluricincla harmonica* | Grey Shrike-Thrush | | | | **x** | **x** | **x** | **x** |
| AVES | PACHYCEPHALIDAE | *Falcunculus frontatus* | Crested Shrike-Tit | | | | | **x** | | **x** |
| AVES | PACHYCEPHALIDAE | *Pachycephala pectoralis* | Golden Whistler | | | | | **x** | **x** | **x** |
| AVES | PACHYCEPHALIDAE | *Pachycephala rufiventris* | Rufous Whistler | | | | **x** | **x** | **x** | **x** |
| AVES | PANDIONIDAE | *Pandion haliaetus* | Osprey | **M** | | | | | | |
| AVES | PARDALOTIDAE | *Pardalotus punctatus* | Spotted Pardalote | | | | | **x** | **x** | **x** |
| AVES | PARDALOTIDAE | *Pardalotus striatus* | Striated Pardalote | | | | | **x** | **x** | **x** |
| AVES | PELECANIDAE | *Pelecanus conspicillatus* | Australian Pelican | | | | | | | |
| AVES | PETROICIDAE | *Eopsaltria georgiana* | White-Breasted Robin | | | | | | **x** | |
| AVES | PETROICIDAE | *Eopsaltria griseogularis* | Western Yellow Robin | | | | | **x** | | |
| AVES | PETROICIDAE | *Melanodryas cucullata* | Hooded Robin | | | | | **x** | **x** | **x** |

| Class | Family | Scientific Name | Vernacular Name | Status | WA Status | Federal Status | Survey area | ALA 2024 | NatureMap 2023 | Bird data 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| AVES | PETROICIDAE | *Microeca fascinans* | Jacky Winter | | | | | | | |
| AVES | PETROICIDAE | *Petroica boodang* | Scarlet Robin | | | | | x | x | x |
| AVES | PETROICIDAE | *Petroica goodenovii* | Red-Capped Robin | | | | | | | |
| AVES | PHALACROCORACIDAE | *Microcarbo melanoleucos* | Little Pied Cormorant | | | | | x | x | x |
| AVES | PHALACROCORACIDAE | *Phalacrocorax carbo* | Great Cormorant | | | | | | | x |
| AVES | PHALACROCORACIDAE | *Phalacrocorax sulcirostris* | Little Black Cormorant | | | | | | | |
| AVES | PHALACROCORACIDAE | *Phalacrocorax varius* | Pied Cormorant | | | | | | | |
| AVES | PHASIANIDAE | *Coturnix pectoralis* | Stubble Quail | | | | | x | x | x |
| AVES | PHASIANIDAE | *Coturnix ypsilophora* | Brown Quail | | | | | | | |
| AVES | PODARGIDAE | *Podargus strigoides* | Tawny Frogmouth | | | | | x | x | x |
| AVES | PODICIPEDIDAE | *Podiceps cristatus* | Great Crested Grebe | | | | | | | |
| AVES | PODICIPEDIDAE | *Poliocephalus poliocephalus* | Hoary-Headed Grebe | | | | | | | |
| AVES | PODICIPEDIDAE | *Tachybaptus novaehollandiae* | Australasian Grebe | | | | | x | x | x |
| AVES | POMATOSTOMIDAE | *Pomatostomus superciliosus* | White-browed Babbler | | | | | x | x | x |
| AVES | PSITTACIDAE | *Barnardius zonarius* | Australian Ringneck | | | | x | | x | |
| AVES | PSITTACIDAE | *Neophema elegans* | Elegant Parrot | | | | | x | x | x |
| AVES | PSITTACIDAE | *Neophema petrophila* | Rock Parrot | | | | | | | |
| AVES | PSITTACIDAE | *Parvipsitta porphyrocephala* | Purple-Crowned Lorikeet | | | | | x | x | |
| AVES | PSITTACIDAE | *Platycercus icterotis* | Western Rosella | | | | x | x | x | x |
| AVES | PSITTACIDAE | *Polytelis anthopeplus* | Regent Parrot | | | | | | | x |
| AVES | PSITTACIDAE | *Purpureicephalus spurius* | Red-capped parrot | | | | | x | x | |
| AVES | RALLIDAE | *Fulica atra* | Eurasian Coot | | | | | | | |
| AVES | RALLIDAE | *Gallinula tenebrosa* | Dusky Moorhen | | | | | | | |
| AVES | RALLIDAE | *Gallirallus philippensis* | Banded Rail | | | | | | x | |
| AVES | RALLIDAE | *Hypotaenidia philippensis* | Buff-banded Rail | | | | | x | | x |
| AVES | RALLIDAE | *Porphyrio melanotus* | Australasian Swamphen | | | | | | | |
| AVES | RALLIDAE | *Porphyrio porphyrio* | Purple Swamphen | | | | | x | x | x |
| AVES | RALLIDAE | *Porzana tabuensis* | Spotless Crake | | | | | | | |
| AVES | RALLIDAE | *Tribonyx ventralis* | Black-Tailed Native-Hen | | | | | | | |
| AVES | RECURVIROSTRIDAE | *Himantopus himantopus* | Pied Stilt | | | | | | | |
| AVES | RECURVIROSTRIDAE | *Recurvirostra novaehollandiae* | Red-necked Avocet | | | | | | | |
| AVES | RHIPIDURIDAE | *Rhipidura albiscapa* | Grey Fantail | | | | x | x | x | x |
| AVES | RHIPIDURIDAE | *Rhipidura leucophrys* | Willie Wagtail | | | | x | x | x | x |
| AVES | STRIGIDAE | *Ninox connivens (SW sub-pop)* | Barking Owl | **P3** | | | | | | |
| AVES | STRIGIDAE | *Ninox novaeseelandiae* | Southern Boobook | | | | | x | x | |
| AVES | SULIDAE | *Morus serrator* | Australasian Gannet | | | | | | | |
| AVES | THRESKIORNITHIDAE | *Platalea flavipes* | Yellow-Billed Spoonbill | | | | | x | x | x |
| AVES | THRESKIORNITHIDAE | *Platalea regia* | Royal Spoonbill | | | | | | | |
| AVES | THRESKIORNITHIDAE | *Plegadis falcinellus* | Glossy Ibis | | | | | | | |
| AVES | THRESKIORNITHIDAE | *Threskiornis moluccus* | Australian White Ibis | | | | | x | x | |
| AVES | THRESKIORNITHIDAE | *Threskiornis spinicollis* | Straw-Necked Ibis | | | | | x | x | x |

| Class | Family | Scientific Name | Vernacular Name | Status | WA Status | Federal Status | Survey area | ALA 2024 | NatureMap 2023 | Bird data 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| AVES | TIMALIIDAE | *Zosterops lateralis* | Silvereye | | | | **x** | | **x** | **x** |
| AVES | TYTONIDAE | *Tyto alba* | Barn Owl | | | | | | | |
| AVES | TYTONIDAE | *Tyto novaehollandiae* | Masked Owl (SW) | **P3** | | | | | | |
| FISH | GALAXIIDAE | *Galaxiella munda* | Mud Minnow | **T** | **VU** | | | **x** | **x** | |
| FISH | GALAXIIDAE | *Galaxiella nigrostriata* | Black-stripe minnow | **T** | **EN** | **EN** | | **x** | **x** | |
| FISH | GEOTRIIDAE | *Geotria australis* | Pouched Lamprey | | **P3** | | | **x** | **x** | |
| FISH | LEPIDOGALAXIIDAE | *Lepidogalaxias salamandroides* | Salamanderfish | **T** | **EN** | | | | **x** | |
| FISH | PERCICHTHYIDAE | *Nannatherina balstoni* | Balston's Pygmy Perch | **T** | **VU** | **VU** | | **x** | **x** | |
| INVERTEBRATE | CENTROPAGIDAE | *Calamoecia elongata* | a copepod (Northcliffe) | **P3** | | | | | **x** | |
| INVERTEBRATE | DAPHNIIDAE | *Daphnia occidentalis* | a water flea (Karri forests) | **P3** | | | | | **x** | |
| INVERTEBRATE | HYRIIDAE | *Westralunio carteri* | Carter's Freshwater Mussel | **T** | **VU** | **VU** | | **x** | **x** | |
| INVERTEBRATE | MIGIDAE | *Bertmainius opimus* | Western pygmy trapdoor spider | **P3** | | | | | **x** | |
| INVERTEBRATE | PARASTACIDAE | *Cherax cainii* | Marron | | | | | | | |
| INVERTEBRATE | PARASTACIDAE | *Cherax destructor* | Yabby* | | | | | | | |
| INVERTEBRATE | PARASTACIDAE | *Cherax quinquecarinatus* | Gilgie | | | | | | | |
| MAMMALIA | BOVIDAE | *Bos taurus* | Cow * | | | | **x** | | | |
| MAMMALIA | BURRAMYIDAE | *Cercartetus concinnus* | Western Pygmy-Possum | | | | | **x** | **x** | |
| MAMMALIA | CANIDAE | *Canis lupus dingo* | Wild Dog, Dingo | | | | | | | |
| MAMMALIA | CANIDAE | *Vulpes vulpes* | Fox* | | | | **x Track** | | | |
| MAMMALIA | DASYURIDAE | *Antechinus flavipes* | Yellow-footed Antechinus | | | | | **x** | **x** | |
| MAMMALIA | DASYURIDAE | *Dasyurus geoffroii* | Chuditch | **T** | **VU** | **VU** | | | | |
| MAMMALIA | DASYURIDAE | *Phascogale tapoatafa* | Brush-Tailed Phascogale | **CD** | | | | | **x** | |
| MAMMALIA | DASYURIDAE | *Sminthopsis fuliginosus* | Dusky Dunnart | | | | | **x** | | |
| MAMMALIA | DASYURIDAE | *Sminthopsis gilberti* | Gilbert's Dunnart | | | | | | | |
| MAMMALIA | DASYURIDAE | *Sminthopsis griseoventer* | Grey-Bellied Dunnart | | | | | | **x** | |
| MAMMALIA | DASYURIDAE | *Sminthopsis murina* | Common Dunnart | | | | | | **x** | |
| MAMMALIA | FELIDAE | *Felis catus* | Cat * | | | | | **x** | | |
| MAMMALIA | LEPORIDAE | *Oryctolagus cuniculus* | Rabbit* | | | | **x Dig** | | **x** | |
| MAMMALIA | MACROPODIDAE | *Macropus fuliginosus* | Western Grey Kangaroo | | | | **X** | **x** | **x** | |
| MAMMALIA | MACROPODIDAE | *Setonix brachyurus* | Quokka | **T** | **VU** | **VU** | | **x** | **x** | |
| MAMMALIA | MURIDAE | *Hydromys chrysogaster* | Water-Rat | **P4** | | | | | **x** | |
| MAMMALIA | MURIDAE | *Mus musculus* | House Mouse* | | | | | **x** | **x** | |
| MAMMALIA | MURIDAE | *Rattus fuscipes* | Western Bush Rat | | | | | | | |
| MAMMALIA | MURIDAE | *Rattus rattus* | Black Rat* | | | | | | | |
| MAMMALIA | MYRMECOBIIDAE | *Myrmecobius fasciatus* | Numbat | **T** | **EN** | **EN** | | | | |
| MAMMALIA | PERAMELIDAE | *Isoodon fusciventer* | Southern Brown Bandicoot | **P4** | | | **x Dig** | | **x** | |
| MAMMALIA | PHALANGERIDAE | *Trichosurus vulpecula* | Common Brushtail Possum | | | | | **x** | **x** | |
| MAMMALIA | PSEUDOCHEIRIDAE | *Pseudocheirus occidentalis* | Western Ringtail Possum | **T** | **CR** | **CR** | | | **x** | |
| MAMMALIA | SUIDAE | *Sus scrofa* | Pig* | | | | | | | |
| MAMMALIA | TARSIPEDIDAE | *Tarsipes rostratus* | Honey Possum | | | | | | | |
| MAMMALIA | VESPERTILIONIDAE | *Chalinolobus morio* | Chocolate Wattled Bat | | | | | | | |

| Class | Family | Scientific Name | Vernacular Name | Status | WA Status | Federal Status | Survey area | ALA 2024 | NatureMap 2023 | Bird data 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| MAMMALIA | VESPERTILIONIDAE | *Falsistrellus mackenziei* | Western False Pipistrelle | **P4** | | | | | x | |
| MAMMALIA | VESPERTILIONIDAE | *Nyctophilus geoffroyi* | Lesser Long-eared Bat | | | | | x | | |
| MAMMALIA | VESPERTILIONIDAE | *Nyctophilus gouldii* | Gould's Wattled Bat | | | | | x | | |
| MAMMALIA | VESPERTILIONIDAE | *Nyctophilus holtorum* | Holts Long-eared Bat | | | | | x | | |
| MAMMALIA | VESPERTILIONIDAE | *Vespadelus regulus* | Southern Forest Bat | | | | | x | x | |
| REPTILIA | AGAMIDAE | *Pogona minor* | Western Bearded Dragon | | | | | | | |
| REPTILIA | CHELIDAE | *Chelodina colliei* | Oblong Turtle | | | | | x | | |
| REPTILIA | ELAPIDAE | *Echiopsis curta* | Bardick | | | | | | | |
| REPTILIA | ELAPIDAE | *Elapognathus coronatus* | Western Crowned Snake | | | | | x | x | |
| REPTILIA | ELAPIDAE | *Elapognathus minor* | Short-nosed Snake | **P2** | | | | x | x | |
| REPTILIA | ELAPIDAE | *Notechis scutatus* | Tiger Snake | | | | | x | x | |
| REPTILIA | ELAPIDAE | *Pseudonaja affinis* | Dugite | | | | | x | x | |
| REPTILIA | ELAPIDAE | *Simoselaps bertholdi* | Jan's Banded Snake | | | | | x | x | |
| REPTILIA | GEKKONIDAE | *Christinus marmoratus* | Marbled Gecko | | | | | x | x | |
| REPTILIA | PYGOPODIDAE | *Aprasia pulchella* | Pretty Worm Lizard | | | | | | | |
| REPTILIA | PYTHONIDAE | *Morelia spilota* | Carpet Python | | | | | | | |
| REPTILIA | SCINCIDAE | *Acritoscincus trilineatus* | Western Three-Lined Skink | | | | | x | x | |
| REPTILIA | SCINCIDAE | *Cryptoblepharus buchananii* | Buchanans Snake-Eyed Skink | | | | | | | |
| REPTILIA | SCINCIDAE | *Ctenotus catenifer* | Chain-striped South-west Ctenotus | | | | | x | x | |
| REPTILIA | SCINCIDAE | *Ctenotus labillardieri* | Common South-West Ctenotus | | | | | x | x | |
| REPTILIA | SCINCIDAE | *Egernia kingii* | King's Skink | | | | | | | |
| REPTILIA | SCINCIDAE | *Egernia napoleonis* | South-Western Crevice-Skink | | | | | x | | |
| REPTILIA | SCINCIDAE | *Hemiergis gracilipes* | South-Western Mulch-Skink | | | | | | | |
| REPTILIA | SCINCIDAE | *Hemiergis peronii* | Lowlands Earless Skink | | | | | x | x | |
| REPTILIA | SCINCIDAE | *Lerista microtis* | South-Western Slider | | | | | x | | |
| REPTILIA | SCINCIDAE | *Morethia lineoocellata* | West Coast Morethia Skink | | | | | | | |
| REPTILIA | SCINCIDAE | *Tiliqua rugosa* | Bobtail | | | | | x | | |
| REPTILIA | TYPHLOPIDAE | *Anilios australis* | Southern Blind Snake | | | | | x | x | |
| REPTILIA | VARANIDAE | *Varanus rosenbergi* | Heath Monitor | | | | | x | | |

## Appendix C.2 PMST database results

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 07-May-2024

# Summary

## Matters of National Environment Significance

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

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 1 |
| Listed Threatened Species: | 23 |
| Listed Migratory Species: | 10 |

## Other Matters Protected by the EPBC Act

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

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

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

| | |
|---|---|
| Commonwealth Lands: | 1 |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 14 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | 4 |
| Regional Forest Agreements: | 1 |
| Nationally Important Wetlands: | 1 |
| EPBC Act Referrals: | 5 |
| Key Ecological Features (Marine): | None |
| Biologically Important Areas: | None |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

| Community Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Empodisma peatlands of southwestern Australia | Endangered | Community likely to occur within area | In feature area |

### Listed Threatened Species [ Resource Information ]

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

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| BIRD | | | |
| Botaurus poiciloptilus | | | |
| Australasian Bittern [1001] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Calidris acuminata | | | |
| Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus | | | |
| Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Calidris ferruginea | | | |
| Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Calyptorhynchus banksii naso | | | |
| Forest Red-tailed Black-Cockatoo, Karrak [67034] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Charadrius leschenaultii | | | |
| Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat may occur within area | In buffer area only |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Numenius madagascariensis](#) | | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| [Sternula nereis nereis](#) | | | |
| Australian Fairy Tern [82950] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| [Tringa nebularia](#) | | | |
| Common Greenshank, Greenshank [832] | Endangered | Species or species habitat may occur within area | In buffer area only |
| [Zanda baudinii listed as Calyptorhynchus baudinii](#) | | | |
| Baudin's Cockatoo, Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736] | Endangered | Breeding known to occur within area | In feature area |
| [Zanda latirostris listed as Calyptorhynchus latirostris](#) | | | |
| Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737] | Endangered | Species or species habitat known to occur within area | In feature area |
| FISH | | | |
| [Galaxiella nigrostriata](#) | | | |
| Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677] | Endangered | Species or species habitat known to occur within area | In feature area |
| [Nannatherina balstoni](#) | | | |
| Balston's Pygmy Perch [66698] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| MAMMAL | | | |
| [Dasyurus geoffroii](#) | | | |
| Chuditch, Western Quoll [330] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Myrmecobius fasciatus](#) | | | |
| Numbat [294] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Pseudocheirus occidentalis](#) | | | |
| Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911] | Critically Endangered | Species or species habitat likely to occur within area | In feature area |
| [Setonix brachyurus](#) | | | |
| Quokka [229] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| OTHER | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Westralunio carteri](#) | | | |
| Carter's Freshwater Mussel, Freshwater Mussel [86266] | Vulnerable | Species or species habitat known to occur within area | In buffer area only |
| PLANT | | | |
| [Caladenia harringtoniae](#) | | | |
| Harrington's Spider-orchid, Pink Spider-orchid [56786] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| [Calectasia cyanea](#) | | | |
| Blue Tinsel Lily [7669] | Critically Endangered | Species or species habitat may occur within area | In buffer area only |
| [Drakaea micrantha](#) | | | |
| Dwarf Hammer-orchid [56755] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Kennedia glabrata](#) | | | |
| Northcliffe Kennedia [16452] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Reedia spathacea](#) | | | |
| Reedia [2995] | Critically Endangered | Species or species habitat known to occur within area | In feature area |

| Listed Migratory Species | | | [ Resource Information ] |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Migratory Marine Birds | | | |
| [Apus pacificus](#) | | | |
| Fork-tailed Swift [678] | | Species or species habitat likely to occur within area | In feature area |
| Migratory Terrestrial Species | | | |
| [Motacilla cinerea](#) | | | |
| Grey Wagtail [642] | | Species or species habitat may occur within area | In feature area |
| Migratory Wetlands Species | | | |
| [Actitis hypoleucos](#) | | | |
| Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |
| [Calidris acuminata](#) | | | |
| Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area | In feature area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | Endangered | Species or species habitat may occur within area | In buffer area only |

## Other Matters Protected by the EPBC Act

### Commonwealth Lands [ Resource Information ]

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

| Commonwealth Land Name | State | Buffer Status |
|---|---|---|
| Unknown | | |
| Commonwealth Land - [51527] | WA | In buffer area only |

### Listed Marine Species [ Resource Information ]

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Bird | | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area overfly marine area | In feature area |
| Bubulcus ibis as Ardea ibis<br>Cattle Egret [66521] | | Species or species habitat may occur within area overfly marine area | In feature area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area overfly marine area | In buffer area only |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area overfly marine area | In feature area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area | In feature area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area | In feature area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area overfly marine area | In feature area |
| Motacilla cinerea<br>Grey Wagtail [642] | | Species or species habitat may occur within area overfly marine area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Numenius madagascariensis | | | |
| Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Thinornis cucullatus as Thinornis rubricollis | | | |
| Hooded Plover, Hooded Dotterel [87735] | | Species or species habitat likely to occur within area overfly marine area | In buffer area only |
| Tringa nebularia | | | |
| Common Greenshank, Greenshank [832] | Endangered | Species or species habitat may occur within area overfly marine area | In buffer area only |

## Extra Information

### State and Territory Reserves [ Resource Information ]

| Protected Area Name | Reserve Type | State | Buffer Status |
|---|---|---|---|
| Boorara-Gardner | National Park | WA | In buffer area only |
| D'Entrecasteaux | National Park | WA | In feature area |
| Jane | National Park | WA | In buffer area only |
| Unnamed WA11993 | 5(1)(g) Reserve | WA | In buffer area only |

### Regional Forest Agreements [ Resource Information ]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

| RFA Name | State | Buffer Status |
|---|---|---|
| South West WA RFA | Western Australia | In feature area |

### Nationally Important Wetlands [ Resource Information ]

| Wetland Name | State | Buffer Status |
|---|---|---|
| Doggerup Creek System | WA | In buffer area only |

### EPBC Act Referrals [ Resource Information ]

| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
|---|---|---|---|---|
| Controlled action | | | | |
| All weather access track road between Windy Harbour and Nelson Location 7965 | 2011/6121 | Controlled Action | Post-Approval | In buffer area only |
| Not controlled action | | | | |
| Geo-science Investigations | 2005/2069 | Not Controlled Action | Completed | In feature area |

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

# Caveat

## 1 PURPOSE

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

The report contains the mapped locations of:

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

## 2 DISCLAIMER

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

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

## 3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

## 4 LIMITATIONS

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

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

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

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

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

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

# Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

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# Appendix 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, literature and expert consultation, and assessed against habitat observed within the survey area. The potential to be impacted depends on the nature of the 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 survey 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 survey area.
- **Unlikely:** Species known or predicted within the locality. Suitable habitat may be present in the survey area, but the proximity of nearest records suggests it is unlikely to occur.
- **Possible:** Suitable habitat present and the species could occur in the survey 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: Shorebirds and waders, e.g. Hooded plover.
- Species considered regionally extinct or misidentified or outside of the animals known distribution (e.g. Malleefowl, Numbat, Rufous bristlebird, Western whipbird, Woylie).

Conservation status is as per the (federal) EPBC Act and (WA) DBCA Parks and Wildlife Service's Threatened and Priority Fauna List last updated April 2024. 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<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| AVES | ARDEIDAE<br>*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). No local records. | Marginal | 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). No local records, nearest near Pemberton. | Marginal | Unlikely |
| | *Ixobrychus minutus subsp. dubius* | Little Bittern | | P4 | This species occupies weed, cumbungi and tussock sections of wetlands, swamps, lakes and rivers (Pizzey and Knight 2007). It nests in small platforms over tussocks and cumbungi over water (Pizzey and Knight 2007). No local records, nearest near Rocky Gully. | Marginal | Unlikely |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | CACATUIDAE<br>*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, 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 (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). Feed residue at found at site. | Present - supporting | Present |
| | *Zanda 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).<br><br>Preferred roosts are in areas with a dense canopy close to permanent sources of water (SPRAT 2018). The DBCA has a record of a white tailed black cockatoo roost approximately 250m east of the project. 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 | Present - supporting | Present |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | ground (Jupp 2000). Tree hollows usually have an entrance of 30-40cm, >30cm deep and are mostly vertical (SPRAT 2018) (Johnson and Kirkby, Undated). Feed residue at found at site. | | |
| | *Zanda 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).<br><br>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).<br><br>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). Some local records, no evidence on site. | Present - supporting | Possible |
| | FALCONIDAE<br>*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 | Present - supporting | Unlikely, occasional visitor |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | duck, pigeons and doves, galahs, rosellas and cockatoo, starlings and larks (Olsen et al. 2006). No stick nests observed. | | |
| | PANDIONIDAE<br>*Pandion haliaetus* | Osprey | M | M | Generally coastal species that feeds on fish. Nests in large trees or on islands, pilons etc (Pizzey and Knight 2007). | Marginal | Unlikely |
| | STRIGIDAE<br>*Ninox connivens connivens* | Barking Owl (SW pop.) | - | P3 | Occurs in forest, woodlands, dense scrub, foothills, river red gums and other large trees near water courses penetrating open country. Nests in large hollows (Pizzey and Knight 2007). A late winter breeder with most eggs laid July to September, the young are fledged in about 35 days (Pizzey and Knight 2007). Sparse and possibly locally extinct. | Marginal | Unlikely, occasional visitor |
| | *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). Nearest records near Pemberton. | Marginal | Unlikely, occasional visitor |
| MAMMALS | DASYURIDAE<br>*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 | Marginal | Unlikely. |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | 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). No local records. | | |
| | *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 season. It is predominantly carnivorous, foraging on arthropods, invertebrates, small vertebrates and nectar (Strahan 1995). No local records, very few hollows observed. | Present - supporting | Unlikely, occasional visitor,<br>**Possible in the remnant patch east of the powerline** |
| | *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)<br>• heath and shrubland,<br>• Swamp Peppermint (*Taxandria linearifolia*) dominated swamps in Jarrah forest,<br>• swampy shrublands,<br>• swordgrass-dominated understorey,<br>• regrowth areas of the Karri forest,<br>• Bullich swamp forest,<br>• Paperbark (Melaleuca spp.) swamp.<br>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). Local records. | Marginal | Unlikely, occasional visitor,<br>**Possible in the remnant patch east of the powerline** |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | MURIDAE<br>*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). | Present - core | Possible |
| | PERAMELIDAE<br>*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). Recorded within the northern dam survey area. | Present - core | Present |
| | PSEUDOCHEIRIDAE<br>*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, 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). Some local records, but typically | Marginal | Unlikely, occasional visitor,<br>**Possible in the remnant patch east of the powerline** |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | not recorded within Karri forest (Biota 2020), and no evidence except for a possible drey within the remnant patch. | | |
| | VESPERTILIONIDAE<br>*Falsistrellus mackenziei* | Western False Pipistrelle | - | P4 | It occurs in wet sclerophyll forest dominated by Karri (*Eucalyptus diversicolor*), and in the high rainfall zones of the Jarrah (*E. marginata*) and Tuart (*E. gomphocephala*) forests. It has also been recorded in mixed Tuart-Jarrah tall woodlands on the adjacent coastal plain. Marri (*E. calophylla*), Sheoak (*Casuarina heugeliana*) and Peppermint (*Agonis flexuosa*) trees are often co-dominant at its collection localities (DotEE, 2018). This species roosts in tree hollows (Phillips & Inwards 1985) in colonies of 5 to 30 bats. The species feed on flying insects between below the forest canopy. Recorded locally. | Present - core | Possible |
| FISH | GALAXIIDAE<br>*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). They prefer relatively undisturbed, permanent stream habitats. Found locally, mapped as occurring within the northern dam catchment (Healthy Rivers website 2024). The dam site was likely too degraded (apart from the area to the east). | Present - supporting | Unlikely but may occur offsite upstream and downstream,<br>**Possible in the remnant patch east of the powerline** |
| | *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 | Present - supporting | Unlikely but may occur offsite upstream and downstream,<br>**Possible in the remnant** |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | 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, characterised by inactivity and a lowered metabolic rate) to survive the dry summer. Found locally, mapped as occurring within both dam catchments (Healthy Rivers website 2024). The dam site was likely too degraded (apart from the area to the east). | | **patch east of the powerline** |
| | LEPIDOGALAXIIDAE<br>*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 2024). 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 2024). Found locally, mapped as occurring within both dam catchments (Healthy Rivers website 2024). The dam site was likely too degraded (apart from the area to the east). | Present - supporting | Unlikely but may occur offsite upstream and downstream,<br>**Possible in the remnant patch east of the powerline** |
| | PERCICHTHYIDAE<br>*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 | Marginal | Unlikely |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | | | | | vegetation (SPRAT 2018) (Bray et al. 2018). Associated with slow-flowing, low salinity, acidic and tannin-stained waters, and complex instream habitat. Not likely to occur locally, as mapped by Healthy Rivers website (2024). The dam site was likely too degraded (apart from the area to the east). | | |
| | CENTROPAGIDAE<br>*Calamoecia elongata* | copepod (Northcliffe) | - | P3 | *Calamoecia elongate* is a short-range endemic zooplankton. Appears to be from around Northcliffe, but little information is available. Given the degraded habitats within the survey area and large tracts of DBCA land and intact habitat adjacent is unlikely the species would be present or significantly impacted on site. | Marginal | Unlikely |
| | DAPHNIIDAE<br>*Daphnia occidentalis* | a water flea (Karri forests) | - | P3 | *Daphnia occidentalis* is a short-range endemic zooplankton. Appears to be present locally, but little information is available. Given the degraded habitats within the survey area and large tracts of DBCA land and intact habitat adjacent is unlikely the species would be present or significantly impacted on site. | Marginal | Unlikely |
| | HYRIIDAE<br>*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). | Marginal | Unlikely |

| Class | Family<br>Genus species | Vernacular | Status Federal | Stat. WA | Requirements | Presence of habitat | Likelihood of occurrence |
|---|---|---|---|---|---|---|---|
| | MIGIDAE<br>*Bertmainius opimus* | Western pygmy trapdoor spider | - | P3 | Trapdoor spider is a short range endemic, occurs locally within State Forest. The spiders construct shallow burrows on the bark of tingle trees (*Eucalyptus guilfoylei, E. jacksonii* and *E. brevistylis*) or in soil on the banks of creek lines and gullies. The burrows are capped with a thin lid that serves to retain moisture and keep out predators such as ants. The lids are sealed with silk when the spiders moult, or when eggs or juveniles are in the burrow with the female. The spiders seem to prefer moist, shaded areas. Burrows are often clustered in appropriate microhabitats. Life history information is limited, and the age structure of the populations is unknown. However, most mygalomorph spiders are relatively long lived (>5 years) (Harvey eta l 2015). | Marginal | Unlikely |
| REPTILES | ELAPIDAE<br>*Elapognathus minor* | Short-nosed Snake | - | P2 | Prefers swamps dominated by sedges, tussocks and dense heath (Bush et al. 2007). No records with 10 km of the project but possible though habitat degraded. | Marginal | Unlikely |

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# Appendix E DBH Trees

| ID | Tree | Dbh (cm) | Comments | No. | Size | Type | Height | Easting GDA94 | Northing |
|---|---|---|---|---|---|---|---|---|---|
| **1** | Karri | 105 | Suitable DBH no hollows | | | | | 6160341 | 421996 |
| **2** | Karri | 100 | Suitable DBH no hollows | | | | | 6160314 | 421975 |
| **3** | Karri | 90 | Suitable DBH no hollows | | | | | 6160314 | 421975 |
| **4** | Karri | 110 | Suitable DBH no hollows | | | | | 6160314 | 422002 |
| **5** | Karri | 75 | Suitable DBH no hollows | | | | | 6160314 | 422002 |
| **6** | Karri | 50 | Suitable DBH no hollows | | | | | 6160314 | 422002 |
| **7** | Karri | 80 | Suitable DBH no hollows | | | | | 6160314 | 422002 |
| **8** | Karri | 60 | Suitable DBH no hollows | | | | | 6160314 | 422002 |
| **9** | Karri | 70 | Suitable DBH no hollows | | | | | 6160314 | 422002 |
| **10** | Karri | 100 | Suitable DBH no hollows | | | | | 6160304 | 421937 |
| **11** | Karri | 75 | Suitable DBH no hollows | | | | | 6160304 | 421938 |
| **12** | Karri | 100 | Suitable DBH no hollows | | | | | 6160300 | 421926 |
| **13** | Karri | 110 | Suitable DBH no hollows | | | | | 6160300 | 421925 |
| **14** | Karri | 120 | Suitable DBH no hollows | | | | | 6160296 | 421925 |
| **15** | Karri | 80 | Suitable DBH no hollows | | | | | 6160288 | 421920 |
| **16** | Karri | 60 | Suitable DBH no hollows | | | | | 6160286 | 421925 |
| **17** | Karri | 55 | Suitable DBH no hollows | | | | | 6160269 | 421898 |
| **18** | Karri | 95 | Suitable DBH no hollows | | | | | 6160313 | 422011 |
| **19** | Karri | 110 | Suitable DBH no hollows | | | | | 6160327 | 422021 |
| **20** | Marri | 50 | Suitable DBH no hollows | | | | | 6160292 | 422027 |
| **21** | Jarrah | 80 | Potentially suitable no signs | 1 | 20cm plus | Vertical | 15m plus | 6160308 | 422034 |
| **22** | | | Drey | | | | | 6160277 | 422033 |
| **23** | Marri | 120 | Suitable DBH no hollows | | | | | 6160244 | 422040 |
| **24** | Marri | 50 | Suitable DBH no hollows | | | | | 6160259 | 422038 |
| **25** | Marri | 50 | Suitable DBH no hollows | | | | | 6160267 | 422038 |
| **26** | Marri | 80 | Suitable DBH no hollows | | | | | 6160276 | 422047 |
| **27** | Marri | 50 | Suitable DBH no hollows | | | | | 6160281 | 422041 |
| **28** | Marri | 50 | Suitable DBH no hollows | | | | | 6160281 | 422041 |
| **29** | Marri | 50 | Suitable DBH no hollows | | | | | 6160268 | 422016 |
| **30** | Marri | 130 | Suitable DBH no hollows | | | | | 6160247 | 421995 |
| **31** | Dead | 85 | Suitable DBH no hollows | | | | | 6160246 | 421993 |
| **32** | Dead | 75 | Suitable DBH no hollows | | | | | 6160247 | 421992 |
| **33** | Karri | 70 | Suitable DBH no hollows | | | | | 6160173 | 421820 |
| **34** | Marri | 50 | Suitable DBH no hollows | | | | | 6160213 | 421887 |
| **35** | Marri | 60 | Suitable DBH no hollows | | | | | 6160215 | 421892 |
| **36** | Marri | 50 | Suitable DBH no hollows | | | | | 6160200 | 421899 |
| **37** | Karri | 50 | Suitable DBH no hollows | | | | | 6160218 | 421912 |
| **38** | Marri | 70 | Suitable DBH no hollows | | | | | 6160218 | 421941 |

| ID | Tree | Dbh (cm) | Comments | No. | Size | Type | Height | Easting GDA94 | Northing |
|---|---|---|---|---|---|---|---|---|---|
| **39** | Marri | 75 | Suitable DBH no hollows | | | | | 6160257 | 421955 |
| **40** | Karri | 50 | Suitable DBH no hollows | | | | | 6160261 | 421954 |
| **41** | Marri | 100 | Suitable DBH no hollows | | | | | 6160251 | 421939 |
| **42** | Karri | 150 | Suitable DBH no hollows | | | | | 6160250 | 421938 |
| **43** | Karri | 80 | Suitable DBH no hollows | | | | | 6160236 | 421888 |
| **44** | Marri | 65 | Suitable DBH no hollows | | | | | 6160233 | 421893 |
| **45** | Karri | 170 | Suitable DBH no hollows | | | | | 6160199 | 421757 |
| **46** | Karri | 50 | Suitable DBH no hollows | | | | | 6160192 | 421742 |