



Terrestrial Fauna Survey and Black Cockatoo Habitat Assessment for Huntly Mine - Myara North

**Pinjarra Alumina Refinery Revised
Proposal**

Alcoa of Australia Limited


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Executive summary

Alcoa of Australia Limited (Alcoa) is proposing to increase production at the Pinjarra Alumina Refinery by 5 per cent from 5 million tonnes per annum (Mtpa) to 5.25 Mtpa and transition the Huntly Bauxite Mine to the proposed Myara North and Holyoake mine regions (the Proposal). The Proposal is located in the Peel Region of Western Australia (WA), approximately 100 km south-east of Perth

The Proposal will be subject to environmental impact assessment under Part IV of the WA *Environmental Protection Act 1986* (EP Act), and the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). The environmental impact assessment will be via a Public Environmental Review (PER).

This Terrestrial Vertebrate Fauna Survey and Black Cockatoo Habitat Assessment (the Survey) has been prepared to support the EPA assessment of the Proposal and addresses the Myara North mine region of the Proposal.

Survey Area

The Survey Area comprises the Myara North Development Envelope (DE) and adjacent conveyor and haul road corridors. The Survey Area lies in Jarrahdale State Forest and is bordered by Jarrahdale town and Serpentine National Park to the west, Monadnocks Conservation Park to the east, and the existing Myara mine region to the south. The Survey Area covers approximately 18,000 hectares (ha).

The Survey included a desktop assessment, a consolidation of previous fauna studies, and a detailed and targeted vertebrate fauna survey undertaken in the Myara North region in winter (June/July) and spring (November) of 2020. The Survey included a Black Cockatoo habitat assessment in accordance with Commonwealth guidance and a targeted assessment of Carter's Freshwater Mussel.

Survey Results

The Survey Area consists of eight broad fauna habitat types: Bullich forest, Granite outcrop, Blackbutt forest, Flooded Gum woodland, Jarrah -Marri forest, Melaleuca dampland. Mine rehabilitation and Pine plantation. Jarrah-Marri forest predominated at 83% of the Survey Area. A small portion of the Survey Area comprises rural cleared land.

The conservation value of each fauna habitat type is specific to the locally occurring conservation significant fauna species and the type of usage by those species. All three Black Cockatoos were recorded primarily throughout the Marri-Jarrah forest, however all habitat types will be utilised for foraging by either one or all of the species. Melaleuca Damplands and riparian areas comprising Bullich Forest, Blackbutt Forest and Marri-Jarrah Forest support a Quokka population with records scattered throughout the Survey Area. Chuditch are wide ranging and expected to use all habitat types at a relatively low density.

In total 13 conservation significant species were recorded in the Survey Area including the Quokka, Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Forest Red-tailed Black Cockatoo, Baudin's Cockatoo, Carnaby's Cockatoo, Western False Pipistrelle, Southern Death Adder, Quenda, Rakali, Masked Owl and Peregrine Falcon. All species identified are likely to have significant populations and habitat present within the Survey Area. With regard to migratory shorebirds, the Survey Area lacks open water bodies that feature shallow shorelines for foraging habitat. The creek lines and vegetated dampland areas within the Survey Area are not suitable for migratory shorebirds.

Carter's Freshwater Mussel was targeted during the survey but no presence was recorded. The species is known to reside in the Serpentine Dam on the southern edge of the Survey Area and while mussels may disperse upstream from the Dam during winter/spring flows, all streams are seasonal and any dispersing mussels are unlikely to survive the extended dry summer period. Therefore, significant populations are unlikely in the Survey Area.

The DBCA NatureMap search identified 185 vertebrate fauna taxa previously recorded within 20 km radius of the Survey Area. This total included 28 mammals, 113 birds, 32 reptiles and 12 amphibians.

The detailed and targeted program recorded 132 vertebrate fauna species utilising the Survey Area, including 23 mammals, 76 birds, 26 reptiles and seven amphibians. Of these, eight introduced species (mammals and birds) were identified.

Fire was observed to cause substantial impact to fauna habitats of the Survey Areas. Large areas of the Survey Area had been burnt within the last 2 to 3 years impacting fauna habitat. During the Survey the north west portion of the Survey Area was prescribed burned in October 2020.

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Acronyms

| | |
|---------|--|
| DE | Development Envelope |
| DBCA | Department of Biodiversity, Conservation and Attractions |
| DBH | Diameter Breast Height |
| DAWE | The Department of Agriculture Water and Energy |
| DEE | Department of the Environment and Energy |
| DSEWPaC | Department of Sustainability, Environment, Water, Population and Communities |
| DSEWHA | Department of Environment, Water, Heritage and the Arts (Canberra) |
| EMRC | Environmental Management and Research Consultants |
| EPA | Environmental Protection Authority |
| EPBC | Environment Protection Biodiversity Conservation |
| EP | Environmental Protection |
| ERD | Environmental Review Document |
| ESD | Environmental Scoping Document |
| FRTBC | Forest Red-tail Black Cockatoo |
| GoWA | Government of Western Australia |
| IBSA | Index of Biodiversity Surveys for Assessments |
| LOO | Likelihood of Occurrence |
| LTFMP | Long Term Fauna Monitoring Program |
| MNES | Matters of National Environmental Significance |
| PMST | Protected Matters Search Tool |
| SM | Song Meter |
| SOP | Standard Operating Procedure |
| SRE | Short-Range Endemic |

1. Introduction

1.1 Project background

Alcoa of Australia Limited (Alcoa) is proposing to increase production at the Pinjarra Alumina Refinery by 5 per cent from 5 million tonnes per annum (Mtpa) to 5.25 Mtpa and transition the Huntly Bauxite Mine to the proposed Myara North and Holyoake mine regions (the Proposal). The Proposal is located in the Peel Region of Western Australia (WA), approximately 100 km south-east of Perth

The Proposal will be subject to environmental impact assessment under Part IV of the WA *Environmental Protection Act 1986* (EP Act), and the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). The environmental impact assessment will be via a Public Environmental Review (PER).

This Terrestrial Vertebrate Fauna Survey and Black Cockatoo Habitat Assessment (the Survey) has been prepared to support the EPA assessment of the Proposal and addresses the Myara North region of the Proposal. Separate reports address the Holyoake region, Pinjarra Refinery, Short-Range Endemic (SRE) invertebrate fauna, aquatic fauna, and subterranean fauna.

1.2 Purpose and scope of this report

The purpose of the surveys was to support the environmental assessment of the Project under Part IV of the *Environmental Protection Act 1986* (EP Act) and under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Specifically, the survey was to identify ecological values to support environment impact assessment of the Project against the EPA's Terrestrial Fauna factor and on MNES, including threatened and migratory fauna. The surveys will inform mine planning to avoid and minimise impacts to conservation values, enable quantification of impacts, and inform mine management arrangements.

This Survey report has been prepared in accordance with the Environmental Scoping Document (ESD) prepared for the Proposal under Part IV of the EP Act. The Survey has been undertaken in accordance with EPA (2020) *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* and relevant Commonwealth guidance on surveys for relevant threatened and migratory species.

This Survey report details the results of desktop assessment, a consolidation of previous fauna studies, and the findings of a detailed and targeted vertebrate fauna surveys undertaken in the Myara North region in winter (June/July) and spring (November) of 2020. The Survey includes a black cockatoo habitat assessment in accordance with Commonwealth guidance.

1.3 Survey Area

The Survey Area comprises the Myara North Development Envelope (DE) and adjacent conveyor and haul road corridors, as presented in Figure 1, Appendix A. The Survey Area lies in Jarrahdale State Forest and is bordered by Jarrahdale town and Serpentine National Park to the west, Monadnocks Conservation Park to the east, and the existing Myara mine region to the south. The Survey Area covers approximately 18,000 ha (refer Figure 1, Appendix A).

The Study Area comprises the Survey Area with a 10 km buffer and defines the limits of desktop database searches as described in Section 2.2.

1.4 Scope of works

The scope of works was to:

- Complete a comprehensive desktop assessment comprising terrestrial vertebrate fauna database search for the Study Area to determine the presence, or likely presence, of conservation significant vertebrate fauna species
- Review relevant literature relating to terrestrial vertebrate fauna within Alcoa's ML1SA mineral lease, with particular focus on conservation significant fauna

- Undertake a two-season detailed and targeted (Forest Red-tailed Black Cockatoo, Carnaby's Cockatoo, Baudin's Cockatoo, Chuditch, Quokka, and other priority species) vertebrate fauna survey within the Survey Area
- Provide a technical report (this document) detailing the results and findings of the survey
- Submit fauna survey data to the Index of Biodiversity Surveys for Assessments (IBSA) in accordance with Statutory requirements.
- Though not a vertebrate species, a targeted survey was undertaken for the threatened aquatic invertebrate Carters Freshwater Mussel as part of the field survey program. The targeted survey was undertaken further to the findings of a desktop aquatic fauna assessment (WRM 2021) which identified the potential presence of the species in the Survey Area.

1.5 Limitations and assumptions

This report: has been prepared by GHD for Alcoa of Australia Limited and may only be used and relied on by Alcoa of Australia Limited for the purpose agreed between GHD and Alcoa of Australia Limited as set out in section 1.4 of this report.

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GHD has prepared this report on the basis of information provided by Alcoa of Australia Limited and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.6 Project terminology and definitions

Some common project terminology are described below in Table 1.

Table 1 Project terminology and definitions

| Term (Abbreviation) | Definition/Use |
|------------------------------------|---|
| Alcoa of Australia Limited (Alcoa) | Proponent of the Project and client of GHD for this Project. |
| GHD Pty Ltd (GHD) | Consultant engaged by Alcoa to prepare environmental approvals documentation and supporting technical studies for the Proposal. |
| Mining region | Sub-regions that comprise the Huntly Mine, including current (Myara), past (Del Park, Huntly 1 & 2, White, McCoy and O'Neil) and future (Myara North, Holyoake), etc. |
| Survey Area | Myara North Development Envelope and associated infrastructure corridor. |
| Study Area | The Survey Area with a 10 km buffer used to define the limits of desktop database searches. |
| Haul Road | Truck and mine infrastructure access road linking into existing corridors. |
| Conveyor Corridor | New conveyor through the Myara region connecting to the Myara North Development Envelope. |
| Detailed fauna survey | As per EPA 2020 describing the type of survey required, replaces wording from EPA 2016 for Level 2 assessment. |
| Targeted fauna survey | As per EPA 2020 describing the type of survey required, refers to undertaking targeted assessments for specific fauna species. |

2. Methodology

2.1 Relevant legislation, conservation codes and background information

In WA some ecological communities, flora and fauna are protected under both Australian Government and State Government legislation. In addition, regulatory authorities provide a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to the Survey is provided in Appendix B.

2.2 Desktop assessment

The desktop assessment comprises a review of various databases and literature sources (listed below) related to the environmental and ecological nature of the Survey Area.

The desktop assessment included a review of:

- The Department of Agriculture Water and Energy (DAWE), formerly Department of the Environment and Energy (DEE) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the Study Area (DAWE 2020) (Appendix C).
- The DBCA *NatureMap* database for fauna species previously recorded within the Study Area (DBCA 2007–) (Appendix C).
- Existing datasets including previous broad-scale vegetation mapping of the Survey Area, aerial photography, geology/soils and hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats and to identify areas with the potential to contain Threatened and Priority fauna species.
- Literature provided by Alcoa and relating to fauna recorded in Alcoa's ML1SA mining lease within the Northern Jarrah Forest, (refer Table 19).

Due to the varying complexity of the reviewed data, various search extents were used to best display the targeted information. The extent used on each database as well as the literature review is displayed in Table 2.

Table 2 Extent of data searches

| Component | Extent | Rationale |
|---------------------------------|-------------|---|
| Regional biogeography | Region | This is a regional characterisation. |
| Climate | Karnet | Closest reliable weather station |
| Geology | Study Area | Broad classification with low number of outputs in Study Area |
| Land systems | Study Area | Broad classification with low number of outputs in Study Area |
| Surface water and hydrology | Study Area | Considered important to include surface water sources in proximity to the survey are which may be used by fauna as a drinking water supply and which may impact habitat type and availability. |
| Conservation reserves | Study Area | To consider protected land in and in proximity to the Survey Area. |
| DBCA Managed Lands | Study Area | To consider protected land in and in proximity to the Survey Area. |
| Environmentally Sensitive Areas | Study Area | To consider protected land in and in proximity to the Survey Area. |
| Regional Ecological Linkages | Study Area | To consider protected land in and in proximity to the Survey Area. |
| Broad vegetation mapping | Survey Area | Fairly detailed and complex data |
| Fauna species databases | Study Area | Search area extended due to motile nature of some fauna |
| Literature review | Region | Much of the literature was from Alcoa's Huntly Mine sites and surrounding forest to the south of the current Survey Area. Available literature was reviewed if applicable to terrestrial fauna. |

2.3 Field survey

2.3.1 Survey details and timing

Field surveys were performed between 25 June and 13 November 2020 and consisted of five site visits from one to eleven days in duration. Most of the survey timing falls within the recommended survey timing for the southern climatic region for all species groups (EPA 2020). However, the first phase was undertaken in winter 2020 outside of the recommended period. This was undertaken to fulfil the survey schedule and the ability to maximise reptile detection via hand searches during seasonally low activity periods. It is unlikely that this survey timing adversely influenced the potential detection of mammal, bird or amphibian via the captures and recording methods used as these fauna groups remain active throughout the year and are detectable during winter. Survey timing and personnel are represented in Table 3.

Table 3 Myara North survey details and timing

| Field Trip | Dates | Task | Duration | Zoologist/Ecologist | Years of experience of field personnel |
|--------------------------|--|---|----------|---------------------------|--|
| 1 | 25 June 2020 | Reconnaissance, camera and bat detector deployment | 1 day | Principal Zoologist | 20 |
| | | | | Senior Zoologist | 20 |
| 2 | 29 June - 9 July 2020 | Phase 1 Survey: Detailed and Targeted fauna surveys (including trapping) within the Survey Area, identification and mapping of potential Black Cockatoo breeding trees and selected large hollows. | 11 days | Senior Zoologist | 20 |
| | | | | Senior Zoologist | 20 |
| | | | | Zoologist | 5 |
| | | | | Ecologist | 10 |
| | | | | Ecologist | 3 |
| | | | | Graduate Ecologist | 2 |
| | | | | Graduate Ecologist | 2 |
| Hydrologist (field hand) | 2 | | | | |
| 3 | 24 June, 16, 20-21, 27 July, 23 August 2020 | Assessment of black cockatoo trees and habitat identified in Myara North | 6 days | Black cockatoo specialist | 20 |
| 4 | 7 September -16 September 2020 | Collection of cameras deployed during Phase 1 survey | 7 days | Zoologist | 5 |
| | | | | Graduate Ecologist | 2 |
| | 28-29 October, 11 November 2020 | Assessment of black cockatoo trees and habitat identified in proposed Myara North facilities location | 3 days | Black cockatoo specialist | 20 |
| 5 | 3 November – 13 November 2020 (excluding weekend due to car rally) | Phase 2 Survey: Detailed and Targeted fauna surveys (including trapping) within the Survey Area, Carters Freshwater Mussel assessment, Quokka assessment, Chuditch assessment, Black Cockatoo assessment. | 10 days | Principal Zoologist | 20 |
| | | | | Senior Zoologist | 20 |
| | | | | Senior Zoologist | 20 |
| | | | | Zoologist | 5 |
| | | | | Graduate Ecologist | 2 |
| Graduate Ecologist | 2 | | | | |
| 6 | 22 December 2020 | Collection of cameras deployed in Phase 2 survey. | 2 days | Senior Zoologist | 20 |
| | | | | Zoologist | 5 |
| | | | | Ecologist | 3 |
| | | | | Graduate Ecologist | 2 |

2.3.2 Guiding documents

The Survey methodology and data collection employed was scoped according to EPA *Technical Guidance – Sampling methods for terrestrial vertebrate fauna* (EPA 2016a) and *Technical Guidance – Terrestrial Fauna Surveys* (EPA 2016b). However, during mobilisation of the Survey the updated *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) was released. Where practicable the EPA (2020) guidance was followed.

The following Commonwealth survey guidance was adopted where relevant:

- EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed black cockatoo (Commonwealth Department of the Sustainability, Environment, Water, Population and Communities 2012a).
- Survey guidelines for Australia's threatened birds (Commonwealth Department of the Environment, Water, Heritage and the Arts 2010).
- Survey guidelines for Australia's threatened mammals (Commonwealth Department of the Sustainability, Environment, Water, Population and Communities 2011).
- Survey guidelines for Australia's threatened reptiles (Commonwealth Department of the Sustainability, Environment, Water, Population and Communities 2011).

2.3.3 Permits and ethics

A Section 40 Authorisation to Take or disturb threatened Fauna (Licence Number: 2020-0075), and a Regulation 27 (Licence No. BA27000269) to take Fauna for biological assessment was obtained from DBCA prior to undertaking the fauna surveys. The fauna survey (specifically trapping and animal handling) was undertaken in accordance with Standard Operating Procedures (SOPs) which were required to be followed under the conditions of GHD's fauna trapping permit. At the time of survey, compliance with these SOPs was accepted by DBCA as evidence of ethical treatment of animals.

2.3.4 Habitat assessment

The Survey Area was assessed for fauna habitat type based on floristic species, structural complexity, connectivity, hydrology, disturbance, type and extent of resource availability and value for fauna. Specifically, the assessment included:

- Habitat structure (e.g. vegetation type, presence/absence of overstorey, midstorey, understorey, and ground cover).
- Description of geomorphology, topography and substrate where applicable.
- Presence/absence of refuge including: fallen timber (coarse woody debris), hollow-bearing trees and stags and rocks/breakaways, and the type and extent of each refuge.
- Location of the habitat within the Survey Area in comparison to the habitat within the surrounding landscape.
- Habitat connectivity of refugia i.e. low dense vegetation associated with drainage lines and damplands within the Jarrah Forest, and identification of wildlife corridors for habitat specialist fauna, namely Quokka and Quenda within and immediately adjacent to the Survey Area.
- Identification and evaluation of key habitat features and types identified during the desktop assessment relevant to fauna of conservation significance.
- Evaluation of the likelihood of occurrence of conservation significant fauna within the environments present (based on presence of suitable habitats and species recorded)
- A representative photograph of each habitat type to complement description of habitat characteristics.

Habitat types have been delineated to align with Mattiske (2021) vegetation community types. That is, each habitat type represents one or more vegetation types. Refer to section 4.1.

2.3.5 Fauna identification and nomenclature

Identification of fauna species was made in the field using available field guides and electronic guides (Table 4). Where identification was not possible, photographs of specimens were collected to be later identified.

Table 4 Fauna references

| Fauna group | Field guide |
|-------------|--|
| Mammals | Menkhorst and Knight (2010), Van Dyck and Strahan (2008) |
| Bats | Churchill (2008), Menkhorst and Knight (2010) |
| Birds | Morcombe (2004) |
| Reptiles | Wilson and Swan (2017), Storr <i>et al.</i> (1999), Storr <i>et al.</i> (2002) |
| Amphibians | Tyler and Doughty (2009) |

Nomenclature

Nomenclature used in this report follows that used by the WA Museum as reported on *NatureMap*. This nomenclature is deemed the most up-to-date species information for WA fauna, with the exception of birds, which follows Christidis and Boles (2008).

2.3.6 Trapping program

The same sampling techniques and trap layouts were used during both phases of the Survey and involved a series of standardised systematic trapping quadrat sites comprising pit-fall traps, Elliott box traps, cage traps and funnel traps. Details of each trap type used are provided below. During both phases, a total of twelve quadrats were established across the Survey Area and each quadrat was systematically surveyed (trapped) for seven to eight nights. Trap quadrat details are presented in Table 15 and locations shown in Figure 3, Appendix A.

The trap quadrats were selected to sample across the major habitat types occurring within the Survey Area. Traps sites were established during the first phase of trapping and closed upon survey completion, before being reopened during the second phase of trapping and removed upon survey completion. During Phase 2 of the survey, traps were closed for three nights after four nights of being opened, and then reopened again for a further four nights (see section 2.3.11). Initial design focused on undertaking a detailed assessment (EPA 2020) however through refinement, it developed into a targeted focused survey for conservation significant species identified in the Likelihood of Occurrence assessment (section 3.6.2) as discussed below.

Potential SRE fauna bycatch was collected throughout the Phase 2 survey and provided to Phoenix Environmental for identification and assessment of SRE fauna (Phoenix 2021). Specimens collected were only those from SRE candidate groups such as isopods, mygalomorphs, scorpions, millipedes, and planarians.

Pit-trap with drift fence

Seven (7) pit-traps were established at each quadrat within the Survey Area. Pit-traps comprised of 20 litre (L) plastic buckets (30 cm diameter, 40 cm deep) at each quadrat. A 50 m long flywire drift fence (30 cm high) bisected the pits; directing fauna into them. Pits were spaced at seven metre intervals along the fence. Soil and an egg carton were placed within each pit to provide shade and protection for captured animals.

Species targeted through this method were the Dell's Skink (*Ctenotus delli*) and Southern Death Adder (*Acanthophis antarcticus*). There are no specific guidelines on the assessment of these reptiles specifically in Western Australia, however detection methods were derived from DSEWPaC (2011a).

Funnel traps

Twelve (12) funnel traps were used along the drift fence at each quadrat. Traps were placed such that animals were directed into them from the drift fence in between the pit traps. Funnel traps were covered with insulating materials to minimise heat or cold exposure to animals.

Species targeted through this method were the Dell's Skink and Southern Death Adder. There are no specific guidelines on the assessment of these reptiles specifically in Western Australia, however detection methods derived from DSEWPaC (2011a).

Elliot box traps

One line of ten (10) Elliot ® box traps was established at each quadrat and positioned approximately 50 m away (and parallel to) the drift fence. Traps were placed approximately ten metres apart and baited with universal bait (a mixture of peanut butter, rolled oats and sardines). Elliott traps were located within shady areas or covered with vegetation to minimise exposure to captured animals. Where practicable Elliot traps were placed (strapped) in trees and onto logs to increase the likelihood of arboreal mammal captures.

Species targeted through this method include Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*). The techniques utilised for this species were derived from Orell (2004), Scida and Gration (2017) and DSEWPaC (2011b).

Cage traps

Two (2) cage traps (with approximate dimensions 26 by 23 by 66 cm) were located at each quadrat site. These traps were placed at each end of the line of Elliot traps approximately 100 m apart. Cage traps were baited with universal bait and chicken wings.

Species targeted through this method include Brush-tailed Phascogale, Chuditch (*Dasyurus geoffroyi*) and Quenda (*Isoodon fusciventer*). Specific survey guidelines exist for the Chuditch and this technique derived from DSEWPaC (2011b). Brush-tailed Phascogale and Quenda are also trapped via cage traps (Orell 2004).

Targeted cage trap lines

Cage traps (with approximate dimensions 26 by 23 by 66 cm) were deployed for a minimum of seven nights along five transects during both survey phases to target Brush-tailed Phascogale, Chuditch and Quenda. Each transect consisted of ten cage traps. These cages were baited with chicken wings as per recommendations from Alcoa (McGregor *et al.* 2014). For each trap deployed, the time and date deployed and recovered, as well as the GPS coordinates were recorded (see Table 5). Cage trap locations are presented in Figure 3, Appendix A.

Captured Chuditch were to be capture-marked-released to assess population size. Upon capture, gender, reproductive stage and health index would be recorded. Health index was rated on a scale from 1 to 3 after feeling the base of the Chuditch tail where a scale of 1 meant that bones could be felt and the Chuditch may be in poor health, and a scale of 3 meant that tail vertebrae could not be felt due to a layer of fat and the Chuditch was considered in excellent health. Photographs would then be taken of the Chuditch's head and back, one spot on the back would then be coloured with permanent marker before a second dorsal photograph was recorded and the Chuditch was released in a suitable hollow or burrow.

Cages would be closed if females carrying pouch young were recaptured, or any Chuditch was re-captured three consecutive nights in a row.

Table 5 Targeted Chuditch cage trap lines summary

| Transect Number | Site name I.D | Habitat type | Location | | Nights deployed | |
|-----------------|---------------|---------------------|----------|----------|------------------------|------------------------|
| | | | Easting | Northing | Phase 1 | Phase 2 |
| Transect 1 | Cage trap 1 | Jarrah Marri forest | 419221 | 6422973 | 7 nights per cage trap | 7 nights per cage trap |
| | Cage trap 2 | | 419394 | 6422892 | | |
| | Cage trap 3 | | 419514 | 6422675 | | |
| | Cage trap 4 | | 419509 | 6422420 | | |
| | Cage trap 5 | | 419565 | 6422228 | | |
| | Cage trap 6 | | 419650 | 6422018 | | |
| | Cage trap 7 | | 419761 | 6421852 | | |
| | Cage trap 8 | | 419942 | 6421709 | | |
| | Cage trap 9 | | 420119 | 6421576 | | |
| | Cage trap 10 | | 420454 | 6421525 | | |
| Transect 2 | Cage trap 11 | Blackbutt forest | 421648 | 6419061 | 7 nights per cage trap | 7 nights per cage trap |
| | Cage trap 12 | | 421627 | 6418960 | | |
| | Cage trap 13 | | 421566 | 6418876 | | |
| | Cage trap 14 | | 421507 | 6418709 | | |
| | Cage trap 15 | | 421512 | 6418688 | | |
| | Cage trap 16 | | 421542 | 6418576 | | |
| | Cage trap 17 | | 421588 | 6418460 | | |
| | Cage trap 18 | | 421554 | 6418336 | | |
| | Cage trap 19 | | 421622 | 6418278 | | |
| | Cage trap 20 | | 421670 | 6418167 | | |
| Transect 3 | Cage trap 21 | Jarrah Marri forest | 428918 | 6412191 | 7 nights per cage trap | 7 nights per cage trap |
| | Cage trap 22 | | 429050 | 6412366 | | |
| | Cage trap 23 | | 429269 | 6412380 | | |
| | Cage trap 24 | | 429411 | 6412288 | | |
| | Cage trap 25 | | 429604 | 6412250 | | |
| | Cage trap 26 | | 429777 | 6412335 | | |
| | Cage trap 27 | | 429896 | 6412492 | | |
| | Cage trap 28 | | 430073 | 6412581 | | |
| | Cage trap 29 | | 430240 | 6412663 | | |
| | Cage trap 30 | | 430324 | 6412836 | | |
| Transect 4 | Cage trap 31 | Jarrah Marri forest | 426343 | 6421760 | 7 nights per cage trap | 7 nights per cage trap |
| | Cage trap 32 | | 426311 | 6421557 | | |
| | Cage trap 33 | | 426318 | 6421336 | | |
| | Cage trap 34 | | 426370 | 6421155 | | |
| | Cage trap 35 | | 426408 | 6420976 | | |
| | Cage trap 36 | | 426292 | 6420861 | | |
| | Cage trap 37 | | 426092 | 6420769 | | |
| | Cage trap 38 | | 425938 | 6420749 | | |
| | Cage trap 39 | | 425737 | 6420688 | | |

| Transect Number | Site name I.D | Habitat type | Location | | Nights deployed | |
|------------------------------|---------------|--|----------|----------|------------------------|------------------------|
| | | | Easting | Northing | Phase 1 | Phase 2 |
| | Cage trap 40 | | 425617 | 6420560 | | |
| Transect 5 | Cage trap 41 | Bullich and Blackbutt forest (for phase 2 this site was moved slightly due to a prescribed burn scar) to Jarrah Marri forest | 418126 | 6419947 | 7 nights per cage trap | 7 nights per cage trap |
| | Cage trap 42 | | 418053 | 6420152 | | |
| | Cage trap 43 | | 418040 | 6420333 | | |
| | Cage trap 44 | | 418048 | 6420531 | | |
| | Cage trap 45 | | 418030 | 6420734 | | |
| | Cage trap 46 | | 417907 | 6420899 | | |
| | Cage trap 47 | | 417881 | 6421081 | | |
| | Cage trap 48 | | 417737 | 6421205 | | |
| | Cage trap 49 | | 417716 | 6421245 | | |
| | Cage trap 50 | | 417657 | 6421297 | | |
| Total of each Phase | | | | | 350 | 350 |
| Combined Total Effort | | | | | 700 | |

Avifauna

Avifauna surveys were undertaken at each of the quadrat sites and opportunistically for a combined total of 2340 minutes. Avifauna surveys were undertaken at each of the quadrat sites. Each survey comprised of a 20 minute census of birds within an unbounded 2 ha area, which is the standard method used by Birds Australia for the Bird Atlas project. Birds detected visually (using binoculars) and/or aurally over a 20 minute period were recorded. Numbers of each species observed were also recorded.

All systematic bird surveys were undertaken either within four hours of dawn or two hours of dusk, as these are the times of day when birds are most active. In addition to systematic surveys, observations of birds were also made opportunistically throughout the survey activities. These are not part of the systematic quadrat surveys but add a significant proportion of the bird species observed.

Avifauna survey effort is displayed in Table 6.

Table 6 Avifauna survey effort

| Site Type | Location | | Habitat type | Survey effort (minutes) |
|----------------|----------|----------|------------------------|-------------------------|
| | Easting | Northing | | |
| Phase 1 | | | | |
| TL1 | 419173 | 6422951 | Jarrah Marri forest | 90 |
| TL2 | 421559 | 6418605 | Blackbutt forest | 90 |
| TL3 | 424227 | 6416681 | Melaleuca damp land | 90 |
| TL4 | 426987 | 6413519 | Jarrah Marri forest | 90 |
| TL5 | 427900 | 6412972 | Granite outcrop Assoc. | 90 |
| TL6 | 427604 | 6410609 | Flooded Gum woodland | 90 |
| TL7 | 428302 | 6417251 | Jarrah Marri forest | 90 |
| TL8 | 426279 | 6422853 | Jarrah Marri forest | 90 |
| TL9 | 424253 | 6425012 | Jarrah Marri forest | 90 |
| TL10 | 424816 | 6421905 | Jarrah Marri forest | 90 |
| TL11 | 420735 | 6417238 | Granite outcrop | 90 |
| TL12 | 413197 | 6421772 | Jarrah Marri forest | 90 |

| Site Type | Location | | Habitat type | Survey effort (minutes) |
|---|----------|----------|--------------------------------------|-------------------------|
| | Easting | Northing | | |
| Opportunistic | 415684 | 6414906 | Not recorded | 30 |
| Opportunistic | 414570 | 6418045 | Not recorded | 30 |
| Opportunistic | 429971 | 6410176 | Not recorded | 30 |
| Opportunistic | 414320 | 6420879 | Not recorded | 30 |
| Opportunistic | 418523 | 6417302 | Not recorded | 30 |
| Opportunistic | 416068 | 6422764 | Not recorded | 30 |
| Phase 1 Total | | | | 1,260 |
| Phase 2 | | | | |
| TL1 | 419173 | 6422951 | Jarrah Marri forest (recently burnt) | 90 |
| TL2 | 421559 | 6418605 | Blackbutt forest | 90 |
| TL3 | 424227 | 6416681 | Melaleuca dampland | 90 |
| TL4 | 426987 | 6413519 | Jarrah Marri forest | 90 |
| TL5 | 427900 | 6412972 | Granite outcrop Assoc. | 90 |
| TL6 | 427604 | 6410609 | Flooded Gum woodland | 90 |
| TL7 | 428302 | 6417251 | Jarrah Marri forest | 90 |
| TL8 | 426279 | 6422853 | Jarrah Marri forest | 90 |
| TL9 | 424253 | 6425012 | Jarrah Marri forest | 90 |
| TL10 | 424816 | 6421905 | Jarrah Marri forest | 90 |
| TL11 | 420735 | 6417238 | Granite outcrop Assoc. | 90 |
| TL12 | 413197 | 6421772 | Jarrah Marri forest | 90 |
| Phase 2 Total | | | | 1,080 |
| Phase 1 and Phase 2 Combined Total | | | | 2,340 |

Camera traps

Thirty-three remote cameras (Reconyx-Hyperfire ® and Reconyx-Pro ®) were deployed during Phase 1 for a total of 2,375 trap nights, and 20 remote cameras were deployed for 547 trap nights during Phase 2. In total 2,922 nights were undertaken. The duration of trap nights for each camera ranged from 21 to 89 trap nights. Remote cameras were deployed to target the conservation significant Chuditch (VU), Quokka (*Setonix brachyurus*, VU), Quenda (P4), Rakali (*Hydromys chrysogaster*, P4), Western Brush Wallaby (*Macropus irma*, P4), Brush-tailed Phascogale (CD) and general fauna (birds, reptiles and mammals). This was done by positioning cameras within the core habitat of targeted species, i.e. for Quokka, creek lines and damplands were investigated and cameras placed low in dense vegetation (within runnels if present). Conversely in upland habitat, Chuditch were targeted by utilising logs and hollows to position cameras. To target Brush-tailed Phascogale, cameras were set up similar to that described in Scida and Gratton (2017). Cameras were baited with universal animal bait (a combination of peanut butter, oats and sardines) to attract fauna species within the Survey Area. For each camera location the number of nights deployed, and the GPS coordinates were recorded (Table 7). Cameras were used in this instance to supplement other trapping techniques and sample for more cryptic species such as the Quokka. The use of cameras also reduces the invasive impacts of trapping on species (DEC 2011).

Camera setup included fast trigger speed (faster than 0.5 sec) and colour photographs during the day and monochrome at night. The highest mega pixel possible, frames per second (>1) with capture set to three pictures per trigger with a one second delay.

Data from the cameras were downloaded to a computer and manually analysed for the presence of fauna following the field survey.

Species targeted through this method include Chuditch, Quokka, Quenda, Rakali, Western Brush Wallaby and Brush-tailed Phascogale.

Table 7 Camera trap locations

| Camera Number | Habitat Type | Location | | Deployed | | Trap Nights Deployed |
|----------------------|---|----------|----------|------------|------------|----------------------|
| | | Easting | Northing | Set | Collected | |
| Phase 1 | | | | | | |
| CAM 1 | Jarrah Marri Forest | 418864 | 6418040 | 6/07/2020 | 9/09/2020 | 65 |
| CAM 4 | Melaleuca dampland | 416403 | 6416995 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 5 | Jarrah Marri Forest | 414533 | 6418380 | 7/07/2020 | 8/09/2020 | 64 |
| CAM 6 | Blackbutt forest | 421796 | 6420180 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 7 | Jarrah Marri Forest | 417930 | 6422313 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 8 | Jarrah Marri Forest | 422863 | 6419611 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 10 | Blackbutt forest | 421279 | 6420885 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 11 | Jarrah Marri Forest | 413643 | 6419215 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 12 | Blackbutt forest | 421719 | 6418205 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 13 | Jarrah Marri Forest | 425487 | 6419041 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 14 | Jarrah Marri forest | 412543 | 6421508 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 15 | Jarrah Marri Forest | 418879 | 6417211 | 6/07/2020 | 9/09/2020 | 65 |
| CAM 15b | Bullich forest | 417973 | 6420573 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 16 | Jarrah Marri Forest | 423744 | 6415834 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 27 | Bullich forest | 417762 | 6421235 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 18 | Bullich forest | 417972 | 6420590 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 19 | Granite outcrop Assoc. | 427821 | 6410903 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 20 | Jarrah Marri Forest | 423469 | 6421514 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 21 | Jarrah Marri Forest | 426592 | 6419221 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 23 | Jarrah Marri Forest | 423494 | 6420401 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 24 | Jarrah Marri Forest | 419237 | 6423010 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 25 | Jarrah Marri Forest | 423668 | 6418484 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 28 | Jarrah Marri Forest | 426306 | 6417290 | 24/06/2020 | 11/09/2020 | 79 |
| CAM 29 | Blackbutt forest | 422981 | 6418491 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 31 | Melaleuca dampland | 424732 | 6423215 | 4/07/2020 | 11/09/2020 | 69 |
| CAM 41 | Jarrah Marri Forest | 415169 | 6416938 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 43 | Melaleuca dampland | 415525 | 6419259 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 44 | Jarrah Marri Forest | 413126 | 6420315 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 1 | Melaleuca dampland | 424674 | 6423235 | 6/07/2020 | 9/09/2020 | 65 |
| CAM 4 | Bullich forest | 417780 | 6421235 | 7/07/2020 | 9/09/2020 | 64 |
| CAM 77 | Blackbutt forest | 420846 | 6407514 | 14/09/2020 | 11/12/2020 | 89 |
| CAM 7 | Jarrah Marri Forest (conveyor corridor) | 419320 | 6404938 | 14/09/2020 | 11/12/2020 | 89 |
| CAM 24 | Jarrah Marri Forest (conveyor corridor) | 423753 | 6411977 | 14/09/2020 | 11/12/2020 | 89 |
| Phase 1 Total | | | | | | 2,375 |

| Camera Number | Habitat Type | Location | | Deployed | | Trap Nights Deployed |
|-------------------------------------|------------------------|----------|----------|------------|-----------|----------------------|
| | | Easting | Northing | Set | Collected | |
| Phase 2 | | | | | | |
| CAM 19 | Jarrah Marri Forest | 422598 | 6417606 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 26 | Melaleuca dampland | 425849 | 6413871 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 31 | Melaleuca dampland | 429026 | 6413236 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 27 | Jarrah Marri Forest | 423076 | 6417283 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 13 | Melaleuca dampland | 424219 | 6416023 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 16 | Jarrah Marri Forest | 422187 | 6417758 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 25 | Melaleuca dampland | 413390 | 6421527 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 12 | Melaleuca dampland | 420665 | 6414911 | 4/11/2020 | 2/12/2020 | 28 |
| CAM GHDa | Jarrah Marri Forest | 421144 | 6415089 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 18 | Jarrah Marri Forest | 419843 | 6416674 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 1 | Blackbutt forest | 414557 | 6419520 | 4/11/2020 | 2/12/2020 | 28 |
| CAM 11 | Bullich forest | 417382 | 6419424 | 3/11/2020 | 2/12/2020 | 29 |
| CAM 44 | Melaleuca dampland | 415880 | 6417989 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 6 | Jarrah Marri Forest | 426620 | 6416720 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 28 | Jarrah Marri Forest | 426043 | 6415364 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 15B | Jarrah Marri Forest | 427392 | 6415617 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 14 | Jarrah Marri Forest | 428306 | 6416019 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 115 | Granite outcrop Assoc. | 426358 | 6425914 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 166 | Granite outcrop Assoc. | 426466 | 6426032 | 5/11/2020 | 2/12/2020 | 27 |
| CAM 10 | Melaleuca dampland | 422643 | 6422180 | 11/11/2020 | 2/12/2020 | 21 |
| Phase 2 Total | | | | | | 547 |
| Combined Phase 1 and 2 Total | | | | | | 2,922 |

Bat Surveys

Bat Detectors (SM2 and SM4 SongMeters®) were deployed for a period of between two and six nights at each survey location during both survey phases. Bat detectors were positioned in areas where bats might be recorded, i.e., utilising water bodies, fly ways, hill tops or open areas associated with damplands or granite outcrops. Bat detectors were set to record from 30 minutes pre-dusk to 30 minutes post-dawn. Detectors were set to record full spectrum and assessed using Kaleidoscope Pro (Wildlife Acoustics) and Anabat Insight (Titley Electronics). For each detector, the time and date deployed and recovered, and the GPS coordinates were recorded (Table 8). Bat detector locations are presented in Figure 3, Appendix A.

Data from the bat detectors were downloaded to a computer and analysed by Craig Grabham, GHD Principal Ecologist, for the presence of bats following the field survey.

Species targeted through this method include the Western False Pipistrelle (*Falsistrellus mackenziei*) with guidance on survey design from DSEWHA (2010) and Bugar *et al* (2017).

Table 8 Bat detector locations

| Bat detector | Habitat type | Location | | Deployed | | Nights deployed |
|-------------------------------------|------------------------|----------|----------|------------|------------|-----------------|
| | | Easting | Northing | Set | Collected | |
| Phase 1 | | | | | | |
| SM4-1 | Jarrah Marri Forest | 426282 | 6417199 | 24/06/2020 | 30/06/2020 | 6 |
| SM4-1 | Granite outcrop Assoc. | 427915 | 6412940 | 30/06/2020 | 2/07/2020 | 2 |
| SM4-1 | Jarrah Marri Forest | 425818 | 6421856 | 2/07/2020 | 4/07/2020 | 2 |
| SM4-4 | Jarrah Marri Forest | 417931 | 6422315 | 24/06/2020 | 30/06/2020 | 6 |
| SM4-4 | Jarrah Marri Forest | 425197 | 6414173 | 30/06/2020 | 2/07/2020 | 2 |
| SM4-4 | Jarrah Marri Forest | 421309 | 6416290 | 3/07/2020 | 6/07/2020 | 3 |
| SM4-5 | Jarrah Marri Forest | 419249 | 6423008 | 24/06/2020 | 29/06/2020 | 5 |
| SM4-5 | Blackbutt forest | 421589 | 6418754 | 29/06/2020 | 2/07/2020 | 3 |
| SM4-5 | Granite outcrop Assoc. | 427860 | 6411147 | 2/07/2020 | 6/07/2020 | 4 |
| SM2-3 | Bullich forest | 417973 | 6420593 | 24/06/2020 | 30/06/2020 | 6 |
| SM2-3 | Melaleuca dampland | 424270 | 6416696 | 30/06/2020 | 2/07/2020 | 2 |
| Total Phase 1 | | | | | | 41 |
| Phase 2 | | | | | | |
| SM4-4 | Granite outcrop Assoc. | 415676 | 6414950 | 3/11/2020 | 5/11/2020 | 2 |
| SM4-1 | Granite outcrop Assoc. | 420798 | 6417251 | 3/11/2020 | 6/11/2020 | 3 |
| SM4-4 | Jarrah Marri Forest | 420771 | 6417263 | 3/11/2020 | 6/11/2020 | 3 |
| SM4-1 | Jarrah Marri Forest | 426302 | 6422178 | 6/11/2020 | 9/11/2020 | 3 |
| SM4-2 | Jarrah Marri Forest | 425097 | 6426021 | 6/11/2020 | 9/11/2020 | 3 |
| SM2-3 | Jarrah Marri Forest | 423254 | 6417433 | 6/11/2020 | 9/11/2020 | 3 |
| SM4-4 | Blackbutt forest | 421492 | 6418891 | 6/11/2020 | 9/11/2020 | 3 |
| SM4 -1 | Melaleuca dampland | 422176 | 6420640 | 9/11/2020 | 11/11/2020 | 2 |
| Total Phase 2 | | | | | | 22 |
| Combined Phase 1 and 2 Total | | | | | | 63 |

Nocturnal Bird Acoustics and Bird Census

Song Meter SM4 (Wildlife Acoustics) acoustic recorders were deployed at 13 sites throughout the Survey Area and recorded a combined total of 47 nights during both survey phases. Acoustics were positioned in areas where birds might be recorded, i.e. utilising water bodies, flyways and specifically targeted the Masked Owl (*Tyto novaehollandiae*). For each acoustic recorder site, the number of nights deployed, and the GPS coordinates were recorded (see Table 9). Acoustic recorder's locations are depicted in Figure 3, Appendix A.

Data from the acoustic recorders were downloaded to a computer and analysed for the presence of birds following the field survey. Data from the acoustic recorders was assessed by Nigel Jackett (Bird Specialist) for the presence of bird species. The methods of his assessment and results are provided in detail in Appendix D.

Table 9 *Bird acoustics recorder locations*

| Bird Acoustics recorder site name | Habitat type | Location | | Deployed | Collected | Nights deployed |
|-------------------------------------|---|----------|----------|-----------|-----------|-----------------|
| | | Easting | Northing | Set | | |
| Phase 1 | | | | | | |
| SM4-AC1 | Blackbutt forest | 417220 | 6419709 | 4/07/2020 | 9/07/2020 | 5 |
| SM4-AC1 | Blackbutt forest | 424795 | 6421966 | 1/07/2020 | 4/07/2020 | 3 |
| SM4-AC2 | Granite outcrop Assoc. | 420722 | 6417160 | 4/07/2020 | 6/07/2020 | 2 |
| SM4-AC2 | Jarra Marri forest | 415306 | 6415314 | 7/07/2020 | 9/07/2020 | 2 |
| SM4-AC3 | Jarra Marri forest | 414389 | 6420890 | 1/07/2020 | 9/07/2020 | 8 |
| SM4-AC4 | Jarra Marri forest (adjacent clearing/farmland) | 415635 | 6419757 | 1/07/2020 | 9/07/2020 | 8 |
| Total Phase 1 | | | | | | 28 |
| Phase 2 | | | | | | |
| SM4-AC3 | Jarra Marri forest | 421995 | 6417174 | 3/11/2020 | 6/11/2020 | 3 |
| SM4-AC1 | Bullich forest | 417415 | 6419370 | 3/11/2020 | 5/11/2020 | 2 |
| SM4-AC2 | Jarra Marri forest | 415679 | 6414947 | 3/11/2020 | 5/11/2020 | 2 |
| SM4-AC2 | Jarra Marri forest (adjacent clearing/farmland) | 424811 | 6426489 | 6/11/2020 | 9/11/2020 | 3 |
| SM4-AC3 | Jarra Marri forest | 426584 | 6421732 | 6/11/2020 | 9/11/2020 | 3 |
| SM4-AC4 | Jarra Marri forest | 423237 | 6417434 | 6/11/2020 | 9/11/2020 | 3 |
| SM4-AC1 | Blackbutt forest | 421492 | 6418887 | 6/11/2020 | 9/11/2020 | 3 |
| Total Phase 2 | | | | | | 19 |
| Combined Phase 1 and 2 Total | | | | | | 47 |

Carter’s Freshwater Mussel assessment

Carter’s Freshwater Mussel (*Westralunio carteri*) assessments were conducted during the Phase 2 survey. The survey approach was based on a method used by Klunzinger *et al.* (2012) to study Carter’s Freshwater Mussel populations in the lower Vasse River. This method is aimed at detecting individual presence. Due to the ephemeral nature of the water bodies within the Survey Area this method was based on the assumption of low density of individuals

Eleven locations were selected for assessment prior to the field survey based on potential direct impacts from clearing and crossing construction over stream zone areas. Potential survey locations focussed on streams likely to have water present in order to maximise detection to confirm presents/absence. For each survey location zoologists walked 100 m upstream and 200 m downstream assessing 10 (1 x 1 m) quadrats at regular 30 metre intervals. While traversing the stream zone opportunistic searching for mussels was also done between each quadrat. In situations where stream zones may have become inaccessible due to dense riparian vegetation, the maximum number of quadrats was surveyed along the accessible stream zone. The following was recorded:

- Any evidence of Carter’s Freshwater Mussel including live mussels and dead shell remains within the water, as well as any shell evidence on banks
- Presence of water and if so, still or flowing, size of water body and depth if determinable
- Riparian vegetation, bank/bed condition including evidence of bank erosion, bed sediment deposition and disturbance (i.e. tramping by pigs, dumped material etc.)
- Riparian vegetation condition
- Evidence of riparian terrestrial fauna including Rakali middens, quokka tracks/runnels/scat etc.
- For standing water the following was recorded:

- Approximate depth, width and (for pools) length
- Substrate (rocky, sandy etc)
- Water quality (clear, turbid, sheen etc)
- Opportunistic observations for aquatic fauna (fish, crayfish, frogs etc).

In total eleven (11) Carters Freshwater Mussel transects were surveyed over the Survey Area. Locations of these transects are presented in Table 10. Greater details on the assessment can be found in Appendix D.

Table 10 Carter's Freshwater Mussel transect summary

| Site Type | Location | | Date completed | Number of quadrats |
|-----------|----------|----------|----------------|--------------------|
| | Easting | Northing | | |
| CFM 1 | 423948 | 6412155 | 11/11/2020 | 10 |
| CFM 2 | 427574 | 6410425 | 4/11/2020 | 9 |
| CFM 3 | 425341 | 6413891 | 11/11/2020 | 10 |
| CFM 4 | 424312 | 6416058 | 5/11/2020 | 10 |
| CFM 5 | 425273 | 6419128 | 5/11/2020 | 10 |
| CFM 6 | 421589 | 6418319 | 5/11/2020 | 10 |
| CFM 7 | 416100 | 6417674 | 5/11/2020 | 10 |
| CFM 8 | 417932 | 6419996 | 3/11/2020 | 10 |
| CFM 9 | 420847 | 6407516 | 11/11/2020 | 10 |
| CFM 10 | 419321 | 6404937 | 11/11/2020 | 10 |
| CFM 11 | 419791 | 6417772 | 4/11/2020 | 11 |

Rakali assessment

Due to similarity of habitat preference, Rakali habitat assessments were performed in conjunction with the Carter's Freshwater Mussel assessments. Each Carter's Freshwater Mussel transect (ten 1 x 1m quadrats over a 300 metre distance) was also searched for the presence of middens, tracks and scat as well as an overall assessment of habitat quality (permanent water, presence of food species, refuge habitat, fire history etc.). In addition to those mentioned above, an additional three locations were actively searched for the presence of Rakali. The locations of these active searches are presented in Table 11.

Remote cameras were also set to target Rakali in areas considered potentially suitable to support their presence such as alongside streams and creeks. Remote cameras are considered unreliable to capture Rakali (due to cool temperatures a wet Rakali maintains). However, cameras placed slightly away from water with sufficient bait to keep the species present longer also yield results (GHD *pers comm.* Cockatoo Island Fauna Surveys). Remote camera locations are presented in Table 7 and Figure 3, Appendix A. Greater details on the assessment can be found in Appendix D.

Table 11 Additional Rakali active search summary

| Site name | Location | | Date completed | Survey effort (minutes) |
|---------------------|----------|----------|----------------|-------------------------|
| | Easting | Northing | | |
| R1 | 423948 | 6412155 | 11/11/2020 | 30 |
| R2 | 427574 | 6410425 | 4/11/2020 | 30 |
| R3 | 425341 | 6413891 | 11/11/2020 | 30 |
| R4 | 424312 | 6416058 | 5/11/2020 | 30 |
| R5 | 425273 | 6419128 | 5/11/2020 | 30 |
| R6 | 421589 | 6418319 | 5/11/2020 | 30 |
| R7 | 416100 | 6417674 | 5/11/2020 | 30 |
| R8 | 417932 | 6419996 | 3/11/2020 | 30 |
| R9 | 420847 | 6407516 | 11/11/2020 | 30 |
| R10 | 419321 | 6404937 | 11/11/2020 | 30 |
| R11 | 419791 | 6417772 | 4/11/2020 | 30 |
| Additional searches | 424220 | 6416019 | 4/11/2020 | 20 |
| | 425346 | 6413895 | 4/11/2020 | 20 |
| | 424902 | 6413431 | 5/11/2020 | 20 |
| Total | | | | 390 |

Quokka Assessments

Quokka assessments were performed during the Phase 1 and 2 surveys (Table 12). Assessments were conducted by targeting potential Quokka habitat (primarily medium-long unburnt riparian vegetation with dense undergrowth and melaleuca dampland). Areas of potential Quokka habitat were searched for presence of runnels, tracks and scat as well as the extent of habitat and connectivity to surrounding potentially suitable habitat. Each identified habitat was searched (meandered) by two ecologists for approximately 60 minutes. This methodology (Quokka habitat assessment) was extracted from Bain (DEC 2013) and where habitat is considered suitable or quokka detected (due to evidence found) remote cameras were placed. In total approximately 31 hours of Quokka assessments were undertaken spread over 31 sites.

Targeted remote cameras were set during both survey phases at locations deemed to be suitable to support Quokkas to confirm their presence (see Table 6 and associated habitat type of Melaleuca damplands). Suitability of camera location was based on habitat characteristics. Habitat with relatively high density of shrubs associated with creeklines and / or Melaleuca damplands. As these habitats provide shelter and movement corridors under cover for Quokkas. Camera location were also selected in proximity to secondary Quokka evidence detected during Quokka assessments such as scats, runnels and footprints. Remote camera locations are presented in Table 7 and Figure 3, Appendix A.

Table 12 Quokka assessment summary

| Site Type | Location | | Date completed | Habitat type | Survey effort (minutes) |
|-------------------|--------------|----------|----------------|------------------------------|-------------------------|
| | Easting | Northing | | | |
| Quokka assessment | 417780 | 6421235 | 24/6/2020 | Bullich forest at creek | 60 |
| | 423934 | 6412206 | 14/09/2020 | Melaleuca dampland | 60 |
| | 419322 | 6404957 | 14/09/2020 | Melaleuca dampland | 60 |
| | 420847 | 6407512 | 14/09/2020 | Melaleuca dampland | 60 |
| | 420884 | 6407494 | 14/09/2020 | Melaleuca dampland | 60 |
| | 418020 | 6420561 | 9/7/2020 | Bullich forest | 60 |
| | 427636 | 6410541 | 9/7/2020 | Flooded Gum Woodland | 60 |
| | 417973 | 6420573 | 24/6/2020 | Bullich forest | 60 |
| | 423744 | 6415834 | 24/6/2020 | Bullich forest | 60 |
| | 417972 | 6420590 | 24/6/2020 | Bullich forest | 60 |
| | 429043 | 6413217 | 4/11/2020 | Melaleuca dampland | 60 |
| | 425848 | 6413873 | 4/11/2020 | Melaleuca dampland | 60 |
| | 424220 | 6416021 | 4/11/2020 | Melaleuca dampland | 60 |
| | 420662 | 6414911 | 4/11/2020 | Melaleuca dampland | 60 |
| | 419747 | 6417722 | 4/11/2020 | Jarrah Marri forest | 60 |
| | 417388 | 6419420 | 4/11/2020 | Bullich forest at creek | 60 |
| | 414559 | 6419466 | 4/11/2020 | Blackbutt forest at creek | 60 |
| | 421923 | 6415255 | 4/11/2020 | Melaleuca dampland | 60 |
| | 421967 | 6417010 | 4/11/2020 | Melaleuca dampland | 60 |
| | 413396 | 6421535 | 4/11/2020 | Melaleuca dampland | 60 |
| | 423637 | 6418272 | 5/11/2020 | Melaleuca dampland | 60 |
| | 425397 | 6419091 | 5/11/2020 | Jarrah Marri forest at creek | 60 |
| | 428728 | 6414402 | 5/11/2020 | Melaleuca dampland | 60 |
| | 427394 | 6415618 | 5/11/2020 | Jarrah Marri forest | 60 |
| | 417343 | 6419328 | 5/11/2020 | Melaleuca dampland | 60 |
| | 424374 | 6416090 | 5/11/2020 | Melaleuca dampland | 60 |
| | 422647 | 6422250 | 5/11/2020 | Bullich forest at creek | 60 |
| | 419434 | 6405119 | 11/11/2020 | Jarrah Marri forest at creek | 60 |
| | 420860 | 6407493 | 11/11/2020 | Melaleuca dampland | 60 |
| | 426048 | 6412319 | 11/11/2020 | Blackbutt forest at creek | 60 |
| | 423869 | 6412250 | 11/11/2020 | Blackbutt forest at creek | 60 |
| | Total | | | | |

Brush-tailed Phascogale assessment

Brush-tailed Phascogales were targeted using remote cameras, cages and Elliot box traps. Remote cameras were deployed in habitats deemed potentially suitable to support phascogales and were deployed within key habitat features important to the Brush-tailed Phascogale such as in trees and facing onto logs. Cameras were deployed during both phases of the survey to increase the capture potential.

Elliot box traps deployed at the traplines were adapted to target Brush-tailed Phascogale during the Phase 2 survey. Elliot traps were strapped into trees and on logs to target phascogale which are largely arboreal (tree dwelling). The Elliot traps were baited with universal bait (a combination of peanut butter, oats and sardines) and covered with bark, leaves or Sheoak needles.

2.3.7 Black Cockatoo habitat assessment

A Black Cockatoo habitat assessment (for Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo) was undertaken over the Survey Area to assess the presence, quality and extent of habitat. The assessment involved visual and aural assessment of the Survey Area, identifying breeding habitat (presence/absence of actual and potential breeding trees), foraging habitat, roosting areas, current activity and any other signs of use by Black Cockatoos. For the purpose of this assessment, the DSEWPaC (2012) Black Cockatoo referral guidelines were used to define breeding, foraging and night roosting habitat.

The number and type of potential breeding trees within the Survey Area was estimated by surveying thirty one (31) plots (60 m by 500 m = 3 ha each) across the Survey Area (93 ha total). Each plot was traversed on foot and all potential Black Cockatoo breeding trees (based on Diameter Breast Height (DBH) recorded. Plots were selected to sample across all the vegetation complexes occurring locally based on vegetation mapping by Mattiske and Havel (1998). The number of plots within each vegetation complex was roughly proportional to the relative amount of each complex within the Survey Area. For example, the extensive Jarrah Marri forest habitat type had proportionately more plots than Bullich forest habitat type which comprised a small proportion of the Survey Area.

Breeding habitat was extrapolated using averaged results from these plot surveys per fauna habitat type throughout the Survey Area. This method was undertaken due to the large extent of the Survey Area and the commitment by Alcoa to undertaking detailed pre-clearing surveys of potential breeding trees in mining and haul road footprints once these are confirmed. For each potential breeding tree, details of the tree location, species, DBH, size and number of hollows observed, evidence of use and any other significant observations were recorded. Where trees were recorded to have a suitable large hollow that could be used or had signs of being used (potential or likely), trees were revisited by Tony Kirkby (Black Cockatoo Specialist) where the hollows were checked for Black Cockatoo use by using a drone, pole camera and telephoto lens.

Information collected during the field survey included:

- Foraging habitat - the location and extent of suitable Black Cockatoo species foraging habitat was identified and mapped for the Survey Area, based on the vegetation associations and presence/absence of known foraging species. During the field surveys any direct or indirect evidence of foraging by Black Cockatoos was recorded via GPS.
- Breeding habitat - suitable breeding habitat for Black Cockatoos is defined by DSEWPaC (2012) as trees of species known to support breeding within the range of the species which either have a suitable nest hollow or are of a suitable Diameter at Breast Height (DBH) to develop a nest hollow. For most tree species, suitable DBH is greater than 500 mm. For Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*), suitable DBH is greater than 300 mm (DSEWPaC 2012), however in this Survey Area no wandoo were present. On average, Carnaby's Cockatoos are known to nest in hollows with an entrance diameter greater than 20 - 30 cm (Johnstone and Storr 1998; Groom 2011). While the Forest Red-tailed Black Cockatoo is known to nest in hollows with an entrance of greater than 12 cm (Johnstone and Storr 1998). Therefore, during the field survey hollows size, as well as position, chew evidence and tree species was a guide for potential and likely use.
- Night roosting habitat - suitable roosting habitat is defined by DSEWPaC (2012). Suitable roosting habitat was identified based on the presence of suitable tall trees, evidence of roosting (feathers, twig clips etc.) and proximity of known roosting sites in the Survey Area and extended Survey Area. There was one suspected location of roosting within the Survey Area. This can be seen in Appendix D.

- Opportunistic observations - both visual and aural observations of Black Cockatoos within the Survey Area and surrounding region were noted during the survey. This information was used to provide context to the use of the Survey Area by all three Black Cockatoo species.

This information was used to calculate the amount of foraging habitat, potential breeding habitat and night roosting habitat within the Survey Area and a guide to the habitats available within the extended Survey Area. A summary of this information is presented below in Table 26.

2.3.8 Other Searches

Rare and threatened species may have a patchy, disparate distribution through landscapes. To provide the best opportunity to determine the presence and relative prevalence of these species, this study employed a variety of sampling methods. Systematic sampling sites were also assessed using non-systematic methods to ensure thorough coverage of the sites, and non-systematic techniques were used to sample the broader Survey Area and increase survey effort.

Diurnal searching

Each trapping site was surveyed for amphibians, reptiles, and mammals. Surveys comprised of active searching of potential shelter sites (overturning logs, rocks and leaf litter) and low vegetation (under bark and in tree stumps) and recording all individuals observed with a focus on conservation significant species. Species presence was also detected and identified via secondary evidence, in the form of scats, tracks, feathers, burrows and skeletal remains. A minimum of one hour was spent at each trap line including the general area around it. Diurnal (active) searching is known to be highly productive during optimal weather in selected habitat types and can account for a significant proportion of reptile species recorded. This method targeted granite outcrops during Phase 1 to maximise effectiveness. A summary of the diurnal search effort completed is provided below in Table 13 with survey locations shown in Figure 3, Appendix A.

Table 13 Active diurnal search summary

| Site name | Location | | Habitat type | Survey effort (minutes) |
|----------------------|----------|-------------------------|-------------------------|-------------------------|
| | Easting | Northing | | |
| Phase 1 | | | | |
| Active search | 419166 | 6422868 | Jarrah Marri forest | 30 |
| | 427925 | 6412801 | Melaleuca dampland | 135 |
| | 426545 | 6422105 | Jarrah Marri forest | 30 |
| | 427854 | 6411179 | Granite Outcrops Assoc. | 30 |
| | 419111 | 6417875 | Granite Outcrops Assoc. | 30 |
| | 412511 | 6421533 | Jarrah Marri forest | 30 |
| | 415502 | 6415131 | Jarrah Marri forest | 120 |
| | 414359 | 6417984 | Jarrah Marri forest | 30 |
| | 427872 | 6410860 | Granite Outcrops Assoc. | 40 |
| | 418184 | 6422052 | Granite Outcrops Assoc. | 240 |
| | 420791 | 6417282 | Granite Outcrops Assoc. | 60 |
| | 428228 | 6418114 | Granite Outcrops Assoc. | 60 |
| | 427273 | 6417099 | Jarrah Marri forest | 60 |
| | 419542 | 6419115 | Jarrah Marri forest | 60 |
| | 427821 | 6418300 | Granite Outcrops Assoc. | 60 |
| | 420750 | 6417139 | Granite Outcrops Assoc. | 60 |
| | 418020 | 6422080 | Granite Outcrops Assoc. | 60 |
| | 426554 | 6425723 | Granite Outcrops Assoc. | 60 |
| | 430136 | 6410618 | Jarrah Marri forest | 30 |
| | 426378 | 6425909 | Granite Outcrops Assoc. | 120 |
| 418557 | 6417351 | Granite Outcrops Assoc. | 140 | |
| 414085 | 6422412 | Jarrah Marri forest | 30 | |
| 420803 | 6417126 | Granite Outcrops | 60 | |
| Total Phase 1 | | | | 1,575 |
| Phase 2 | | | | |
| Active search | 424329 | 6416182 | Granite Outcrops | 30 |
| | 428008 | 6410850 | Jarrah Marri forest | 120 |
| | 424219 | 6416025 | Jarrah Marri forest | 20 |
| | 424876 | 6414720 | Jarrah Marri forest | 60 |
| | 424609 | 6413211 | Granite Outcrops | 20 |
| | 419909 | 6424636 | Jarrah Marri forest | 60 |
| | 427714 | 6411184 | Jarrah Marri forest | 20 |
| | 428399 | 6413891 | Jarrah Marri forest | 20 |
| | 427103 | 6414267 | Jarrah Marri forest | 60 |
| | 426591 | 6421728 | Jarrah Marri forest | 60 |
| | 426543 | 6422105 | Jarrah Marri forest | 30 |
| | 426290 | 6422164 | Jarrah Marri forest | 20 |
| | 418184 | 6415922 | Jarrah Marri forest | 90 |

| Site name | Location | | Habitat type | Survey effort (minutes) |
|-------------------------------------|----------|----------|--------------------|-------------------------|
| | Easting | Northing | | |
| | 418431 | 6415399 | Granite Outcrops | 180 |
| | 422622 | 6422820 | Jarra Marri forest | 20 |
| | 426935 | 6413464 | Jarra Marri forest | 20 |
| | 422059 | 6423729 | Jarra Marri forest | 20 |
| | 419286 | 6419772 | Jarra Marri forest | 60 |
| | 425697 | 6424851 | Jarra Marri forest | 20 |
| | 416087 | 6422641 | Jarra Marri forest | 60 |
| | 414743 | 6421898 | Jarra Marri forest | 30 |
| | 426174 | 6423113 | Jarra Marri forest | 30 |
| | 415025 | 6422056 | Jarra Marri forest | 30 |
| | 414082 | 6422386 | Jarra Marri forest | 20 |
| Total Phase 2 | | | | 1,100 |
| Combined Phase 1 and 2 Total | | | | 2,675 |

Nocturnal searching

Spot lighting was undertaken to detect nocturnal species that may otherwise remain undetected using other survey techniques. Handheld or head mounted spotlights were used for a minimum of 15 minutes at each trap line for each survey phase and within the general area. Nocturnal searches involved spot lighting for a minimum of 200 m traversed at each location and recording all species observed during the exercise. A summary of the nocturnal searches completed is provided below in Table 14 with survey locations displayed in Figure 3, Appendix A.

Table 14 Nocturnal search summary

| Site Type | Location | | Habitat type | Survey effort (minutes) |
|-------------------------|----------|----------|----------------------------|-------------------------|
| | Easting | Northing | | |
| Phase 1 | | | | |
| Frog / Nocturnal search | 424263 | 6416733 | Melaleuca dampland | 15 |
| Frog / Nocturnal search | 427726 | 6410729 | Blackbutt forest | 30 |
| Frog / Nocturnal search | 425272 | 6413885 | Jarra Marri forest | 15 |
| Frog / Nocturnal search | 424331 | 6416842 | Melaleuca dampland | 15 |
| Frog / Nocturnal search | 428035 | 6412958 | Granite Outcrops Assoc | 15 |
| Frog census | 424347 | 6415981 | Melaleuca dampland | 15 |
| Nocturnal search | 423543 | 6418321 | Melaleuca dampland | 30 |
| Nocturnal search | 417782 | 6421118 | Bullich / Blackbutt forest | 30 |
| Nocturnal search | 421610 | 6418810 | Blackbutt forest | 30 |
| Nocturnal search | 427636 | 6410541 | Flooded Gum woodland | 30 |
| Nocturnal search | 427615 | 6410458 | Blackbutt forest | 90 |
| Nocturnal search | 427616 | 6410462 | Blackbutt forest | 90 |
| Nocturnal search | 425445 | 6416692 | Jarra Marri forest | 60 |
| Nocturnal search | 429006 | 6412852 | Jarra Marri forest | 30 |
| Total Phase 1 | | | | 495 |
| Phase 2 | | | | |

| Site Type | Location | | Habitat type | Survey effort (minutes) |
|-------------------------------------|----------|----------|----------------------------|-------------------------|
| | Easting | Northing | | |
| Nocturnal search | 419178 | 6422955 | Jarrah Marri forest | 60 |
| Nocturnal search | 421550 | 6418600 | Blackbutt forest | 80 |
| Nocturnal search | 420745 | 6417248 | Granite Outcrops Assoc | 60 |
| Nocturnal search | 413297 | 6421782 | Melaleuca dampland | 60 |
| Nocturnal search | 417415 | 6419370 | Bullich / Blackbutt forest | 60 |
| Nocturnal search | 417781 | 6421118 | Bullich / Blackbutt forest | 60 |
| Nocturnal search | 421609 | 6418809 | Blackbutt forest | 60 |
| Nocturnal search | 427636 | 6410541 | Flooded Gum woodland | 60 |
| Total Phase 2 | | | | 500 |
| Combined Phase 1 and 2 Total | | | | 995 |

Opportunistic observations

Opportunistic observations involve the recording of fauna taxa (physical presence and/or signs of presence) spatially throughout the Survey Area. These observations are gathered throughout the survey duration during all in-situ activities including travel, and generally account for a substantial proportion of the species assemblage recorded including conservation significant fauna. Opportunistic observations include physical observations (sighting or hearing fauna), and indirect evidence (scats, tracks, diggings, nests, feathers, slough, skeletal remains, pellets) which indicate the current or recent activity of a species present. Wherever possible, numbers of individuals, microhabitat use and other relevant information was recorded. Opportunistic observations were recorded outside of the diurnal, nocturnal or general trap site surveys (for example when driving, walking to a site, checking camera traps and bat detectors).

2.3.9 Summary of survey effort

Survey effort is described as the amount and type of survey that is undertaken during an assessment. Table 15 provides detail on the type and amount of survey time undertaken during both survey phases. Each of the trapping sites were sampled for a minimum of seven (7) trap-nights per survey phase including bucket, cages (both at general trap lines and cage trap transects), funnel and Elliott traps. The total trapping effort across both survey phases consisted of 6,412 trap nights. Additionally, over both survey phases remote cameras were deployed for a total of 2,922 nights, 2,340 minutes of bird census was undertaken (Table 5), 63 nights were sampled for bat acoustics (Table 7), 47 nights were sampled for bird acoustics (Table 8), 2,675 minutes of diurnal active searching was completed (Table 13), 995 minutes of nocturnal searching was completed (Table 14). Additionally, 390 minutes for Rakali (Table 11) and 1,860 minutes (Table 12) of Quokka assessments were undertaken.

Table 15 Summary of fauna survey effort

| Fauna trapping sites Phase 1 2020 | | | | Elliot traps | | Pit traps | | Cage traps | | Funnel traps | |
|-------------------------------------|---------|----------|-------------|--------------|--------------|------------|--------------|------------|-------------|--------------|--------------|
| Sites Phase 1 | Easting | Northing | nights open | # of traps | trap nights | # of traps | trap nights | # of traps | trap nights | # of traps | trap nights |
| TL 1 | 426987 | 6413519 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 2 | 424252 | 6425012 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 3 | 427900 | 6412972 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 4 | 426279 | 6422853 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 5 | 419173 | 6422951 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 6 | 420734 | 6417238 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 7 | 421559 | 6418605 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 8 | 428302 | 6417251 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 9 | 427604 | 6410609 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 10 | 413197 | 6421772 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 11 | 424815 | 6421905 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 12 | 418020 | 6420561 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| Total –Phase 1 | | | | 120 | 840 | 84 | 840 | 24 | 168 | 144 | 1,008 |
| Fauna trapping sites Phase 2 2020 | | | | Elliot traps | | Pit traps | | Cage traps | | Funnel traps | |
| Sites Phase 2 | Easting | Northing | nights open | # of traps | trap nights | # of traps | trap nights | # of traps | trap nights | # of traps | trap nights |
| TL 1 | 426987 | 6413519 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 2 | 424252 | 6425012 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 3 | 427900 | 6412972 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 4 | 426279 | 6422853 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 5 | 419173 | 6422951 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 6 | 420734 | 6417238 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 7 | 421559 | 6418605 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 8 | 428302 | 6417251 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 9 | 427604 | 6410609 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 10 | 413197 | 6421772 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 11 | 424815 | 6421905 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| TL 12 | 418020 | 6420561 | 7 | 10 | 70 | 7 | 70 | 2 | 14 | 12 | 84 |
| Total Phase 2 | | | | 120 | 840 | 84 | 840 | 24 | 168 | 144 | 1,008 |
| Total Phase 1 and 2 combined | | | | 240 | 1,680 | 168 | 1,680 | 48 | 336 | 288 | 2,016 |

2.3.10 Species accumulation

The number and type of species trapped each day was recorded and a species accumulation curve was created for the Survey Area using PRIMER v6 (Clarke and Gorley 2006). The species accumulation curve represents the successfulness of the trapping program for its duration. Typically, the longer the trapping program the more complete the representation of species sampled per trapping location or habitat type. Accumulation curves should show “levelling” of the groups species counts prior to the completion of the survey. Many limitations can influence the results of a curve and should be observed as a guide to the project’s success. This curve is presented in Plate 10 in Section 4.3.1.

The data was run through Primer v6 against 8 existing models, these models are:

- Sobs - Curve of observed species counts
- Chao 1 - Chao's estimator based on number of rare species
- Chao 2 - Chao's estimator using just presence-absence data
- Jackknife 1 - Jackknife estimator based on species that only occur in one sample
- Jackknife 2 - Second order jackknife estimator
- Bootstrap - Bootstrap estimator based on proportion of quadrats containing each species
- MM (Michaelis-Menton) - Curve fitted to observed Sobs curve
- UGE - Calculated species accumulation curve based on Ugland, Gray and Ellingsen (2003)

2.3.11 Fauna survey limitations

EPA (2020) states that fauna and faunal assemblage survey reports for environmental impact assessment in Western Australia should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with the fauna component of this field survey are discussed in Table 16.

Table 16 Fauna survey limitations

| Limitations | Constraints | Impact on Survey outcomes |
|--|-------------|---|
| Scope (what fauna groups were sampled and were some sampling methods not able to be employed because of environmental constraints) | Nil | All fauna groups were able to be sampled. During the Phase 2 survey the traps had to be closed for three nights due to a car rally in the Survey Area. The traps were re-opened following the rally and were open for a minimum of 7 nights (combined) each. |
| Seasonal environmental conditions | Minor | The surveys were scoped and designed around EPA (2016a) guidelines; however they were modified and completed when EPA (2020) guidelines was released. This document provides recommended survey timing for the Southern Climatic Region for amphibians, birds and mammals. The recommended survey timing for reptiles in accordance with these guidelines include a primary survey being undertaken between October-December (completed) and a secondary survey to be completed between February-March (not completed). The first survey undertaken for the Myara North Survey Area was completed in June/July 2020 which is outside of the recommended survey timing for reptiles (EPA 2020). The survey was arranged prior to the release of the EPA (2020) guidelines; however, the survey incorporated extensive active searching in habitats deemed suitable for the Dell Skink and Southern Death Adder - conservation significant reptiles identified in the desktop assessment as potentially occurring within the Survey Area. Raking of leaf litter and active searching in granite is considered particularly useful during the winter months to detect reptiles lying dormant in the cooler weather. A high proportion of the reptile species recorded were detected via active searching. The survey timing discrepancy is not considered a major limitation to this survey due to the effort applied to active searching with particular focus on the conservation significant reptiles. The survey timing had no impact of recording mammals and birds. |
| Proportion of fauna identified, recorded and/or collected | Nil | All fauna were identified and released on site. |
| Proportion of the task achieved and further work which might be needed. | Nil | All scoped work was completed successfully. |
| Remoteness and/or access problems | Nil | No issues were encountered with the exception of the aforementioned car rally resulting in the traps being closed for three consecutive nights. |
| Accordance to EPA guidelines | Minor | Change of EPA guidelines from 2016 vertebrate guidance to 2020 during Phase 1 survey. Original scoping was to perform a detailed terrestrial fauna survey over the Survey Area in accordance with EPA (2016a). Following the release of the EPA (2020) guidelines the survey was adapted to take on more of a targeted approach. Chuditch and Black Cockatoo were targeted during both phases of the survey, while targeted Carters Freshwater Mussel and Quokka assessments were included into the Phase 2 survey. |

2.4 Climate data for survey period

Weather conditions during the Phase 1 survey were generally cool and damp with rainfall occurring most days. The Phase 2 survey period also experienced rainfall at the beginning and end of the survey duration; however experienced dry and warm conditions for the majority of the survey. An overview of the weather experienced

during the survey is presented in Table 17. Weather data was obtained from the Bureau of Meteorology website closest weather station to the site, Karnet (Station ID: 009111) located approximately 5 km southwest of the Survey Area.

Table 17 *Weather data for survey period (Phase 1 and 2)*

| Date | Minimum temp (°C) | Maximum temp (°C) | Rainfall (mm) |
|------------------|--------------------------|--------------------------|----------------------|
| Phase 1 | | | |
| 29 June 2020 | 10.2 | 15.0 | 34.1 |
| 30 June 2020 | 11.2 | 15.0 | 2.0 |
| 1 July 2020 | 9.2 | 14 | 7.4 |
| 2 July 2020 | 6.5 | 15.4 | 0 |
| 3 July 2020 | 5.9 | 17.4 | 0.3 |
| 4 July 2020 | 8.3 | 20.5 | 0.5 |
| 5 July 2020 | 9.7 | 21.6 | 0 |
| 6 July 2020 | 11 | 15.9 | 4.8 |
| 7 July 2020 | 9.5 | 15 | 22.3 |
| 8 July 2020 | 6 | 14.6 | 9.6 |
| 9 July 2020 | 5.2 | 14.9 | 0.3 |
| Phase 2 | | | |
| 2 November 2020 | 13.4 | 16.5 | 15.8 |
| 3 November 2020 | 11.1 | - | 7.3 |
| 4 November 2020 | - | 20.3 | 0 |
| 5 November 2020 | 10.4 | 22.5 | 0 |
| 6 November 2020 | 10 | 27.4 | 0 |
| 9 November 2020 | 12.4 | 25.6 | 0 |
| 10 November 2020 | 13.7 | 26.6 | 0 |
| 12 November 2020 | 12.1 | 22.8 | 0 |
| 13 November 2020 | 10.4 | 22.5 | 5.6 |

3. Desktop Assessment

3.1 Climate

The Survey Area is located within the Northern Jarrah Forest subregion of Western Australia. The climate of this region is classified as Warm Mediterranean, with two distinct seasons: a warm and dry summer (December to February) and a cool wet winter (June to August) (Williams & Mitchell 2001).

The region is characterised spatially by rainfall, with rainfall being greatest on the scarp and decreasing to the east and north (Williams & Mitchell 2001). The majority of all rainfall received occurs during winter months and is a result of low pressure systems associated with westerly winds. The closest operating weather station is Serpentine Karnet (Station ID: 009111) located approximately 5 km southwest of the Survey Area.

Climate data (Bureau of Meteorology 2020) from this station indicates:

- Mean maximum temperature ranges from 15.5 °C in July to 30.6 °C in January
- Mean minimum temperature ranges from 6.3 °C in July and August to 15.8 °C in February
- Mean annual rainfall is 1,153 mm with average of 98.5 rain days/year.

3.2 Geology and land systems

3.2.1 Geology

The Australian continent is made up of four continental blocks: the Yilgarn, Pilbara and Gawler Cratons and the Wilyama Block. The Survey Area is located within the South West Terrane of the Yilgarn Craton. The Yilgarn Craton is comprised of geological formation from the Archaean (2.5 billion years ago) to Cainozoic ages (66 million years ago to present) and bounded by the Murgoo Gneiss Complex of the Western Gneiss Terrane in the west and the Southern Cross Province in the east. The South West Terrane is composed of granitic rocks classified into groups based on characteristics. The Study Area overlays two geological units:

- South West Terrane greenstones – granulite and migmatite
- Yilgarn Craton Granites - granitic rock, undivided; metamorphosed

3.2.2 Land systems

The Survey Area is located within two land systems:

- Darling Plateau System - Lateritic plateau. Duplex sandy gravels, loamy gravels and wet soils. Jarrah-Marri-wandoo forest and woodland.
- Murray Valleys System - Western Darling Range from the Avon Valley to Harvey. Deeply incised valleys with Red loamy earths, shallow duplexes and rock outcrop and Jarrah-Marri-wandoo forest and woodland with mixed shrubland.

3.3 Surface water and hydrology

The Survey Area lies predominantly within the Serpentine River catchment and lies adjacent to the Serpentine River and Serpentine Dam and Pipehead Dam Reservoirs. Tributaries of the Serpentine River and Serpentine Dam Reservoir include 39 Mile Brook, Banksia Gully and Gold Mine Gully, which flow in a roughly south-west direction through the Survey Area. The north west portion of the Survey Area drains to Honour Brook, which flows west through Jarrahdale and discharges into the Serpentine River downstream of the Pipehead Dam. The north-east portion of the Survey Area lies within the Wungong Brook catchment, which drains into Wungong Dam Reservoir approximately 4 km to the north-west.

The Serpentine Dam, Pipehead Dam and Wungong Dam are public drinking water reservoirs. The south-west extent of the Survey Area lies within the Reservoir Protection Zone of the Serpentine Dam and Pipehead Dam reservoirs.

The Serpentine Dam and Pipehead Dam are man-made perennial water bodies. The Serpentine River, Wungong Brook and tributaries within the Survey Area are ephemeral and flow for periods of several months during winter and spring. Drainage floors occur in areas of alluvial deposits along the Serpentine River and tributaries and form ephemeral waterlogged damplands during the winter and spring.

3.4 Land use

3.4.1 Crown reserves and estates

There are three reserves located within the Survey Area (see Table 18 and Figure 2, Appendix A).

Table 18 Reserves within the Survey Area

| Reserve number | Name | Class | Use | Approximate location relative to Survey Area |
|----------------|-------------------------|---------|-------------------------|---|
| R 16634 | Jarrahdale State Forest | Class C | State Forest | Covering majority of the Survey Area with the exception of the north eastern-most portion |
| R 335 | Un-named | Class C | Waterway, resting place | Lies within a small portion of the eastern Survey Area, adjacent to Albany Highway |
| R 5913 | Jarrahdale State Forest | Class C | State Forest | Lies within the south-eastern boarder of the Survey Area |

The following DBCA managed lands lie adjacent to the Survey Area:

- Serpentine National Park (Class A) to the west
- Monadnocks Conservation Reserve (Class A) to the east.

3.4.2 Environmentally Sensitive Areas

Three Environmentally Sensitive Areas (ESAs) lie within the western portion of the Survey Area (Figure 2, Appendix A). An additional 51 ESAs lie within 10 km of the Survey Area.

3.4.3 Regional Ecological linkages

Three ecological linkages lie within the Survey Area, as presented in Figure 2, Appendix A. The ecological linkages are interpreted to be in association with riparian corridors of the Serpentine River, Wungong Brook and Gold Mine Brook-39 Mile Brook. An additional 11 ecological linkages lie within the Study Area.

3.5 Vegetation

3.5.1 Broad vegetation mapping and extents

Vegetation associations

Broad scale (1:250,000) pre-European vegetation mapping of the Study Area has been completed by Beard (1979) at an association level. The mapping indicates the Survey Area intersects two vegetation associations:

- West Darling_3 (association 3): Mainly Jarrah and Marri *Eucalyptus marginata*, *Corymbia calophylla*
- West Darling_128 (association 128): Rock

Vegetation complexes

Regional vegetation complex mapping has been completed by Matiske & Havel (1998) with updates from Webb *et al.* (2016) based on major landform boundaries within the South West Forest and forested region of south-west Western Australia. The mapping indicates eight vegetation complexes are present within the Survey Area:

- Dwellingup (D1): Open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla* on lateritic uplands in mainly humid and subhumid zones.
- Dwellingup (D2): Open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla* on lateritic uplands in subhumid and semiarid zones.
- Yarragil 1 (Yg1): Open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.
- Yarragil 2 (Yg2): Open forest of *Eucalyptus marginata* subsp. *thalassica*-*Corymbia calophylla* on slopes, woodland of *Eucalyptus patens*-*Eucalyptus rudis* with *Hakea prostrata* and *Melaleuca viminea* on valley floors in subhumid and semiarid zones.
- Cooke (Ce): Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla* (subhumid zone) and open forest of *Eucalyptus marginata* subsp. *thalassica*-*Corymbia calophylla* (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae-Proteaceae species and lithic complex on granite rocks and associated soils in all climate zones, with some *Eucalyptus laeliae* (semiarid), and *Allocasuarina huegeliana* and *Eucalyptus wandoo* (mainly semiarid to periarid zones).
- Swamp (S): Mosaic of low open woodland of *Melaleuca preissiana*-*Banksia littoralis*, closed scrub of *Myrtaceae* spp., closed heath of *Myrtaceae* spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones.
- Murray 1 (My1): Open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla*-*Eucalyptus patens* on valley slopes to woodland of *Eucalyptus rudis*-*Melaleuca raphiophylla* on the valley floors in humid and subhumid zones.
- Goonapping: Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata* (humid zones) and *Eucalyptus marginata* subsp. *thalassica* (semiarid to periarid zones) on the sandy-gravels, low woodland of *Banksia attenuata* on the drier sandier sites (humid to periarid zones) with some *Banksia menziesii* (northern arid and periarid zones) and low open woodland of *Melaleuca preissiana*-*Banksia littoralis* on the moister sandy soils (humid to periarid zones).

3.6 Fauna

3.6.1 Fauna diversity

The *NatureMap* database identified 185 terrestrial vertebrate fauna species previously recorded within the Study Area. This total comprised of 113 birds, 32 reptiles, 28 mammals and 12 amphibians. Of the 185 fauna species previously recorded, 177 are native species and eight are naturalised (introduced) species. The EPBC Act PMST search detected an additional four threatened bird species as potentially occurring within the Study Area and the DBCA Threatened and Priority Fauna database returned one additional mammal within the Survey Area.

The *NatureMap* and PMST database search is provided in Appendix C. DBCA Threatened and Priority Fauna results are displayed in Figure 2, Appendix A.

3.6.2 Conservation Significant Fauna

Based on the above database searches, 13 conservation significant terrestrial vertebrate taxa were identified as likely to occur or known to be present within the Survey Area.

These species included:

- Two species listed as Endangered under the EPBC Act and BC Act including Baudin's Cockatoo (*Calyptorhynchus baudini*) and Carnaby's Cockatoo (*C. latirostris*)
- Three species listed as Vulnerable under the EPBC Act and BC Act including Forest Red-tailed Black Cockatoo (*C. banksii naso*), Chuditch (*Dasyurus geoffroii*), and Quokka (*Setonix brachyurus*)

- One species, Peregrine Falcon (*Falco peregrinus*) listed as 'Other specially protected' under the BC Act
- Six species listed as Priority 3 or 4 by DBCA
- *Phascogale tapoatafa wambenger* listed as 'Conservation Dependent' by the DBCA.

Desktop assessment for aquatic fauna (WRM 2021) identified the invertebrate species Carter's Freshwater Mussel (*Westralunio carteri*) as potentially present within the Survey Area. This species listed as Vulnerable under the EPBC Act and BC Act.

All conservation significant species identified as potentially occurring are presented in the Likelihood of Occurrence (LOO) assessment in Appendix D and further discussed regarding survey results in Section 4.3.

3.7 Previous Studies

A literature review was performed on previous terrestrial fauna studies considered relevant to the current Survey Area, to inform the basis of the fauna surveys. The review focuses on conservation significant species recorded during surveys on Alcoa mining lease and surrounding areas. A review of 26 existing reports that are considered relevant to the current study is provided in Table 19.

Table 19 Previous studies considered relevant to Myara North Survey Area

| Project | Location and key findings | Location in relation to this Survey Area |
|--|--|---|
| Environmental Management and Research Consultants (EMRC) (1992) Long term fauna monitoring program 1992 (draft) | <p>Location: 20 plots between Jarrahdale, Huntly and Karnet (control)</p> <p>Alcoa conducted numerous surveys as part of a monitoring program which included trapping (five successive trap nights in July, August and September), avifauna (quantitative and inventory surveys in summer and winter), reptile survey (trapping over five consecutive nights in Summer with toenail clippings to indicate recapture) opportunistic survey, nocturnal surveys and active searches.</p> <p>A total of 16 mammals, 61 birds, 21 reptiles, 6 frog and 80 ant species were recorded.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> • Quenda – trapped at Jarrahdale • Baudin's Cockatoo (recorded at all sites) • Red-eared Firetail (delisted) • Carpet Python (delisted) | <p>8 survey plots established in Jarrahdale, 8 plots established in Huntly and four control plots at Karnet.</p> <p>Exact locations are not shown in report but Jarrahdale plots are expected to be adjacent or within the current Survey Area.</p> |
| EMRC (1995) Long term fauna monitoring program 1995 | <p>Location: 20 plots between Jarrahdale, Huntly and Karnet (control)</p> <p>Alcoa conducted numerous surveys as part of a monitoring program which included trapping (five successive trap nights in July, August and September), avifauna (quantitative and inventory surveys in summer and winter), reptile survey (trapping over five consecutive nights in Summer with toenail clippings to indicate recapture) opportunistic survey, nocturnal surveys and active searches.</p> <p>A total of 19 mammals (six introduced), 57 birds, 20 reptiles, 5 frog and 52 ant species were recorded.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> • Quenda – four individuals were trapped • Chuditch – all opportunistic sightings (one near Phillips Road/Nettleton Road and seven at Huntly Mine in 1995). | <p>8 survey plots established in Jarrahdale, 8 plots established in Huntly and four control plots at Karnet.</p> <p>Exact locations are not shown in report but Jarrahdale plots are expected to be adjacent or within the current Survey Area.</p> |
| EMRC (2003). McCoy Long Term Fauna Monitoring Program 2003 | <p>Location: six plots established, two in the Cameron catchment, two in the Gordon control catchment and two between these and the current Huntly Mine McCoy region crusher site.</p> <p>The monitoring program surveyed all terrestrial vertebrate species and ants. Mammal trapping occurred over four successive trap nights in both summer and winter using 10 pit traps, 16 medium Elliot traps, four large Elliot traps and four cage traps. Reptiles were targeted using five PVC pot traps with drift fence during summer. Traps were open on 29th Jan (summer) and 13 Aug (winter).</p> <p>Birds were surveyed using quantitative methods (two permanent bird transects surveyed on three consecutive days in summer and winter) and inventory methods (opportunistic recordings at each plot during the trapping program).</p> <p>A total of six mammals (one introduced), 39 birds, 7 reptiles, 9 frog and 37 ant species were recorded.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> • Chuditch – two trapped plus sightings or signs • Baudin's Cockatoo - sightings | <p>Approximately 31 km south of the current Survey Area.</p> |
| EMRC (2006) Long term fauna monitoring program 2006 | <p>Location: 20 plots between Jarrahdale, Huntly and Karnet (control)</p> <p>Alcoa conducted numerous surveys as part of a monitoring program which included trapping (five successive trap nights in July, August and September), avifauna (quantitative and inventory surveys in summer and winter), reptile survey (trapping over five consecutive nights in Summer with toenail clippings to indicate recapture) opportunistic survey, nocturnal surveys and active searches.</p> <p>A total of 18 mammals (six introduced), 49 birds, 21 reptiles, 5 frog and 70 ant species were recorded.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> • Chuditch – opportunistic sightings at Huntly • Quokka – opportunistic sighting at Huntly • Baudin's Cockatoo – sighted at Jarrahdale, Huntly and Karnet • Carpet Python (delisted) • Quenda - trapped at Jarrahdale and Karnet • Western Brush Wallaby - sighted at Jarrahdale and Huntly | <p>8 survey plots established in Jarrahdale, 8 plots established in Huntly and four control plots at Karnet.</p> <p>Exact locations are not shown in report but Jarrahdale plots are expected to be adjacent or within the current Survey Area.</p> |
| EMRC (2007a) McCoy Long Term Fauna Monitoring Program – results of the 2007 survey | <p>Location: six plots established, two in the Cameron catchment, two in the Gordon control catchment and two between these and the current Huntly McCoy crusher site.</p> <p>Methods used were identical to those used in the 2003 survey (above).</p> <p>A total of seven mammal (two introduced), 41 bird, seven reptile, five frog and 54 ant species was recorded.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> • Baudin's Cockatoo –sightings • Western Brush Wallaby – multiple sightings | <p>Approximately 31 km south of the current Survey Area.</p> |
| ALCOA World Alumina Australia (2010) No 40. Threatened fauna species management plans for Alcoa's bauxite mining operations in the Jarrah forest | <p>Location: Mining Lease ML1sa</p> <p>Management Plan for seven species of fauna known to occur within the mining lease:</p> <ul style="list-style-type: none"> • Chuditch • Quokka • Noisy Scrub-bird • Baudin's Black Cockatoo • Forest Red-tailed Black Cockatoo • Peregrine Falcon • Carpet Python (delisted) | <p>The current Survey Area is within the 1sa Mining Lease</p> |

| Project | Location and key findings | Location in relation to this Survey Area |
|---|---|---|
| Stokes (2011) Orion Long Term Fauna Monitoring Program | <p>Location: six monitoring sites within Alcoa's Orion mine region comprising two typical upland forest areas, two associated with stream zones and two within rehabilitated forest (8 years old).</p> <p>Mammals, birds, reptiles and frogs were surveyed during both summer (March) and winter (July), and ground dwelling invertebrates were sampled in summer only. Survey methods were similar to those used in EMRC (2006) with the addition of a single large trapping transect designed to specifically target Chuditch and species of goanna. This transect covered approx. 880 ha and comprised 40 wire cage traps spaced 300 m apart and was trapped over four successive nights at the same time as the generic mammal survey.</p> <p>A total of 10 mammals (three introduced), 38 birds, 9 reptiles, two frogs, 22 ground invertebrates, 49 ant species was recorded.</p> <ul style="list-style-type: none"> Recorded threatened fauna comprise: <ul style="list-style-type: none"> Chuditch – five males trapped in summer Quenda – one trapped Western Brush Wallaby – multiple sightings Baudin's Cockatoo – sightings Forest Red-tailed Black Cockatoo - sightings | Within 20 km of the far western boundary of the Study Area |
| Stokes (2012) Vertebrate Fauna Survey of Planted Mining Areas at Alcoa's Keats Mining Region 2011/2012 | <p>Location: Keats mining region.</p> <p>Fauna were surveyed using a range of techniques, including trapping, remote sensitive cameras, tracking tunnels, observational surveys and spotlighting. Pitfall traps were not used. Five areas were trapped for mammals comprising two dieback free Jarrah forest areas and three stream zones. One landscape trapping transect was deployed to target Chuditch and goanna and this encompasses upland Jarrah forest, stream zones, low lying open forest, dieback graveyards and Sheoak forest.</p> <p>Black Cockatoo habitat survey was also undertaken. Surveys were only undertaken in summer due to time constraints.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> Forest Red-tailed Black Cockatoo – flock sighted (up to 11 individuals) Baudin's Cockatoo – 2 individuals sighted Western Brush Wallaby – sightings and recorded on remote camera Chuditch – one male trapped Carpet Python (delisted) | Approximately 37 km southwest of the current Survey Area. |
| Way <i>et al.</i> (2013), McCoy Long Term Fauna Monitoring Program Report of the 2013 Field Survey | <p>Location: six plots established, two in the Cameron catchment, two in the Gordon control catchment and two between these and the current Huntly McCoy crusher site and an additional three sites established in two year old rehabilitation within the McCoy Intermediate Rainfall Zone.</p> <p>In 2013 the McCoy Long Term Fauna Monitoring Program involved survey of terrestrial vertebrates (including mammals, birds and reptiles) and ground invertebrates, using the same methods used in previous LTFMP at McCoy (EMRC 2003, 2007a). Mammals, birds, reptiles, and frogs were surveyed in both winter (July-August 2013) and summer December 2013-January 2014). Additional survey methods were also implemented including a single large trapping transect to sample highly mobile species, remote sensor cameras and all invertebrates collected in pitfall traps were identified to taxonomic order.</p> <p>A total of 13 mammal species (four introduced), 46 birds, five frog, 31 invertebrates, and 64 ant species was recorded.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> Western Quoll – one adult male trapped Quenda – recorded on remote cameras Western Brush Wallaby – multiple sightings and on remote cameras Baudin's Cockatoo – multiple sightings Forest Red-tailed Black Cockatoo – multiple sightings | Approximately 31 km south of the current Survey Area. |
| Chuditch survey raw data Myara 2013 | <p>This is an excel data file along with short summary document with the location description as 'Myara west' and 'Myara east'.</p> <p>Shows details of eight quoll captures at 'Myara west' and one quoll captured at 'Myara east' between 18-22 March 2013.</p> <p>Myara West excel data provides 8 GPS capture locations (in cage traps). Myara East excel data provides 40 locations with coordinates however according to the report only 1 capture location was recorded at Cage 26. The coordinates of this location were unable to be identified.</p> <p>Total number of captures comprised of five males and four females.</p> | <p>Location described as Myara west and east and general area surrounding Karnet Prison which is approximately within 10 km of the Survey Area.</p> <p>GPS coordinates provided:</p> <ul style="list-style-type: none"> 410458 E, 6409663 N 410839 E, 6408964 N 411357 E, 6408290 N 411766 E, 6410671 N 411138 E, 6407725 N 412384 E, 6408752 N 414231 E, 6408816 N 414362 E, 6409006 N |
| McGregor <i>et al.</i> (2014). Does forest restoration in fragmented landscapes provide habitat for a wide-ranging carnivore? | <p>Location: Huntly and Willowdale mines</p> <p>Fourteen Chuditch trapping sessions (13 at Huntly, one at Willowdale) across 9 trapping transects (8 at Huntly, one at Willowdale) were undertaken between June 2009 and Dec 2010.</p> <p>Radio collars with a two-stage transmitter and mortality mode were attached to 14 adult Chuditch (9 female, 5 males – all trapped at Huntly). Chuditch were tracked to their dens during the day. Spool and line tracking was also used.</p> <p>In total 29 individual Chuditch were captured on 60 occasions. Of the 14 individuals fitted with radio collars, three were found dead on the Huntly mine access road with evidence of road trauma. Another three Chuditch were also found dead from vehicle strikes along this road.</p> <p>The study identified 138 den sites from 11 tracked animals: 75 in unmined forest and 63 in restored forest ranging from 2-32 years old. In unmined forest, dens were mostly in hollow logs and ground burrows beneath tree stumps, but these substrates were never used in restored forest where dens were mostly ground burrows, usually associated with rock piles at the surface.</p> | Huntly Mine and Willowdale Mine approx. 40 km and 55 km respectively southwest of the Survey Area. |
| Burgar <i>et al.</i> (2015) The importance of mature forest as bat roosting habitat within the production landscape | <p>Location: forest surrounding Huntly mine site, for both restored and unmined forest.</p> <p><i>Nyctophilus gouldii</i> and <i>Vespadelus regulus</i> were trapped and tracked during maternity and mating seasons using harp traps and position-sensitive radio transmitters. Few bats were captured in restored forest so traps were relocated to water sources.</p> <p>Study aimed at identifying roost habitat within restored forest vs unmined forest. Findings indicate that habitat restoration in production forest landscapes is unlikely to play a significant role in conserving species that rely on slow developing microhabitats such as tree hollows for decades or centuries and that retaining and managing forest remnants would be a more effective strategy to conserve populations of these species.</p> | Huntly mine, approximately 40 km southwest of the current Survey Area. |

| Project | Location and key findings | Location in relation to this Survey Area |
|---|---|--|
| Burgar <i>et al.</i> (2017) Habitat features act as unidirectional and dynamic filters to bat use of production landscapes | <p>Location: five forest types around the Huntly mine (four restored forest with different stages of vegetation succession, and one unmined forest)</p> <p>Ultrasonic detectors (Anabat Titley Electronics) were set at 64 sites four times per year between Oct and March 2010/2011 and 2011/2012 for a total of 512 survey nights.</p> <p>31,347 bat call files were recorded over both years of which 22,520 were identified to species/species group. <i>Vespadelus regulus</i> was detected most frequently (15,833 call files) and <i>Falsistrellus mackenziei</i> least frequently (167 call files). Six species/groups were detected.</p> <p>Recorded threatened fauna comprise:</p> <ul style="list-style-type: none"> Western False Pipistrelle | Huntly Mine site, approximately 40 km southwest of the Survey Area |
| Craig <i>et al.</i> (2017) Can postmining revegetation create habitat for a threatened mammal? | <p>Location: Jarrah Forest (Huntly mine site approximately 10 km north of Dwellingup)</p> <p>Most revegetation conducted for biodiversity conservation aims to mimic reference ecosystems present predisturbance. However, revegetation can overshoot or undershoot targets, particularly in the early stages of a recovery process, resulting in conditions different from the reference model. Revegetation that has, as yet, failed to fully meet revegetation targets may, nonetheless, provide habitat for threatened species not present in reference ecosystems. To investigate this possibility a survey of the Quokka (<i>Setonix brachyurus</i>), a threatened macropod, in a mining landscape in south-western Australia was conducted. Four sites in each of riparian forest (the preferred habitat of quokkas) but is not mined, mid-slope forest, which is the premining reference ecosystem but is not suitable habitat for quokkas, and revegetated forest on mine pits 16–21 years postmining.</p> <p>Quokkas were recorded in all riparian forest sites and two revegetated forest sites but not in any mid-slope forest sites. Occupied revegetated sites had greater cover between 0 and 2 m and were spatially closer to riparian forest than unoccupied revegetated sites, suggesting predation pressure was likely influencing which mine pits were occupied. The study demonstrated postmining revegetation can provide new habitat for a threatened species and suggested that revegetating a small proportion of sites to provide new habitat for threatened species could be considered as a management option in some scenarios. This could improve landscape connectivity and increase both the area of available habitat and between-site heterogeneity, which could all potentially increase the ability of revegetation to conserve biodiversity.</p> | Huntly Mine site, approximately 40 km southwest of the Survey Area |
| EMRC (2015) Long Term Fauna Monitoring Program Summary of Results at Orion Mining Region. | <p>Location: Numerous plots over the Willowdale Mine area</p> <p>Results of the 3rd survey of the LTFMP. Same methodology and plot locations as 2010 survey of the area. Additionally a large trapping transect targeting Chuditch and remote sensing cameras also deployed. Trapping conducted over 4 nights in both winter and summer seasons.</p> <p>The study results:</p> <ul style="list-style-type: none"> Twelve mammal species were trapped Thirty five bird species recorded Thirteen reptile species recorded Three frog species recorded <p>Results were indicative of some species being affected (not present afterwards or in lower numbers) by the January 2016 wildfire that burnt through the Willowdale Mine and surrounding areas including four of the six Orion sites.</p> | Within 20 km of the far southern boundary of the Study Area. |
| Doherty <i>et al.</i> (2016). Successional changes in feeding activity by threatened cockatoos in revegetated mine sites. | <p>Location: Numerous plots over the Huntly Mine, Boddington Bauxite Mine and Newmont Boddington Gold Mine.</p> <p>232 plots were surveyed in revegetated forest and 480 plots were surveyed in unmined forest to determine whether there were successional patterns in cockatoo feeding activity in revegetation aged between 4 to 23 years.</p> <p>The study concludes that black cockatoos feed in vegetation at all three mine sites, despite variations in vegetation age, structure and floristics. Black cockatoos begun feeding on proteaceous and myrtaceous food plants within 4 and 7 years following revegetation, indicating that some food sources are restored quickly after mining disturbance of the Jarrah forest. The results highlight the importance of monitoring fauna recolonization over appropriate time scales to understand how successional processes in revegetation influence fauna persistence in production landscapes.</p> | Huntly Mine approx. 40 km southwest of current Survey Area, Boddington Bauxite Mine approximately 60 km southeast of the current Survey Area, and Newmont Boddington Gold Mine 27 km southeast of current Survey Area. |
| Mastrantonis <i>et al.</i> (2019) Climate change indirectly reduces breeding frequency of a mobile species through changes in food availability | <p>Location: the Northern Jarrah Forest of South West Western Australia over both the Swan and Murray River Catchments.</p> <p>Using a dataset of annual breeding frequency spanning 19 years, in combination with hydrological, climatological, and remotely sensed data, the effects of environmental variation on the annual breeding frequency of Forest Red-tailed Black Cockatoo's (FRTBC) were modelled.</p> <p>In total, 143 unique trees were surveyed over the 19 year period. A total of 173 breeding events were observed during this time with 104 and 71 events observed in the Swan and Murray River catchments respectively. On average there were 5.83 breeding events recorded per year with events ranging from 0 to 21 annually.</p> <p>Results found several significant relationships between annual breeding frequency of FRTBCs and environmental variation. While the model, which included a proxy for the availability of the cockatoo's primary food source and the previous season's rain, explained 49% of annual breeding frequency, there were also direct and indirect effects of heatwaves and forest productivity. FRTBC breeding was found to appear be linked to the spatiotemporal availability of its primary food sources, the fruit from the tree species, Marri <i>Corymbia calophylla</i> and Jarrah <i>Eucalyptus marginata</i>. However, due to climate change experienced and predicted to be experienced in the future in Western Australia it is expected that the food resources during the breeding season for cockatoos will become increasingly limited in time and space, thus threatening their persistence.</p> | The Survey Area is within the bounds of the literature Study Area. |
| Burn (2000) A survey of the impact of burning on mammals and birds in Alcoa's rehabilitated Bauxite mines at Jarrahdale | <p>Location: Jarrahdale forest (two unmined and four rehabilitated bauxite mine pits)</p> <p>To ascertain the impact of burning on birds and mammals at the above location pre burning monitoring took place 1997, and post burn monitoring commenced in 1998 in both burnt and unburnt, rehabilitated and unmined forest sites. Low numbers of mammals were caught making it difficult to conclude with certainty whether burning had an effect on most species. New epicormic growth may have attracted possums into one rehabilitated area, while mice invaded the dense rehabilitated site after the burn. There was a large decline in the numbers of birds and bird species following the burn in the dense rehabilitation. Burning sparse rehabilitation only resulted in a small decline while fire had little effect on bird populations of unmined forest.</p> <p>It was concluded that more time was needed to define the longer-term effects of burning on mammals and birds. The present survey was therefore undertaken in 2000 to assess the situation three years after burning.</p> | Approximately 9 km north of the northern boundary of the Study Area. |

| Project | Location and key findings | Location in relation to this Survey Area |
|--|---|--|
| Huntly rehabilitation (2000) | <p>As no long term monitoring of fauna has been conducted at Huntly since 1998, it was decided a repeat of the 1994 survey using identical methods would occur to gain a better understanding of the extent to which vertebrate fauna colonise older rehabilitation. The sites ranged from 14 to 22 years.</p> <p>Sixteen mammal species are known to inhabit rehabilitation at Huntly including 10 native and 6 feral species. Thirty four bird species were recorded in the rehabilitated areas surveyed (similar to the 36 recorded in the 1994 survey. Eight reptile species and one frog species were recorded in the rehabilitated areas surveyed.</p> <p>Fourteen recommendations came about which if implemented should encourage the return of fauna species in similar number to which they occur in surrounding unmined forest. Some recommendations are identical to the 1994 study; they have either not been implemented or they should continue. Key recommendations include;</p> <ul style="list-style-type: none"> • Where it is not yet known about species recolonisation follow up monitoring in rehabilitated areas will reveal whether they have recolonised. • Surrounding forest if the source of all fauna recruitment. It is important that fauna habitat be protected so that species are available to recolonise. | Huntly Mine - approximately 35 km south |
| EMRC (2007b) A Vertebrate Fauna Survey of Rehabilitated Areas at Alcoa's Huntly Minesite. (Final report) | <p>Provides an overview of the 1994, 2000 and 2007 vertebrate fauna surveys of Alcoa's rehabilitated bauxite mines at Huntly. Mammals, birds and reptiles were surveyed in six rehabilitated pits ranging in age from 8 to 16 years.</p> <p>In total 16 mammal species (11 indigenous and 5 introduced), 34 birds and 8 reptiles were recorded. Rare or specially protected species either recorded in the present survey or recently sighted or trapped in rehabilitation at Huntly include the Brush-tailed Phascogale, Chuditch, Quokka, Baudin's Cockatoo, Forest Red-tailed Black Cockatoo and Carpet Python. Other species recorded in rehabilitation during the survey included the Echidna, Brush-tailed Phascogale and Common Brushtail Possum, while Western Brush Wallaby, Chuditch and Quenda have also recently been either trapped or sighted in rehabilitation at Huntly. Total bird species numbers recorded have remained similar to those in 2000 and in 1994, however in individual rehabilitated sites, the numbers of bird species and bird diversity have both decreased. Numbers of reptile species remained similar to those of previous years, with the Specially Protected Carpet Python seen in rehabilitation on a number of occasions. Thirteen recommendations were given as a result including; protection of adjacent fauna habitat, construction of fauna habitats and corridors, control of feral species, construction of suitable habitat specific to mammals and reptiles.</p> | Huntly Mine - approximately 40 km south |
| EMRC (2001a) Alcoa World Alumina Australia Ltd. Long Term Fauna Monitoring Program. (V2) | <p>The Alcoa Long Term Fauna Monitoring Program was designed in 1991. Monitoring events took place in 1992, 1995, 1998 and 2001 (Nichols 1992) using identical methods each time (except for the baseline). The program is designed to monitor fauna every three years at twenty plots located in rehabilitation and nearby forest at Jarrahdale, Huntly and Karnet (remote from mining). A total of 16 mammal (10 indigenous, six introduced), 50 bird, 17 reptile, 7 frog and 73 ant species was recorded. In 1998, the corresponding figures were 18 mammal, 53 bird, 21 reptile, 7 frog and 56 ant species. Mammals recorded included one officially gazetted rare species, the Chuditch. Two of the species recorded in 1998 were not detected in 2001. These were the Brush-tailed Phascogale and an unidentified bat species. Numbers of several species appear to have changed significantly with some mammal and bird species declining, possibly due to very dry summer followed by very low winter rainfall. Common brushtail possum and frog species increased. Baudin's Cockatoo was recorded at both Jarrahdale and Huntly. The reptile fauna included one 'Specially Protected' species, viz. the Carpet Python.</p> <p>Quantitative data showed that the composition of all rehabilitated sites was becoming more similar to that of the unmined sites. However, they remain linked to each other, particularly JR1 and JR2, which have become even more similar to each other.</p> | Jarrahdale plots are expected to be adjacent or within the current Survey Area, Huntly (approximately 40 km south) and Karnet (approximately 10km north) |
| EMRC (1998) Alcoa of Australis Ltd. Long Term Fauna Monitoring Program (1998) | <p>Location: Plots located in rehabilitation and nearby forest at Jarrahdale, Huntly and Karnet.</p> <p>This report provides the results of the 1998 fauna monitoring program. Methods used were identical to the 1995 monitoring program. Results are then compared to previous monitoring programs (1992 and 1995) in detail and the influence of mining and successional processes on fauna can be assessed. A total of 18 mammal (12 indigenous, six introduced), 53 bird, 20 reptile, 5 frog and 56 ant species was recorded. Mammals recorded included two officially gazetted rare species, viz. the Chuditch and the Quokka. Two of the species recorded (Dunnart <i>Sminthopsis gilberti</i> and the Honey Possum) in 1995 were not detected in 1998. A number of species have increased since the previous monitoring event (Mardo and Quenda). There wasn't any evidence of any mammal species declining due to proximity of mining. All bird species recorded in 1992 and 1995 were recorded in 1998. Only one rare bird species, Baudin's Cockatoo was recorded and this was present at all sites. One new skink species was collected - <i>Glaphyromorphus gracilipes</i> was trapped at stream site HS1 (Banya Road) during the summer trapping program. Insufficient reptile numbers were collected to determine trends over time.</p> | Jarrahdale plots are expected to be adjacent or within the current Survey Area Huntly (approximately 40 km south) and Karnet (approximately 10km north) |
| EMRC (2004) Orion LTFMP report 2004 Final | <p>Location: Willowdale -north east portion of Orion region (two healthy forest and two dieback forest plots, two steam zone plots and two plots in rehabilitation)</p> <p>The LTMFP was reviewed in 2003 (Majer, 2003) which included a recommendation for a similar program to be established at Orion so that any differences in faunal successional processes taking place at Willowdale could be detected. Similar techniques to those used at Jarrahdale, Huntly and McCoy. Mammals recorded during the survey included the Chuditch, Quokka, Mardo, Dunnart, Common Brushtail Possum, Western Brush Wallaby. Only one mammal species was recorded in the young rehabilitation (Feral Mouse). Forty one bird species was recorded including the Baudin's Cockatoo. Bird numbers were highest at steam sites and lowest at rehabilitated sites. Six reptile species were recorded compared with 15 species recorded in the 1999 pre-mining survey. Three frog species were recorded. Fifty ant species were recorded. Further monitoring was recommended to determine successional patterns.</p> | Willowdale (within 20 km of the far southern boundary of the Study Area) |
| EMRC (1999) A fauna survey of planned mining areas at Alcoa's Orion Mining region | <p>Location: Orion mining region at Willowdale</p> <p>This report provides the results of the fauna survey conducted between February and November 1999. The habitats monitored were poorly surveyed in current mining areas, extensive dieback affected areas, small dieback free areas and on sites where mining operations are planned. A total of 46 bird species, nine mammals (6 native, 3 introduced), 13 reptiles and five frogs was recorded. These included three rare species (the Chuditch, Baudin's Cockatoo and possibly the Quokka) and one Specially Protected species (the Carpet Python). As well as these, the Noisy Scrub-bird has been reintroduced into the area and the uncommon Brush-tailed Phascogale is present albeit in low densities. The fauna of the Orion area was largely comparable to that of existing Willowdale mining areas. Results emphasise the need for ongoing fox control. Rehabilitation using Jarrah and other indigenous species offers the best prospects of successfully recreating suitable habitat for the species. Eleven recommendations were given for managing the area's faunal diversity including; protection of adjacent fauna habitat, construction of fauna habitats and corridors, control of feral species, construction of suitable habitat specific to mammals and reptiles.</p> | Willowdale (within 20 km of the far southern boundary of the Study Area) |

| Project | Location and key findings | Location in relation to this Survey Area |
|---|---|---|
| <p>EMRC (2007c) A Vertebrate Fauna Survey of Rehabilitated Areas at Alcoa's Willowdale Minesite</p> | <p>Location: Willowdale (rehabilitated bauxite mine sites)</p> <p>This report details the 2007 results of the long term fauna monitoring. Previous monitoring events occurred in 1994, 2000 (following fox control) and again in 2007.</p> <p>In the 2007 survey a total of 25 bird species, 10 mammals (seven indigenous, three introduced) and five reptiles was recorded in rehabilitation. They included three rare species, viz. the Chuditch, Brush-tailed Phascogale and Forest Red-tailed Black Cockatoo. Numbers of native mammals trapped in rehabilitation were higher than in previous years, with Yellow-footed Antechinus increasing from 0 in 1994 to 6 in 2007; Brush-tailed Phascogales increased from 0 to 1 and Chuditch increased from 0 to 3. Bird species had declined since the 2000 survey. Total numbers of both insectivores and honeyeaters both showed large declines between 1994 and 2000. There was a gradual decline in numbers of the skink <i>Acritoscincus trilineatum</i> as the rehabilitated sites become more like upland forest habitat and less suitable for this species.</p> <p>Fifteen recommendations were given for managing the area's faunal diversity including; protection of adjacent fauna habitat, construction of fauna habitats and corridors, control of feral species, construction of suitable habitat specific to mammals and reptiles</p> | <p>Willowdale (within 20 km of the far southern boundary of the Study Area)</p> |
| <p>EMRC (2001b) A Vertebrate Fauna Survey of rehabilitated areas at Alcoa's Willowdale Minesite</p> | <p>Location: Willowdale (rehabilitated bauxite mine sites)</p> <p>This report details the 2000 fauna monitoring event results after the introduction of fox control following the 1994 monitoring event. A total of 31 bird species, nine mammals (five introduced, four indigenous) and five reptiles was recorded. Although not trapped or recorded in the present survey, both the rare Chuditch and the specially protected Carpet Python have been recently recorded in rehabilitation at Willowdale. Numbers of native mammals trapped in rehabilitation were low, as in 1994. Some evidence suggests that Fox predation may still be a problem near farmland. The 31 bird species recorded in the 2000 survey is less than the 45 recorded in 1994. The five reptile species recorded indicate that the rehabilitation has not yet become more suitable for this fauna group. Fifteen recommendations were given for managing the area's faunal diversity including; protection of adjacent fauna habitat, construction of fauna habitats and corridors, control of feral species, construction of suitable habitat specific to mammals and reptiles.</p> | <p>Willowdale (within 20 km of the far southern boundary of the Study Area)</p> |

4. Survey Results

4.1 Fauna Habitats

There were eight broad fauna habitat types delineated in the Survey Area during the field survey. These habitat types are categorised based on flora species, hydrology, soil and topography. They align with the vegetation types identified by Matiske (2021). The habitat types recorded in the Survey Area are described in Table 20 and mapped in Figure 5a and 5b, Appendix A. The broad fauna habitat types are:

- Jarrah-Marri forest
- Bullich forest
- Granite outcrop
- Blackbutt forest
- Flooded Gum woodland
- Melaleuca dampland
- Mine rehabilitation
- Pine plantation.

In addition to the fauna habitats listed above, a small proportion (0.7%) of the Survey Area comprised cleared rural land. These areas are included in Figure 5a and 5b, Appendix A. They have limited habitat values due to lack, paucity, or low quality of intact native vegetation.

4.1.1 Fauna habitat linkages

The Survey Area represents a large continuous tract of forest with good connectivity to all habitats directly adjacent.

4.1.2 Quality of habitat



Whilst the vegetation is mostly intact the impact by logging, frequent and extensive fire and dieback in some areas were evident. Despite this the habitat presents a large contiguous intact forest with multiple habitat types suitable for large ranging species such as the Chuditch, Brush-tailed Phascogale and Western Brush Wallaby.



The granite outcrop habitat provides quality resources (refuge, breeding, feeding and dispersal) for a diverse suite of fauna particularly reptiles. However some areas of granite outcrop are damaged in the form of broken/shattered rocks with tyre tracks observed over portions of outcrops. This may impede on species density as damaged habitat reduces the opportunity for species to hide or create refuge.



The forested areas covering the majority of the Survey Area were in very good to excellent condition (with respect to disturbance) with the exception of some areas of dieback infestation and some areas of recent timber harvesting. The forested habitats provided an array of micro-habitats such as logs, hollows, leaf litter, soft sand and dense foliage with a broad range of floristic species providing a range of foraging, roosting, denning and sheltering habitat. However prescribed burning in spring of 2020 destroyed several known Black Cockatoo breeding hollows in a patch of Bullich forest in the northern portion of the Survey Area (Tony Kirkby pers.comm). The same burn destroyed known Quokka habitat along the densely vegetated drainage line. This is based on Quokka detection during the current survey. Inappropriate fire frequency, intensity and extent can have adverse impacts on habitat quality for significant species and broader fauna assemblages.

Small streams were recorded throughout the Survey Area which provide accessible drinking water to fauna. Most of the streams appear to be seasonal however the Serpentine Dam lies adjacent south of the Survey Area which provides accessible drinking water year-round, particularly to birds. Floodplains were associated with some of the streams that provide suitable Quokka habitat as well as where frogs were recorded during both survey phases.

Table 20 Major habitat types within the Survey Area

| Description | Corresponding Vegetation Type Code (Mattiske 2021) | Extent in the Mine Development Envelope Survey Area (ha) | Extent in the Conveyor/Haul Road Corridor Survey Area (ha) | Total Survey Extent (ha) | Percentage of Total Survey Area | Representative Images |
|---|--|--|--|--------------------------|---------------------------------|---|
| <p>Blackbutt Forest Blackbutt open forest with occasional Bullich, and Marri over sparse <i>Banksia littoralis</i> over <i>Trymalium</i>, <i>Macrozamia</i>, <i>Xanthorrhoea preissi</i>, over <i>Lepidospermum tetraquetrum</i>, <i>Astartea scoparia</i> and areas of dense Swamp peppermint (<i>Taxandria linearifolia</i>). This habitat is limited to localised patches often associated with creeks and drainage lines. Disturbance factors include frequent fire, feral pigs, dieback, damage caused rock removal, trail bike and 4WD on granite.</p> <p>Fauna Species recorded during survey: Provides habitat for a range of small forest and woodland birds such as Rufous Treecreeper, Golden Whistler, and Grey Shrike Thrush. Low dense understory provides shelter and suitable corridors for Quokka and Quenda. Forest reptiles recorded include Rosenberg Monitor and Southern Carpet Python.</p> <p>Habitat for conservation significant species Western Brush Wallaby, Quenda, Quokka, Chuditch and Western False Pipistrelle. Breeding and roosting habitat for all three Black Cockatoo species.</p> | CW, AW, AW/AX, AX/CW, C | 673 | 14 | 687 | 3.9% |  |
| <p>Bullich forest. Valleys and drainage areas dominated by Bullich (<i>Eucalyptus megacarpa</i>) and with some Black Butt (<i>E. patens</i>), occasional Marri (<i>Corymbia calophylla</i>), over Sheoak (<i>Allocasuarina fraseriana</i>), <i>Banksia littoralis</i> over Grass trees (<i>Xanthorrhoea preissii</i>), Bracken fern, patches of dense <i>Gahnia trifida</i> shrubland over <i>Lasiopetalum floribundum</i>, sedges and herbs. Substrate is dark clayloam soil. These areas are associated with seasonal creeks and drainage areas. This habitat is limited in extent to localised patches within the Survey Area. Disturbance factors include frequent fire, feral pigs, dieback.</p> <p>Fauna species recorded during survey: Provides habitat for a range of forest and woodland birds and frogs such as Ticking frog. Quokka and Quenda were recorded via camera within dense understory and shrub areas of this habitat. Potential breeding habitat for Black Cockatoo species, and nesting has been confirmed in areas of old growth Bullich (Tony Kirkby pers.comm).</p> <p>Habitat for conservation significant species: Black Cockatoos, Chuditch, Quokka, Quenda, Western Brush Wallaby, Masked Owl, Brush-tailed Phascogale, Western False Pipistrelle.</p> | W, WA | 239 | 28 | 267 | 1.5% |  |

| Description | Corresponding Vegetation Type Code (Mattiske 2021) | Extent in the Mine Development Envelope Survey Area (ha) | Extent in the Conveyor/Haul Road Corridor Survey Area (ha) | Total Survey Extent (ha) | Percentage of Total Survey Area | Representative Images |
|--|--|--|--|--------------------------|---------------------------------|--|
| <p>Flooded Gum woodland</p> <p>Flooded Gum (<i>E. rudis</i>) open woodland with occasional Blackbutt, over open to open to sparse <i>Banksia littoralis</i> over Prickly Moses (<i>Acacia pulchella</i>), myrtaceous species such as Swamp peppermint (<i>Taxandria linearifolia</i>), <i>Astertea scoparia</i> <i>Trymalium odoratissimum</i>, low shrub/sedgeland. Substrate varies from dark grey to grey brown sandy clays. Associated with poorly drained broad valleys forming seasonal swamps and occasionally tall open forest along drainage lines. Disturbance factors include frequent fire, feral pigs.</p> <p>Fauna Species recorded during survey:</p> <p>Provides habitat for a range of woodland shrubland birds such as Scrubwrens, Fairy-wrens, and nectar feeding birds such as Honeyeaters, wattlebirds and parrots.</p> <p>Habitat for conservation significant species</p> <p>Chuditch and potential foraging habitat for Black Cockatoos. Favoured areas for Western Brush Wallaby. In areas of dense Myrtaceous thicket (low fire frequency) this provides refuge and movement corridors for Quokka and Quenda.</p> | AC, AD, AX | 674 | 13 | 688 | 2.9% |  |
| <p>Granite outcrop</p> <p>Granite outcrops with associated lithic vegetation complexes and adjacent associated fringing open Jarrah and Marri areas with scattered Sheoak, Melaleuca, <i>Banksia ilicifolia</i> over occasional Grass trees over mixed open heath communities of Myrtaceous and Proteaceous low shrubs. Soils are pale grey to yellowish fine sand or sandy clay. Granite outcrops often associated with seasonal watercourse and seasonally damp areas. This habitat found as localised patches throughout the Survey Area. Disturbance factors include frequent fire, feral pigs, dieback, damage caused by rock removal, trail bike and 4WD on granite.</p> <p>Fauna Species recorded during survey:</p> <p>Provides shelter and foraging for a range of reptile and frog fauna e.g. Ornate Crevice-dragon, Barking Gecko, Speckled stone gecko, Gould's hooded snake, Southern Carpet Python, and Black-headed Monitor. Associated water courses provide seasonal breeding for locally common frog species such as Quacking froglet and Moaning frog. Two Death Adders were also recorded on this habitat.</p> <p>Habitat for conservation significant species:</p> <p>Foraging and denning habitat for Chuditch. Habitat for Western Brush Wallaby, Southern Death Adder, and Dell's Ctenotus. Fringing open forest provides foraging and potential breeding habitat for Black Cockatoo species.</p> | R, G, G1, G2, RG | 366 | 7 | 373 | 2.1% |  |

| Description | Corresponding Vegetation Type Code (Mattiske 2021) | Extent in the Mine Development Envelope Survey Area (ha) | Extent in the Conveyor/Haul Road Corridor Survey Area (ha) | Total Survey Extent (ha) | Percentage of Total Survey Area | Representative Images |
|--|--|--|--|--------------------------|---------------------------------|---|
| <p>Jarrah – Marri forest <i>E. marginata</i> and <i>C. calophylla</i> open forest over Grass trees (<i>Xanthorrhoea preissi</i>), <i>Lasiopetalum floribundum</i>, <i>Macrozamia</i> mid shrubland. Patches have dominance of understory <i>Allocasuarina fraseriana</i> and <i>Banksia grandis</i>. Often with complex mosaic of low shrubs such as Fabaceae, Hibbertia, Leucopogon, Adenanthos, and Pteridium. This is the most extensive habitat identified and comprises a number of vegetation types dominated by Jarrah on upper, mid and low slopes and broad valleys. Soils range from well drained gravely sand to sandy clay loam. Historical logging is a significant disturbance factor: extensive areas of forest are at varying ages of regeneration. Other disturbances include frequent fire (significant), feral pigs, dieback, trail bike, 4WD and dumped rubbish including weed plants.</p> <p>Fauna species recorded during survey: Provides habitat for a range forest and woodland birds such as Thornbills, Rufous Treecreeper, Pardalotes, Sitella, and Purple-crowned Lorikeet. All three Black cockatoo species observed feeding extensively throughout. Forest reptiles include Crevice Skink (<i>Egernia napoleonis</i>), Gould's Monitor (<i>Varanus gouldii</i>), <i>Lerista distinguenda</i>, and Southern Blind Snake (<i>Anilius australis</i>). Small mammals include forest micro-bats, and Mardo (<i>Antechinus flavipes</i>). Other species include Echidna, Western Brush Wallaby, Peregrine Falcon and Western Grey kangaroo.</p> <p>Habitat for conservation significant species: Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Peregrine Falcon, Masked Owl, Western False Pipistrelle, Dell's Skink, Southern Death Adder. Foraging and potential roosting habitat for all three locally occurring Black Cockatoo (<i>Calyptorhynchus</i>) species. Breeding habitat for all three Black Cockatoo species.</p> | D, DA, DG, E, J, M, P, PG, PJ, PT, PS, PW, S, SP, ST, T, SW, TP, TS, Q | 14,601 | 121 | 14722 | 83.2% |  |
| <p>Melaleuca dampland. Paperbark (<i>Melaleuca pressiana</i>) over sparse isolated <i>Banksia littoralis</i> over open Hakea, occasional Woody Pear (<i>Xylomelum</i>), Grass trees and over mixed shrublayer of Cyperaceae, Restionaceae, Babingtonia, Jacksonia and Acacia, over low shrubs, sedges and herbs. There are areas of sparse to occasional stunted Jarrah and Marri however these are limited to lowland transitional zones adjacent to slightly higher elevation and drainage open forest areas. Generally limited to areas of poor drainage and subject to winter inundation such as broad valleys and swamps. Substrate is grey gravely clay and clay loam. Disturbance factors include frequent fire and feral pigs.</p> <p>Fauna species recorded: Provides habitat for a range forest and woodland birds. Black cockatoo species forage on Banksia, Hakea and occasional Jarrah and Marri. Several frog species breed seasonally such as Glauert's Froglet (<i>Crinia glauerti</i>) and Moaning Frog (<i>Heleioporus eyrei</i>). Reptiles include Cool Skink (<i>Acritoscincus trilineatum</i>), and Earless Skink (<i>Hemiergis initialis</i>). Small mammals include forest micro-bats, and Mardo (<i>Antechinus flavipes</i>). Other species include Echidna, Western Brush Wallaby and Western Grey kangaroo.</p> <p>Habitat for conservation significant species during survey: Western Brush Wallaby, Western False Pipistrelle. Foraging habitat for all three locally occurring Black Cockatoo (<i>Calyptorhynchus</i>) species although Jarrah and Marri are generally stunted and sub-optimal for potential breeding habitat. Where creek lines or dense vegetation is present Quokka and Quenda reside.</p> | A | 130 ha | 0 | 130 | 0.7% |  |

| Description | Corresponding Vegetation Type Code (Mattiske 2021) | Extent in the Mine Development Envelope Survey Area (ha) | Extent in the Conveyor/Haul Road Corridor Survey Area (ha) | Total Survey Extent (ha) | Percentage of Total Survey Area | Representative Images |
|--|--|--|--|--------------------------|---------------------------------|-----------------------|
| <p>Mine rehabilitation</p> <p>Historic mine rehabilitation (> 20 years old) of the Jarrahdale Mine. This is historic rehabilitation under previous completion criteria and not representative of current or future rehabilitation programs. These areas are Jarrah dominated trees. These areas generally have high value foraging habitat for Black Cockatoo species but lack trees of suitable age (trunk diameter) to have developed hollows of sufficient diameter and depth to be considered potentially suitable breeding trees for Black Cockatoos. These areas do however provide continuity of forest or woodland connectivity allowing fauna movement and foraging habitat for a range of species ground such as terrestrial reptiles, birds, small mammals.</p> | Rehab | 387 | 14 | 402 | 2.4% | Image not available |
| <p>Pine plantation</p> <p>These are monocultures of Pine timber tree species (Pinus). They represent very high quality foraging habit for Carnaby's and Baudin's Cockatoos. They tend to be devoid of understory and ground layer vegetation and lack habitat values for most other native vertebrates.</p> | PL | 162 | 0 | 162 | 0.9% | Image not available |

4.2 Fauna Diversity

The combined fauna surveys (Phase 1 and Phase 2) recorded 132 vertebrate fauna species utilising the Survey Area, including 23 mammals, 76 birds, 26 reptiles and 7 amphibians. A breakdown of the fauna assemblage is provided below.

4.2.1 Mammals

The combined surveys recorded 23 mammal species from 12 families within the Survey Area including six species of introduced mammals and 17 native mammal species. The most specious family was the Dasyuridae and Vespertilionidae (both with four species) and Macropod (three species). Six micro-chiropteran bats were positively identified from call analysis and further two species were unconfirmed. Seven of the mammal species recorded are listed as conservation significant and are further discussed in section 4.3.

A breakdown of mammal families recorded during the surveys is provided in Table 21.

Table 21 Mammal families recorded during the field survey

| Mammal Family | Number of species | |
|---------------------------------------|-------------------|-----------|
| | Phase 1 | Phase 2 |
| Canidae (Fox) | 1 | 1 |
| Dasyuridae (Dasyurid mammals) | 3 | 4 |
| Felidae (Cat) (domestic) | 1 | 1 |
| Leporidae (Rabbit) | 1 | 1 |
| Macropodidae (Kangaroo) | 3 | 3 |
| Molossidae (Free-tail Bat) | 2 | 2 |
| Muridae (Rodent) | 2 | 3 |
| Peramelidae (Quenda) | 1 | 1 |
| Phalangeridae (Possum) | 1 | 1 |
| Suidae (Wild pig) | 1 | 1 |
| Tachyglossidae (Short-billed Echidna) | 1 | 1 |
| Vespertilionidae (Simple-nosed Bats) | 4 | 4 |
| Total | 21 | 23 |

4.2.2 Birds

Bird surveys identified 76 bird species from 36 families over the combined Phase 1 and Phase 2 surveys. The most specious families were the Meliphagidae (8 species), Acanthizidae (6 species) and Psittaculidae (6 species). Five of the bird species recorded are listed as conservation significant and are further discussed in section 4.3.

No migratory shorebirds were recorded during the survey. The phase 2 survey coincided with the seasonal occurrence of shorebirds across the southwest region. The survey area lacks open water including shallow shorelines for foraging habitat. The creek lines and vegetated dampland areas within the survey area are not suitable. Therefore, they are unlikely to occur within the survey area, and any occurrence would be as vagrant visitation due to proximity of Serpentine Reservoir.

A breakdown of bird families recorded during the survey is provided in Table 22.

The Masked Owl (*Tyto novaehollandiae*) was specifically targeted for assessment utilising SM4 Acoustic Song Meters in suspected habitat areas as shown in Table 6 and Figure 3, Appendix A. Song Metres recorded 25 opportunistic bird species and detected the presence of Masked Owl during the Phase 1 survey with no detections during the Phase 2 survey. A comprehensive detailed summary of the results of the Acoustic Song meters is provided in Appendix D.

It should be noted that Song Meters were placed at targeted Masked Owl habitat during the Phase 1 survey and deployed to fill in 'gaps' in the Phase 2 survey to increase coverage over the Survey Area and indicate distribution of Masked Owl.

Table 22 *Bird families recorded during the field surveys*

| Bird Family | Number of species | |
|--|-------------------|---------|
| | Phase 1 | Phase 2 |
| Acanthizidae (Weebill/Gerygone) | 5 | 6 |
| Accipitridae (Diurnal birds of prey) | 1 | 2 |
| Aegothelidae (Nightjar) | 0 | 1 |
| Alcedinidae (Kingfisher) | 1 | 2 |
| Anatidae (Duck) | 2 | 1 |
| Artamidae (Magpie group) | 3 | 5 |
| Cacatuidae (Cockatoo group) | 3 | 4 |
| Campephagidae (Cuckoo-shrikes) | 1 | 1 |
| Casuariidae (Emu) | 1 | 1 |
| Charadriidae (Lapwing) | 1 | 0 |
| Climacteridae (Tree Creeper) | 1 | 2 |
| Columbidae (Pigeon) | 2 | 1 |
| Corvidae (Crow, Raven) | 2 | 1 |
| Cuculidae (Cuckoos) | 1 | 1 |
| Dicaeidae (Flowerpeckers) | 1 | 0 |
| Estrildidae (Finches) | 0 | 1 |
| Falconidae (Falcons) | 0 | 1 |
| Hirundinidae (Swallows) | 2 | 1 |
| Locustellidae (Songlark) | 1 | 0 |
| Maluridae (Wrens) | 3 | 2 |
| Meliphagidae (Honeyeaters) | 3 | 8 |
| Meropidae (Bee-eater) | 0 | 1 |
| Monarchidae (Lark) | 1 | 1 |
| Neosittidae (Sitellas) | 0 | 1 |
| Pachycephalidae (Whistlers) | 3 | 3 |
| Pardalotidae (Pardalotes) | 0 | 2 |
| Petroicidae (Robin) | 3 | 3 |
| Podargidae (Frogmouths) | 1 | 1 |
| Psittaculidae (Parrots) | 3 | 6 |
| Rhipiduridae (Fantail) | 1 | 1 |
| Rallidae (Rails) | 1 | 0 |
| Strigidae (True Owls) | 1 | 1 |
| Threskiornithidae (large wading birds) | 0 | 1 |
| Turnicidae (Quail) | 1 | 1 |
| Tytonidae (Owl) | 1 | 0 |
| Zosteropidae (Silvereye) | 1 | 1 |

| Bird Family | Number of species | |
|--------------|-------------------|-----------|
| | Phase 1 | Phase 2 |
| Total | 51 | 64 |

4.2.3 Amphibians

A combined total of seven amphibians from three families were recorded during the Phase 1 and Phase 2 surveys. The most species family was Myobatrachidae (three species). No conservation significant amphibians were recorded during this time. A breakdown of amphibians recorded during the survey is provided in Table 23.

Table 23 Amphibian families recorded during the field surveys

| Amphibian Family | Number of species | |
|---|-------------------|----------|
| | Phase 1 | Phase 2 |
| Myobatrachidae (Quacking/Bleating Frog) | 3 | 2 |
| Limnodynastidae (Moaning Frog) | 1 | 1 |
| Pelodyadidae (Slender tree Frog) | 1 | 1 |
| Total | 5 | 4 |

4.2.4 Reptiles

A combined total of 26 reptile species from nine families were recorded during the Phase 1 and Phase 2 surveys. The most specious family was Scincidae (10 species) followed by Elapidae (four species). One conservation significant reptile was recorded during the survey which is further discussed in section 4.3.

A breakdown of reptile families recorded during the survey is provided in Table 24.

Table 24 Reptile families recorded during the field surveys

| Reptile Family | Number of species | |
|--|-------------------|-----------|
| | Phase 1 | Phase 2 |
| Agamidae (Dragons) | 1 | 2 |
| Boidae (Pythons) | 1 | 1 |
| Carphodactylidae (Terrestrial Geckoes) | 1 | 0 |
| Elapidae (Snakes) | 2 | 4 |
| Gekkonidae (Geckos) | 1 | 2 |
| Pygopodidae (Legless Lizards) | 0 | 1 |
| Scincidae (Skinks) | 8 | 9 |
| Typhlopidae (Blind Snakes) | 0 | 1 |
| Varanidae (Monitors) | 3 | 2 |
| Total | 17 | 22 |

4.2.5 Introduced Species

Mammals comprised the main group in which introduced fauna were recorded. In total eight species were observed and included:

- Feral Pig (*Sus scrofa*)
- European Fox (*Vulpes vulpes*)
- European Rabbit (*Oryctolagus cuniculus*)
- Black Rat (*Rattus rattus*)

- House Mouse (*Mus musculus*)
- Feral cat (*Felis catus*)
- Rainbow Lorikeet (*Trichoglossus moluccanus*)
- Laughing Kookaburra (*Dacelo novaeguineae*).

These species are considered feral to the region.

4.3 Conservation Significant Fauna

Thirteen conservation significant fauna species were recorded within the Survey Area during the surveys. This includes:

- Baudin's Cockatoo (*Calyptorhynchus baudinii*) – listed as Endangered under the BC Act and Endangered under the EPBC Act.
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the BC Act and Endangered under the EPBC Act.
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act.
- Quokka (*Setonix brachyurus*) – listed as Vulnerable under the BC Act and the EPBC Act.
- Chuditch (*Dasyurus geoffroi*) listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act.
- Peregrine Falcon (*Falco peregrinus*) listed as Special Protection (Schedule 7) under the BC Act.
- Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) listed as Conservation Dependent by DBCA.
- Masked Owl Southwest (*Tyto novaehollandiae novaehollandiae*) listed as Priority 3 by the DBCA.
- Rakali (*Hydromys chrysogaster*) listed as Priority 4 by the DBCA.
- Quenda (*Isoodon fusciventer*) – listed as Priority 4 by the DBCA.
- Western Bush Wallaby (*Notamacropus Irma*) – listed as Priority 4 by the DBCA.
- Southern Death Adder (*Acanthophis antarcticus*) listed as Priority 3 by the DBCA.
- Western False Pipistrelle (*Falsistrellus mackenziei*) listed as Priority 4 by the DBCA.

Likelihood of occurrence assessment

In addition to the field survey results, an assessment of the likelihood of conservation significant species occurring in the Survey Area was undertaken. This assessment is based on species' biology, habitat requirements, the quality and availability of suitable habitat as determined during the field survey and records of the species in the Survey Area and locality. The *NatureMap* database identified 185 terrestrial vertebrate fauna species previously recorded within the Study Area. This total comprised of 113 birds, 32 reptiles, 28 mammals and 12 amphibians. Of the 185 fauna species previously recorded, 177 are native species and eight are naturalised (introduced) species. The EPBC Act PMST search detected an additional four threatened bird species as potentially occurring within the Study Area and the DBCA Threatened and Priority Fauna database returned one additional mammal within the Survey Area. Based on the above database searches and GHD observations, fourteen conservation significant terrestrial vertebrate taxa were identified as likely to occur or present within the Survey Area.

With regard to migratory shorebirds, the survey area lacks open suitable foraging habitat, namely shorelines or extensive shallow open water. The creek lines and vegetated seasonal dampland areas within the survey area are not considered suitable foraging habitat and in most cases are dry during the period of migratory bird use in the south west of Western Australia. Therefore, they are unlikely to occur within the survey area, and any occurrence would be as rare vagrant.

Table 25 summarises the species of conservation significance that are either known or considered likely to occur in the Survey Area. A brief description of these species and their associated habitat types within the Survey Area are described below. The parameters of assessment for this likelihood of occurrence assessment and the full likelihood of occurrence assessment are provided in Appendix D.

Table 25 Summary of likelihood of occurrence assessment for conservation significant fauna

| Species | EPBC Act | BC Act/ DBCA | Assessment outcome |
|--|----------|--------------|---|
| Birds | | | |
| Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>) | EN | EN | Known. The species was recorded during the survey and shown in Figure 4d, Appendix A. |
| Carnaby's Cockatoo (<i>C. latirostris</i>) | EN | EN | Known. The species was recorded during the survey and shown in Figure 4d, Appendix A. |
| Forest Red-tailed Black Cockatoo (<i>C. banksii naso</i>) | VU | VU | Known. The species was recorded during the survey and shown in Figure 4b, Appendix A. |
| Peregrine Falcon (<i>Falco peregrinus</i>) | - | SP | Known. One individual was recorded during the survey and the Jarrah Marri forest within the Survey Area is suitable nesting habitat. |
| Masked Owl (southwest) (<i>Tyto novaehollandiae novaehollandiae</i>) | - | P3 | Known. The species was recorded on acoustic recorders during the survey and shown in Figure 4c, Appendix A. |
| Mammals | | | |
| Western False Pipistrelle (<i>Falsistrellus mackenziei</i>) | - | P4 | Known. This species was recorded on Song Meters in both the Phase 1 and Phase 2 surveys. Suitable habitat is available to support this species. |
| Chuditch (<i>Dasyurus geoffroi</i>) | VU | VU | Known. This species was recorded on two remote cameras during Phase 1 and Phase 2 of the survey. The Survey Area contains suitable breeding and foraging habitat to support this species. |
| Quenda (<i>Isodon fusciventer</i>) | - | P4 | Known. The species was recorded via cage trapping, remote cameras and diggings during the survey and shown in Figure 4c, Appendix A. |
| Quokka (<i>Setonix brachyurus</i>) | VU | VU | Known. The species was recorded on remote camera during the Phase 1 and Phase 2 of the survey shown in Figure 4a, Appendix A. The species appears to be wide spread and associated with riparian areas and damplands. |
| Brush tailed Phascogale (<i>Phascogale tapoatafa wambenger</i>) | - | CD | Known. At least three individuals were recorded on one remote camera within the Survey Area. Suitable habitat occurs within Survey Area. |
| Western Brush Wallaby (<i>Notamacropus irma</i>) | - | P4 | Known. The species was recorded throughout the Survey Area as shown in Figure 4c, Appendix A. |
| Rakali (<i>Hydromys chrysogaster</i>) | | P4 | Known. The species was recorded on one remote camera along a flowing stream section of Big Brook that bisects the proposed conveyor location shown in Figure 4c, Appendix A. |
| Reptiles | | | |
| Southern Death Adder (<i>Acanthophis antarcticus</i>) | - | P3 | Known. The species was recorded during the survey near granites near to Serpentine Dam and shown in Figure 4c, Appendix A. Suitable forest and rocky habitat occurs within Survey Area. |
| Dell's Skink (<i>Ctenotus Dellii</i>) | | P4 | Likely. The species has previously been recorded in the region and habitat is present for the species. |
| Legend: | | | |
| CD= Conservation dependent fauna | | | |
| CR = Critically endangered under the EPBC Act or BC Act | | | |
| EN = Endangered under the EPBC Act or BC Act | | | |
| VU = Vulnerable under the EPBC Act or BC Act | | | |
| SP (S7) = Schedule 7, Special Protection under BC Act | | | |
| P3 = Priority 2 under DBCA, poorly known species. | | | |
| P4 = Priority 4 under DBCA, rare, near threatened and other species in need of monitoring. | | | |

Fauna species recorded in the Survey Area

Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

The Forest Red-tailed Black Cockatoo is listed as Vulnerable under the EPBC Act and BC Act.

The Forest Red-tailed Black Cockatoo is endemic to the south-west humid and sub-humid zones of Western Australia (Mawson and Johnstone 1997). It inhabits the dense Jarrah, Karri (*E. diversicolor*) and Marri forests receiving more than 600 mm of annual average rainfall. The current distribution is north of Perth and east to Mount Helena, Christmas Tree Well, North Banister, Mt Saddleback, Rocky Gully and the upper King River (Johnstone 1997). More recently the species has been utilising and persisting on the northern portions of the Swan Coastal Plain and is now considered a regular sighting (Johnstone *et al* 2017). Habitats in which Forest Red-tailed Black Cockatoos occur at Bungendore Park and Jarrahdale, have an understorey of Bull Banksia (*Banksia grandis*), Snottygobble (*Persoonia longifolia*), Sheoak (*Allocasuarina fraseriana*) and *Banksia* spp., with scattered Blackbutt (*E. patens*) and Wandoo (*E. wandoo*) (Johnstone & Kirkby 1999). Forest Red-tailed Black Cockatoos roost in Jarrah-Marri-Blackbutt habitat on road-sides, paddocks or forest blocks. While the Forest Red-tailed Black Cockatoo feeds on the seeds of other species, around 90 per cent of its diet is made up of the seeds from Marri and Jarrah fruits.

Forest Red-tailed Black Cockatoos have been recorded breeding in both Myara and Myara North, particularly at the Yamba area at the west of Myara and near the Tuart/Acacia Road area at the north-west of Myara North (T. Kirby, pers. comm.). Breeding is recorded in Jarrah, Marri (majority), Bullich and Blackbutt. Breeding has been recorded from adjacent areas including Serpentine National Park, Wungong Catchment, 39 Mile Brook area and Monadnocks Nature Reserve.

Significant Forest Red-tailed Black Cockatoos roost sites are known from the Myara North region at Jarrahdale Road/Albany Highway (350 birds but usually 50-60) and Jarrahdale Road near Jarrahdale (100 birds) (Johnstone and Kirkby unpublished data).

Forest Red-tailed Black Cockatoos were recorded at 149 locations throughout the Survey Area with approximately 280 physical observations recorded during Phase 1 and 91 physical observations during Phase 2. Individuals were recorded in flight, feeding or calling throughout the Survey Area. Foraging evidence, predominantly chewed Marri and Jarrah pods, was recorded throughout the Survey Area. All observations have been mapped and are presented in Figure 4b and 4d, Appendix A.



Plate 1: Forest Red-tailed Black Cockatoo image captured during winter survey

Baudin's Cockatoo (*Calyptorhynchus baudinii*)

Baudin's Cockatoo is listed as Endangered under the EPBC Act and BC Act.

Baudin's Cockatoo is endemic to the south-west of Western Australia. The range of Baudin's Cockatoo varies considerably between the breeding and non-breeding seasons. During the breeding season (from October to January), the species nests in the far south-west of WA within Jarrah, Marri and karri forests which receive an average of 750 mm of rainfall annually. Breeding generally occurs in woodland or forest, but may also occur in former woodland or forest now present as isolated trees. Breeding has been recorded at Perth Hills, Lowden (Johnstone & Storr 1998), Serpentine (hills area), and to the east at Kojonup (Johnstone & Kirkby 2008). Nesting occurs in hollows of live or dead karri, Marri, wandoo and tuart (*Eucalyptus gomphocephala*) trees (DSEWPac 2012). During the breeding season feeding primarily occurs in native vegetation, particularly Marri (DSEWPac 2012). The range then expands during the non-breeding season (from February) as flocks forage more widely, congregating on the central and northern parts of the Darling plateau, as far as Mundaring and Gidgegannup (DSEWPac 2012; Saunders 1974 & 1979). Some pockets of breeding have also been recorded around Augusta, Northcliffe, Walpole, Denmark and Albany (DSEWPac 2012).

Baudin's Cockatoo has been recorded breeding in both the Myara and Myara North regions, though only in low numbers. Most breeding appears to be in the Solus Road area at the border of the Myara and Myara North regions (Alcoa, T. Kirkby unpublished data). Limited breeding also occurs in Bullich and Marri at the border of the Wungong Catchment and 39 Mile Brook Catchment areas approximately 5 km to the north of the Survey Area.

Within close proximity of the Survey Area Baudin's Cockatoo are known to roost in Bullich at Dirk Brook Road and Gobby Road (up to 350 birds) at the west of Myara (Johnstone and Kirkby unpublished data). The species is known to roost in Bullich at the Karnet area north of Kingsbury Drive (100 birds) and in smooth white barked exotic eucalypts at Turner Road (150 birds) south of Jarrahdale at Myara North (Alcoa, T. Kirkby unpublished data).

Flocks of between one and 40 Baudin's Cockatoo were observed during the surveys, including some mixed Baudin's - Carnaby's Cockatoo flocks noted based on bill length. All observations have been mapped and are presented in Figure 4a and 4d, Appendix A.

Carnaby's Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Cockatoo is listed as Endangered under the EPBC Act and BC Act.

Carnaby's Cockatoo (*C. latirostris*) is endemic to the south-west of Western Australia with a wide-spread distribution. Carnaby's Cockatoo nest in hollows of live or dead eucalypts, primarily smooth-barked Salmon Gum and Wandoo (Saunders 1979, 1982) though breeding has been reported in other Wheatbelt tree species and some tree species on the Swan Coastal Plain and Jarrah forest (Saunders 1979, 1982; Storr 1991; Johnstone and Storr 1998). Success in breeding is dependent on the quality and proximity of feeding habitat within 12 km of nesting sites (Saunders 1977, 1986; Saunders and Ingram 1987). Along with the trees that provide nest hollows, the protection, management and increase of this feeding habitat that supports the breeding of Carnaby's Cockatoo is a critical requirement for the conservation of the species.

Carnaby's Cockatoos have been recorded breeding in the Myara region and two nests are present in Marri at the west of the area near Scarp Road. Breeding is expected to occur at the south of Myara North in the vicinity of Solus Road and Mountain Road based on seasonal observations (Alcoa, T. Kirkby unpublished data). Breeding has been recorded in Marri at the Wungong Catchment and 39 Mile Brook Catchment approximately 5 km to the north (Johnstone and Kirkby unpublished data). More breeding may be recorded with greater survey effort as there are records of lone males in a few areas during the breeding season which may indicate that females are at the hollow either incubating an egg or brooding a chick (T. Kirby, pers. comm.). Carnaby's Cockatoos foraging evidence was recorded with foraging activity observed throughout all forest and woodlands habitats. A range of plants in utilised including Eucalyptus, Corymbia, Banksia, and records of foraging on *Hakea undulata* and Jarrah, along Frollett Road and Albany Highway at Myara North (Alcoa/T.Kirkby unpublished data). Pine plantation (Pinus) within the Study Area also represent a high value seasonal foraging resource. Foraging resources across the site are of high value particularly given the presents of potential and known breeding trees present within and in proximity to the foraging habitat.

Carnaby's Cockatoo were recorded at several locations throughout the Survey Area with a total of approximately 443 birds observed during the winter survey. Observations of flocks ranging from 5 and 200 Carnaby's Cockatoo were recorded. More individuals were recorded in the northern portion of the Survey Area; however evidence of them was observed throughout the entire Survey Area. Their locations were present in pine trees (feeding, calling and flying to and from). All observations have been mapped and are presented in Figure 4b and 4d, Appendix A.



Plate 2: Carnaby's Cockatoo image captured during winter survey

Masked Owl (southwest) (Tyto novaehollandiae novaehollandiae)

The Masked Owl is listed as Priority 3 by DBCA.

The Masked Owl occurs in open forest and woodland, and roosts among dense foliage in gullies, or in caves or tree hollows (Peake *et al* 1993, Kavanagh & Murray 1996, Liddelow, Wheeler and Kavanagh, 2002). Habitat is known to be woodland or open forest with cleared agricultural land nearby. The Masked Owl occurs mainly in the woodland region or where agricultural land intrudes into the heavier forest (Liddelow, Wheeler and Kavanagh, 2002).

During the winter field survey, a total of 132 calls attributable to Masked Owls were recorded at two locations within the middle portion of the Survey Area. Their locations were present in Jarrah Marri forest associated to properties along Kingsbury Drive near to Serpentine Dam. One of the locations where the Masked Owl was detected (SM4-AC2 – Object ID 119) was near Serpentine Dam on the northern side. Due to the distance apart, timing of calls and numbers of calls the data is likely at least one pair of Masked Owl is present (see Appendix D). No other locations were recorded for the species despite the entire Survey Area being suitable for the species. All observations have been mapped and are presented in Figure 4c, Appendix A.

A detailed summary of the acoustic recordings of the Masked Owl is provided in Appendix D.

Quenda (Isoodon fusciventer)

The Quenda is listed as Priority 4 by DBCA.

The Quenda has patchy distribution through the Jarrah and Karri forest and on the Swan Coastal Plain. Its habitat is generally dense scrubby, often swampy, vegetation with dense cover up to one metre high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. Populations inhabiting Jarrah and Wandoo forests are usually associated with watercourses (Braithwaite, 1995).

Over the course of the surveys Quenda was recorded at 21 locations within the Survey Area via trapping, remote cameras and opportunistically. Three of these locations are within cage traps, 13 are on cameras and five are opportunistic sightings. Quenda locations are spread widely across the Survey Area; however almost half (ten) records are from the northwest portion. Habitat preference tends to be associated with areas of low dense vegetation along drainage lines and damplands. These areas are providing adequate cover from predators.

All observations have been mapped and are presented in Figure 4c, Appendix A.



Plate 3: Quenda recorded on a remote camera during the Phase 1 survey

Quokka (*Setonix brachyurus*)

The Quokka is listed as Vulnerable under the BC Act and the EPBC Act.

The current distribution of the mainland quokka includes areas through the south-west forests from Jarrahdale to Walpole. The mainland quokka lives in the Darling Range and south-west regions of Western Australia, mostly inhabiting densely vegetated swamps and sometimes tea-tree thickets on sandy soils along creek systems and dense heath on slopes. Mainland quokkas tend to hide in runs among vegetation during the day and forage along the swamp margins at night (Kitchener, D.J, 1995).

In the southern forest, quokkas occupy a range of forest, woodland and wetland ecotypes. The most commonly occupied sites comprise Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*), karri (*E. diversicolor*) or tingle (*E. jacksonii* or *E. guilfoylei*) forest and riparian habitats with a sedge dominated understorey (DEC 2013). Habitat supporting a low density of near-surface fuel, a complex vegetation structure and burn patchiness are the factors favouring quokka occupancy in the southern forest (DEC 2013). The habitat critical to survival for the south coast subpopulation includes a wider range of vegetation types (floristically and structurally) than in the northern Jarrah forest, including swamps, riparian areas, incised gullies and dense coastal heath (de Tores *et al.* 2007). Habitat occupied at the Swan Coastal Plain site at Muddy Lakes consists of fringing wetland vegetation of dense bulrush (*Typha orientalis*)/pale rush (*Juncus pallidus*) sedgeland with other sedges including jointed rush (*Baumea articulata*), *Typha domingensis* and coast sword-sedge (*Lepidosperma gladiatum*) (Keighery *et al.* 2002) (DEC 2013).

During the surveys Quokkas were recorded at a total of 16 locations across the Survey Area, each associated with riparian vegetation or damplands (Figure 4a, Appendix A). This comprises the presence of Quokka from signs (scat, prints or runnels) at three locations and the recordings of Quokka on 13 remote cameras. During phase 1, 16 individual Quokka (from 20 hits) were recorded and Phase 2 20 individuals (from 76 hits) on camera based on camera independence, animal size, pouch young size, hair loss and ear damage. Some individuals can be seen below in Plate 4 and Plate 5. Between 1 and 6 individuals were recorded per site based on independent characteristics, with the number of individuals likely higher due to animals being similar. During both phases a number of females either had pouch young or young at foot suggesting recruitment across the Survey Area.

Quokka detection locations were widespread across the Survey Area but limited to areas of dense vegetation associated with drainage lines and damplands. These areas are providing sufficient cover for shelter from predators, food and are movement corridors through the landscape. It is likely Quokka are present in the region wherever drainage lines and damplands are present with long unburnt vegetation. During this survey it was found animals were persisting in dense regrowth of approximately 5-6 years old after fire. This is probably occurring due to baiting in the region under western shield as few foxes were recorded on camera.



Plate 4: Quokka adult and juvenile captured on camera during Phase 1 survey



Plate 5: Quokka adult and juvenile captured on camera during Phase 2 survey

Western Brush Wallaby (Notamacropus irma)

The Western Brush Wallaby is listed as Priority 4 by DBCA.

Western Brush Wallaby are locally common in dry sclerophyll forest and woodlands in the southwest of Western Australia (Menkhorst & Knight 2010). They are predominantly diurnal, grazing on grasses and forbs.

Western Brush Wallaby were recorded throughout much of the Survey Area with a total of 62 observations of individuals (predominantly opportunistic) recorded during the surveys. Sightings occurred mainly amongst the Jarrah Marri forest, the dominant fauna habitat type, and were more prevalent in the southern and mid portions of the Survey Area. Remote cameras recorded approximately 21 records of Western Brush Wallaby over the deployment period.

Locations of Western Brush Wallaby observations recorded during the survey are presented in Figure 4c, Appendix A.



Plate 6: Western Brush Wallaby recorded during Phase 1 survey

Southern Death Adder (Acanthophis antarcticus)

The Southern Death Adder is listed as Priority 3 by DBCA.

The Southern Death Adder lives in forests and woodlands, grasslands and heath. The species is a highly cryptic generally only visible if active or sunbaking. Generally the species requires thick litter to hide.

During the Phase 1 survey two Southern Death Adders were opportunistically recorded by Matiske Consulting at one location (or generally in the same region) within close proximity to each other during the vegetation and flora survey being undertaking for this Project. This observation have been mapped and are presented in Figure 4c, Appendix A. This species was not detected by any other method throughout either of the surveys.



Plate 7: Southern Death Adder recorded by Matiske in winter 2020 (Image by Zac Sims)

Chuditch (Dasyurus geoffroii)

The Western Quoll or Chuditch is listed as Vulnerable under the BC Act and EPBC Act.

The Chuditch is Western Australia's largest carnivorous marsupial and is endemic to south-west Western Australia. It has mostly brown fur with distinctive white spots (40-70 white spots on its body but not on its tail). The tail is 21-35 cm long. The Chuditch is a carnivore and feeds mostly on large invertebrates. It also eats small lizards, birds and mammals. They are also known to consume the red pulp on Zamia seeds, small fruits and part of flowers. They utilise hollow logs or burrows during the day and hunt at night. It is an excellent climber, which makes it easier to catch tree-dwelling animals. Historically, Chuditch inhabited a wide range of habitats, but today it survives mostly in Jarrah *Eucalyptus marginata* forests and woodlands, mallee shrublands and heathlands (DBCA 2017a).

During the field survey the Chuditch was recorded on two remote cameras in the central north-eastern and central north-western portion of the Survey Area (Figure 4a, Appendix A). Despite the extensive survey effort (cages and cameras) no other individuals were recorded. The Survey Area contains suitable breeding and foraging/hunting habitat to support this species and a population of the species in the Survey Area.



Plate 8: Chuditch recorded on remote cameras during Phase 1 survey

Rakali (Hydromys chrysogaster)

The Rakali is listed as Priority 4 by DBCA.

Rakali live in the vicinity of permanent bodies of fresh, brackish, or marine water, lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. In the south-west of WA they have been shown to prefer areas with riparian vegetation, better water quality and a degree of habitat complexity. Woody debris, rock ledges and wetland islands are likely to be important areas for feeding and refuge (DEC 2012). It is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck & Strahan 2008).

One Rakali was recorded during Phase 1 of the survey via remote camera along a flowing stream section of Big Brook that bisects the proposed conveyor alignment (Figure 4c, Appendix A). A 300 m portion of the stream (Big Brook) was actively searched for Carters Freshwater Mussel and Rakali. No Rakali middens were recorded however a small amount of Yabbi remains were discovered on a bank which indicates recent use by Rakali. Big Brook is a seasonal Brook but a main tributary of Serpentine Dam, which is likely the source origin of Water Rat in the Survey Area. A further 13 locations were assessed for Rakali (See Appendix D for Rakali Assessment results) with an additional three creeks identified as potentially suitable for Rakali. Two of these areas had cameras deployed but no additional animals were detected. No other creeks in the Survey Area were assessed as suitable for the species due to the lack of permanent water within upper sections of creeks.



Plate 9: Rakali recorded on a remote camera during Phase 1 survey

Peregrine Falcon (Falco peregrinus)

The Peregrine Falcon is listed as Special Protection (Schedule 7) under the BC Act.

The Peregrine Falcon is a large falcon species which predominantly preys aerially on medium sized birds such as Pigeon, Galah and ducks. The species prefers areas with deep gorges or large cliff faces with riparian or plain habitat surrounding. Within the south-west this species utilised forest trees as suitable nest habitat, foraging in surrounding forests and clearings. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of buildings in cities (Morcombe 2004). The Peregrine Falcon is wide ranging, mobile and aerial in nature, and therefore is likely to utilise forest and woodland habitats within the Survey Area.

During the Phase 2 survey one Peregrine Falcon was recorded roosting in a tree at Trapline 3 (Figure 4c, Appendix A) in the south of the Survey Area. The Survey Area contains suitable breeding and hunting habitat to support this species.

Western False Pipistrelle (Falsistrellus mackenziei)

The Western False Pipistrelles is listed as Priority 4 under DBCA managed species list.

The Western False Pipistrelles is a vespertilionid bat that occurs in Southwest Australia. It is an insectivore associated with old growth forest that provides the species with its preferred foraging opportunities. Namely, flying insects are hunted around tall forest canopy in the valley between trees tops or the open areas above the mid-storey (Kitchener, Caputi & Jones, 1986). Their range is dominated by wet sclerophyll eucalypt forest and semi woodland of the southwest. Roosting sites are usually associated with old growth eucalypts containing hollows as well as within branches or tree stumps. The Western False Pipistrelle has been recorded on the Swan Coastal Plain in Banksia woodland (Kitchener, Caputi & Jones 1986).

The Western False Pipistrelle was recorded at 13 sites during both phases of the Survey Area (Figure 4c, Appendix A), suggesting a large portion of the Survey Area, including eucalyptus forest and woodland habitats are utilised for foraging and roosting.

Brush tailed Phascogale (Phascogale tapoatafa)

The Brush tailed Phascogale is listed as Conservation Dependent (CD) under the BC Act.

It occurs at low densities in the northern Jarrah forest with highest densities occurring in the Perup/Kingston area, Collie River valley and near Margaret River and Busselton. This species has been observed in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover. Records are less common from wetter forests. They are most active between dusk and dawn (though emerging later in mid-winter) and forage almost exclusively among the tree canopy. Nest sites include hollow tree limbs, rotten stumps and even bird's nests. Lactating females show a preference for large tree cavities with small entrances. They are opportunistic feeders including invertebrates, nectar, small birds and small mammals (DBCA, 2017b).

The Brush-tailed Phascogale was detected during phase 2 of the survey via remote camera from Jarrah – Marri forest with Sheoak understory within the central portion of the Survey Area (Plate 10 and Figure 4c, Appendix A.). Three individuals were identified on the same camera and all appear to be sub adult and likely from the same litter. This indicates a breeding population is present in the Survey Area.



Plate 10: Brush-tailed Phascogale recorded on remote camera

4.3.1 Accumulation curve

An accumulation curve was run for the data collected during the field survey within 8 models in Primer V6 (Plate 11). Jackknife1, Chao 1, Chao2 and Jackknife2 curves demonstrate poor fit to the data, while the remaining curves reach a curve asymptote (very few new species were recorded) after trap night 10-12. For, Bootstrap, MM, Sobs and UGE somewhat model levelling is demonstrated by the end of the survey indicating that of the species active at the time of the survey a majority of them were sampled prior to the end of the project. This is also comparable to the raw data of which the known species in the region (of native reptile, small mammal and frogs) approximately 51 could utilise the habitats present in the Survey Area (based on NatureMap records) where this study recorded 41.

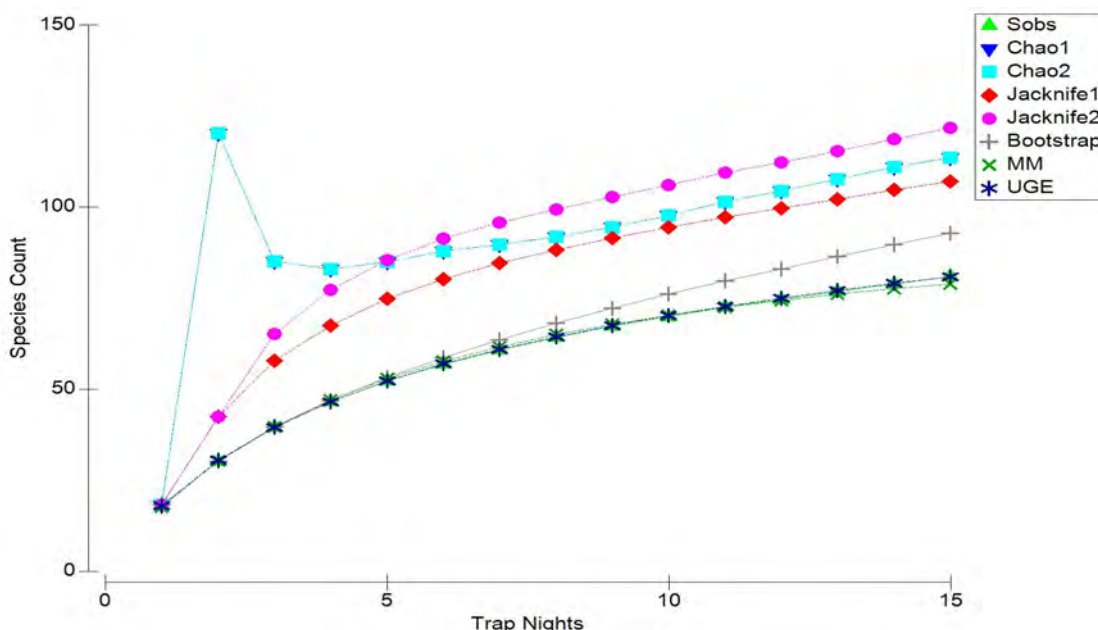


Plate 11: Species accumulation over time

4.3.2 Black cockatoo habitat assessment

The Black Cockatoo habitat assessment focussed on qualifying and quantifying the breeding habitat values for Black Cockatoo species occurring within the Survey Area. Due to the scale of the Survey Area, thirty one (31) three hectare habitat assessment plots were sampled to determine habitat usage and potential value for Baudin's, Carnaby's, and Forest Red-tailed Black Cockatoo as described in Section 2.3.7. Table 26 presents results on potential and actual usage of cockatoo breeding habitat within the Study Area. Table 27 provides a comparison of potential breeding habitat values for the fauna habitats across the Survey Area. Table 28 presents a quality assessment of the foraging habitat within the different habitat types.

4.3.2.1 Foraging habitat

In total 112 foraging sites were recorded consisting of 106 sites of Forest Red-tailed Black Cockatoo, nine sites of Carnaby's Cockatoo and one site from Baudin's Cockatoo. Throughout the six habitat types foraging quality is either low, medium or high depending on impacts of fire and dieback (Table 28). Melaleuca Damplands appears to be particularly impacted by recent fires in the region with few foraging species present at the time of the Survey. All six habitats are useable by either one or more Black Cockatoo species as a food source which is dominated by foraging species or has scattered foraging species present throughout the habitat type.

Table 28 presents a quality assessment of the foraging habitat within the different habitat types.

4.3.2.2 Breeding habitat

From this study and Alcoa's existing data from the Study Area it is known that two main areas appear to be where most of the current breeding activity has been recorded. These areas are within and around the Bullich habitat in the central northern western portion of the Study Area and central southern portion of the Study Area (see

Figure 4d). Several scattered other breeding trees are also known. The northern western portion appears to be more Forrest Red-tailed Black dominated breeding while the other region Baudin's Cockatoo. Breeding trees are mostly in Marri however Bullich and Blackbutt are also utilised in the Study Area.

Transect data undertaken within the Study Area identified that Flooded Gum Woodland and Jarrah/Marri Forest had the greatest number of trees per hectare with a DBH of >50cm at 12 and 9 respectively. Blackbutt Forest and Melaleuca Dampland had 7, while Granite Outcrop Association and Bullich Forest had 6 and 2 respectively (Table 27). The high density of trees in Melaleuca Damplands and Granite Outcrop Association is due to ecotone vegetation, that is Blackbutt fringing Melaleuca Dampland and Marri fringing granite outcrops. During the Survey at least four nests of Forest Red-tailed Black Cockatoo were lost to a prescribed burn in the northern western portion of the Study Area.

4.3.2.3 Roosting habitat

One roost site was recorded during the Survey Area in the vicinity of the Balmoral Anzac camp. The area had evidence of roosting, ie scat and leaf and twig clips and on nocturnal investigation identified at least 4 birds were roosting at the site. It is highly likely more roost locations are present in the Survey Area due to the large numbers of birds (854 consisting of 443 Carnaby's, 40 Baudin's and 371 Forrest Red-tailed Black Cockatoo) recorded in the Survey Area. It is likely that the location of roosting site is dependent on habitat quality in relation to fire history, timber harvesting, dieback or other anthropomorphic behaviour.

Table 26 Black Cockatoo habitat usage

| Habitat usage | Presence within the Survey Area | Evidence |
|--|--|--|
| Foraging habitat | Yes, Marri, Jarrah and Banksia | Chewed Marri and/or Jarrah nuts, feeding evidence at Casuarina and Banksia trees at 112 locations however the entire Survey Area excluding granite outcrops (actual granite not supportive vegetation) is assessed as foraging habitat. |
| Actual Breeding Events | No | Historical breeding events were recorded at 8 locations (see Figure 4d). Two sites recorded with evidence of Baudin's Cockatoo breeding and six sites recorded with evidence of Forest Red-tailed Black Cockatoos breeding. |
| Potential breeding hollows | Yes, this data is based on transect surveys only | 19 potential breeding trees > 500 mm DBH of either Jarrah, Marri, Flooded Gum, Blackbutt or Bullich in the Survey Area. Four large Jarrah with large hollows (>200 mm) suitable for breeding. Two of these had chews present however no actual breeding events were recorded. |
| Likely Breeding hollows | Yes, this data is based on transect surveys only | Ten trees in total were identified as being likely/suitable breeding hollows. Four large Marri trees, one large Jarrah tree with large hollows (>200 mm), two large blackbutt trees and three large Bullich trees with large hollows (>200mm). These trees identified had chews present at the entrance to the hollow however no actual breeding events were recorded. |
| Roosting habitat | Yes | One suspected roost location recorded in the Balmoral Anzac camp had evidence of roosting. |
| Potential breeding trees per hectare | Yes | Potential breeding trees identified derived from transect data (see Table 27 for further detail). Trees with hollows per habitat type per hectare: Jarrah-Marri forest: 3 Marri trees/ha, 6 Jarrah trees/ha Flooded Gum woodland: 12 Flooded Gum trees/ha Bullich forest: 2 Bullich trees/ha Blackbutt forest: 7 Blackbutt trees/ha: |
| <p>Legend: Potential breeding hollow: breeding hollow of an adequate size for use. Likely breeding hollow: breeding hollow previously known/recorded to have been used, active chew marks present or other evidence hollow has been used.</p> | | |

Table 27 Black Cockatoo potential breeding trees from transect data

| | Area (ha) of habitat within Survey Area | Area (ha) of habitat within cockatoo assessment transects | Number of trees >50cm DBH within transects | Mean density trees >50cm DBH (trees/ha) within transects | Number of trees identified with potential hollows within transects | Number of trees identified with likely hollows within transects | Range of density potential breeding trees (DBH>50cm)/ha |
|-----------------------------|---|---|--|--|--|---|---|
| Bullich Forest | 267 | 0.66 | 1 | 2 | 0 | 0 | 0 |
| Granite Outcrop Association | 373 | 2.7 | 17 | 6 | 0 | 0 | 0 |
| Blackbutt Forest | 687 | 7.8 | 53 | 7 | 0 | 1 | 0-1 |
| Flooded Gum Woodland | 688 | 8.7 | 105 | 12 | 5 | 4 | 0-6 |
| Melaleuca Dampland | 130 | 2.5 | 17 | 7 | 0 | 0 | 0 |
| Jarrah Marri Forest | 14,722 | 81.7 | 723 | 9 | 5 | 14 | 0-2 |
| Pine Plantation | 162 | 0 | 0 | <1 | 0 | 0 | 0 |
| Cleared areas | 259 | 0 | 0 | <1 | 0 | 0 | 0 |
| Rehabilitation areas | 402 | 0.04 | 0 | <1 | 0 | 0 | 0 |
| Total | 17690 | 104.1 | 916 | 9 | 10 | 19 | 0 |

Legend:

Potential breeding hollow: breeding hollow of an adequate size for use.

Likely breeding hollow: breeding hollow previously known/recorded to have been used, active chew marks present or other evidence hollow has been used.

Table 28 Black cockatoo foraging habitat assessment

| Habitat type | Vegetation type | Baudin's Cockatoo | | | Carnaby's Cockatoo | | | Forest Red-tailed Black Cockatoo | | |
|-----------------------------|--|--|--|-----------------------------|---|--|-----------------------------|--|--|-----------------------------|
| | | Foraging species present | Evidence of foraging | Quality of foraging habitat | Foraging species present | Evidence of foraging | Quality of foraging habitat | Foraging species present | Evidence of foraging | Quality of foraging habitat |
| Bullich Forest | W, WA | Limited However scattered Marri proteaceous trees and shrubs | None | medium | Limited However scattered Marri proteaceous trees and shrubs | None | medium | Limited | None | medium |
| Granite Outcrop Association | R, G, RG, G1, G2 | Limited However scattered Marri proteaceous trees and shrubs | None | low | High Associated proteaceous species | None | low | None | None | low |
| Blackbutt Forest | CW, AW, AW/AX, AX/CW, C | Limited | None | medium | Limited | Evidence of feeding in <i>Banksia littoralis</i> | medium | High Blackbutt | Numerous locations of the species feeding on Blackbutt seed | high |
| Flooded Gum Woodland | AC, AD, AX | Limited | None | medium | Limited | None | medium | None | None | medium |
| Melaleuca Dampland | A | Limited However scattered Marri proteaceous trees and shrubs | None | low | High Associated proteaceous species | None | low | None | None | none |
| Jarrah Marri Forest | D, DA, DG, E, J, M, P, PG, PJ, PT, PS, PW, S, SP, ST, T, SW, TP, TS, Q | High Dominant feeding habitat for this species, mainly Jarrah, Marri. | The species was recorded feeding in Marri nuts | high | High Jarrah, Marri, Banksia, and proteaceous species | The species was recorded feeding in Jarrah, Marri, Banksia, and records of foraging on <i>Hakea undulata</i> | high | High Dominant feeding habitat for this species, mainly Jarrah, Marri and Casuarina. Flowers of Banksia, | The species was recorded feeding in Marri, Jarrah, Casuarina nuts. A small flock was also observed feeding on nectar of Banksia grandis. | high |
| Mine rehabilitation | Rehab | Jarrah, Marri, exotic eucalyptus | none | high | Jarrah, Marri, exotic eucalyptus | none | high | Jarrah, Marri, exotic eucalyptus | none | high |
| Pine plantation | PL | Growing tips of mature pine trees (Pinus) | none | medium | Cones of mature pine trees (Pinus) | Chewed cones and cockatoos observed feeding | medium | none | none | none |

Legend: Evidence of foraging- none (no feeding habitat present), limited (some species present but not dominant), high (habitat is dominated with feeding species).

4.3.3 Carter's Freshwater Mussel

Eleven locations (with between 9 and 11 transects per location) were searched for Carter's Freshwater Mussel within the Survey Area with no signs of mussels (alive or dead) recorded (see Appendix D for results). Of the surveyed transects, most were dry or reduced to small standing water puddles at the time of survey (November 2020) indicating that the waterways are dry for over four months of the year. The duration of dry streams is noted to be well outside of the five day exposure experiments undertaken in controlled conditions (Klunzinger 2012). However, under protected muddy conditions in a creek bed they are likely to survive longer.

Some transects also contained rocky substrate which may be sub-optimal for Carter's Freshwater Mussel as it requires sandy and clay substrate in which to bury. Three locations (of the 11) had water features suitable enough to maintain Carter's Freshwater Mussel; however none of the transects identified any live mussels or shell remains the species on banks. In these areas the species may be present albeit in very low numbers or below detectable numbers. When adequate stream water is present, the species may occasionally or sporadically be present following dispersal of young mussels up stream within host fish, however the dispersing mussels are unlikely to survive long term due to the dry nature of this portion of the forest. This is demonstrated by the lack of adult shells (dead animals) normally present when undertaking Carter Freshwater Mussel surveys, when they are present.

5. Conclusions

The Survey Area consists of eight broad fauna habitat types: Bullich forest, Granite outcrop, Blackbutt forest, Flooded Gum woodland, Jarrah -Marri forest, Melaleuca dampland. Mine rehabilitation and Pine plantation. Jarrah-Marri forest predominated at 83% of the Survey Area. A small portion of the Survey Area comprises rural cleared land.

The conservation value of each fauna habitat type is specific to the locally occurring conservation significant fauna species and the type of usage by those species. All three Black Cockatoos were recorded primarily throughout the Marri-Jarrah forest, however all habitat types will be utilised for foraging by either one or all of the species.

Melaleuca Damplands and riparian areas comprising Bullich Forest, Blackbutt Forest and Marri-Jarrah Forest support a Quokka population with records scattered throughout the Survey Area. Chuditch are wide ranging and expected to use all habitat types at a relatively low density.

In total 13 conservation significant species were recorded in the Survey Area including the Quokka, Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Forrest Red-tailed Black Cockatoo, Baudin's Cockatoo, Carnaby's Cockatoo, Western False Pipistrelle, Southern Death Adder, Quenda, Rakali, Masked Owl and Peregrine Falcon. All species identified are likely to have significant populations and habitat present within the Survey Area.

The survey area was assessed in terms of habitat suitability for migratory shorebirds. No shorebirds were recorded during the survey. The survey area lacks open water bodies that feature shallow shorelines for foraging habitat. The creek lines and vegetated seasonal dampland areas within the survey area are not considered suitable foraging habitat due to the dense forest vegetation associated with these riparian areas, and the lack of extensive shallow shoreline. Therefore, they are unlikely to occur within the survey area, and any occurrence would be as rare vagrant.

Carter's Freshwater Mussel was targeted during the survey but no presence was recorded. This is expected given that the streams are seasonal and dry up for several months of the year. The species is known to reside in the Serpentine Dam on the southern edge of the Survey Area and while mussels may disperse upstream from the Dam during winter/spring flows, all streams are seasonal, and any dispersing mussels are unlikely to survive the extended dry summer period. Therefore, significant populations are unlikely in the Survey Area.

The DBCA NatureMap search identifies that 185 vertebrate fauna taxa previously recorded within 20 km radius of the Survey Area. This total included 28 mammals, 113 birds, 32 reptiles and 12 amphibians.

The detailed and targeted program recorded 132 vertebrate fauna species utilising the Survey Area, including 28 mammals, 76 birds, 26 reptiles and seven amphibians. Of these, eight introduced species (mammals and birds) were identified.

Fire was observed to cause substantial impact to fauna habitats of the Survey Areas. Large areas of the Survey Area had been burnt within the last 2 to 3 years impacting fauna habitat. During the survey the north west portion of the Survey Area was prescribed burned in October 2020.

6. References

- ALCOA World Alumina Australia 2010, 'No 40. Threatened fauna species management plans for Alcoa's bauxite mining operations in the Jarrah forest'.
- Beard, JS 1976, *Vegetation Survey of Western Australia. Muchison 1: 1 000 000 Vegetation Series. Map Sheet 6 and Explanatory Notes to Sheet 6*. Published by UWA Press, Perth.
- Bell, PJ & Mooney, N 2002, *Distribution, Habitat and Abundance of Masked Owls (Tyto novaehollandiae) in Tasmania, In; Ecology and Conservation of Owls*, Eds. Newton I, Kavanagh R, Olsen J, and Taylor I. CSIRO Publishing, Australia.
- Braithwaite, RW 1995, *Southern Brown Bandicoot*. In R. Strahan (Ed.) *The Mammals of Australia*. Australian Museum and Reed Books. Chatswood, NSW.
- Burbidge, AA 2004, '*Threatened Animals of Western Australia*'. Department of Conservation and Land Management, Perth.
- Bureau of Meteorology 2020, *Climate statistics for Australian locations*, retrieved June 2020, from <http://www.bom.gov.au/climate>
- Burgar, JM, Craig, MD & Stokes, VL 2015, '*The importance of mature forest as bat roosting habitat within a production landscape*', *Forest Ecology and Management*, vol 356, pp 112-123.
- Burgar, JM, Stokes, VL & Craig, MD 2017, '*Habitat features act as unidirectional and dynamic filters to bat use of production landscapes*', *Biological conversations*, vol 209, pp 280-288.
- Burn 2000, *A Survey of the impact of burning on mammals and birds in Alcoa's rehabilitated Bauxite mines at Jarrahdale*.
- Christidis, L & Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, Melbourne, Australia, CSIRO Publishing.
- Churchill, S 2008, *Australian Bats*, second edition, Milton, Australia, Allen & Unwin.
- Clarke, KR & Gorley, RN 2006, *PRIMER v6: User Manual/Tutorial (Plymouth Routines in Multivariate Ecological Research)*, PRIMER-E, Plymouth.
- Cogger, H 2014, *Reptiles and Amphibians of Australia*, Collingwood, Victoria, CSIRO Publishing.
- Craig, MD, White, DA, Stokes, VL & Prince, J 2017, '*Can postmining revegetation create habitat for a threatened mammal?*' *Ecological Management & Restoration*, vol 18 no. 2. Ecological Society of Australia and John Wiley & Sons Australia. Ltd.
- de Tores, P, Hayward, MW, Dillon, MJ & Brazell, RI 2007, '*Review of the distribution, causes for decline and recommendations for management of the quokka, Setonix bracyurus (Macropodidae: Marsupialia), an endemic macropodid marsupial from south-west Western Australia*', *Conservation Science Western Australia*, vol 6(1), pp 13-73.
- Department of Agriculture Water and Energy (DAWE) 2020, *Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results*, retrieved May 2020, from <http://www.environment.gov.au/epbc/pmst/index.html>.
- Department of Agriculture, Water and the Environment (DAWE) 2021a, '*Atrichornis clamosus in Species Profile and Threats Database*', Department of the Environment, Canberra.
- Department of Agriculture, Water and the Environment (DAWE) 2021b, '*Calidris acuminata in Species Profile and Threats Database*', Department of the Environment, Canberra.
- Department of Agriculture, Water and the Environment (DAWE) 2021c, '*Calyptorhynchus banksii naso in Species Profile and Threats Database*', Department of the Environment, Canberra.

Department of Agriculture, Water and the Environment (DAWE) 2021d, '*Calyptorhynchus baudinii* in Species Profile and Threats Database', Department of the Environment, Canberra.

Department of Agriculture, Water and the Environment (DAWE) 2021e, '*Species Profile and Threats Database*', Department of the Environment, Canberra.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007, '*NatureMap: Mapping Western Australia's Biodiversity*', retrieved May 2020, from <http://naturemap.dpaw.wa.gov.au/default.aspx/>.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, '*Fauna profiles – Chuditch Dasyurus geoffroii*', retrieved from <http://www.dbca.wa.gov.au>

Department of Biodiversity, Conservation and Attractions (DBCA) 2017b, '*Fauna profiles – Brush-tailed Phascogale*', retrieved <http://www.dbca.wa.gov.au>

Department of Environment and Conservation (DEC) 2011, '*Standard Operating Procedure Remote operation of cameras SOP No: 5.2*', Prepared for: Department of Environment and Conservation's Animal Ethics Committee and Species and Communities Branch.

Department of Environment and Conservation (DEC) 2012, '*Fauna Profiles. Water Rat (Rakali) Hydromys chrysogaster (Geoffrey, 1804)*', Department of Environment and Conservation, Perth, WA.

Department of Environment and Conservation (DEC) 2013, '*Quokka Setonix brachyurus Recovery Plan*', Wildlife Management Program No. 56, Department of Environment and Conservation, Perth, WA.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011a, '*Survey guidelines for Australia's threatened reptiles*', Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011b, '*Survey guidelines for Australia's threatened mammals*', Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, '*Referral guidelines for three species of Western Australian black cockatoos*', retrieved from: <http://www.environment.gov.au/epbc/publications/wa-black-cockatoos.html>.

Doherty, TS, Wingfield, BN, Stokes, VL, Craig, MD, Lee, JGH, Finn, HC & Calver, MC 2016, '*Successional changes in feeding activity by threatened cockatoos in revegetated mine sites*', Wildlife Research, vol 43, pp 93-104. CSIRO Publishing.

Environmental Management and Research Consultants (EMRC) 1992, '*Long Term Fauna Monitoring Program 1992*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 1995, '*Long term fauna monitoring program 1995*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 1999, '*A fauna survey of planned mining areas at Alcoa's Orion Mining Region*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2000, '*A Vertebrate Survey of Rehabilitated Areas at Alcoa's Huntly Mine site – year 2000 results*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2001a, '*Alcoa World Alumina Australia Ltd. Long Term Fauna Monitoring Program - 2001 results*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2001b, '*A Vertebrate Fauna Survey of rehabilitated areas at Alcoa's Willowdale Mine site – Year 2000 results*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2003, '*McCoy Long Term Fauna Monitoring Program 2003*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2006, '*Long term fauna monitoring program 2006*', report prepared for Alcoa of Australia.

- Environmental Management and Research Consultants (EMRC) 2007a, '*McCoy Long Term Fauna Monitoring Program –results of the 2007 survey*', report prepared for Alcoa of Australia.
- Environmental Management and Research Consultants (EMRC) 2007b, '*A Vertebrate Fauna Survey of Rehabilitated Area's at Alcoa's Huntly Minesite -year 2007 results Final Report*', report prepared for Alcoa of Australia.
- Environmental Management and Research Consultants (EMRC) 2007c, '*A Vertebrate Survey of Rehabilitated areas at Alcoa's Willowdale Minesite – Year 2007 results*', report prepared for Alcoa of Australia.
- Environmental Management and Research Consultants (EMRC) 2015, '*Long Term Fauna Monitoring Program Summary of Results at Alcoa's Orion Mining Region*', report prepared for Alcoa of Australia.
- Environmental Protection Authority (EPA) 2016a, '*EPA Technical Guidance –Terrestrial Fauna Surveys*', Perth.
- Environmental Protection Authority (EPA) 2016b, '*EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna*', Perth.
- Environmental Protection Authority (EPA) 2020, '*EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna*', Perth.
- Garnett, ST & Crowley, GM 2000, *The Action Plan for Australian Birds*, Environment Australia, Canberra.
- Groom, C 2011, *Artificial hollows for Carnaby's Black Cockatoo*, Department of Environment and Conservation, Kensington, Western Australia.
- Higgins, PJ (ed.) 1999, *Handbook of Australian, New Zealand & Antarctic Birds, Volume 4: Parrots to Dollarbird*, South Melbourne, Australia, Oxford University Press.
- Johnstone, RE & Kirkby, T 1999, '*Food of the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii* naso in south-west Western Australia*', *Western Australian Naturalist*, vol 22, pp 167-177.
- Johnstone, RE & Kirkby, T 2008, '*Distribution, status, social organisation, movements and conservation of Baudin's Cockatoo (*Calyptorhynchus baudinii*) in South-west Western Australia*', *Records of the Western Australian Museum*, vol 25, pp 107-118.
- Johnstone, RE & Storr, GM 1998, *Handbook of Western Australian Birds. Volume 1: Nonpasserines (Emu to Dollarbird)*, Western Australian Museum, Perth.
- Johnstone, RE 1997, '*Current studies on three endemic Western Australian cockatoos*', *Eclectus*, vol 3, pp 34--35.
- Johnstone, RE, Kirkby, T & Sarti, K 2017, '*The distribution, status movements and diet of the Forest Red-tailed Black Cockatoo in the south-west with emphasis on the greater Perth regions*', *Western Australian Naturalist*, vol 30 (4), pp 1-193.
- Jones, D & Goth, A (2008). *Mound-builders*. CSIRO Publishing. Victoria.
- Kavanagh, RP & Murray, M 1996, '*Home Range, Habitat and Behaviour of the Masked Owl *Tyto novaehollandiae* Near Newcastle, New South Wales*', *Emu Austral Ornithology, Journal of Birdlife Australia*, vol 96, pp 250-257, CSIRO publishing.
- Keighery, B, Keighery, G, Dell, J, & Santich, S 2002, '*A preliminary assessment of the natural values of the South Bunbury to Capel Coastal Corridor*', Department of Environmental Protection, Perth.
- Kitchener, DJ 1995, '*Quokka*', In R. Strahan (Ed.) *The Mammals of Australia*, Australian
- Kitchener, DJ, Caputi, N, Jones, B 1986, '*Revision of Australo-Papuan *Pipistrellus* and *Falsistrellus* (*Microchiroptera: Vespertilionidae*)*', *Records of the Western Australian Museum*, vol 12, pp 435–495, ISSN 0312-3162.
- Klunzinger MW 2012, '*Ecology, life history and conservation status of *Westralunio carteri* Iredale 1934, an endemic freshwater mussel of south-western Australia*', PHD Thesis, Murdoch University, Perth Western Australia.
- Klunzinger, MK, Beatty, SJ, Morgan, DL, & Lymbery, AJ 2012, '*Distribution of *Westralunio carteri* Iredale, 1934 (*Bivalvia: Unionoidea: Hyriidae*) on the south coast of south-western Australia, including new records of the species*', *Journal of the Royal Society of Western Australia*, vol 95, pp 77-81.

- Liddelow, G, Wheeler, I & Kavanagh, R 2002, *Owls in the Southwest forests of Western Australia*, Ecology and Conservation of Owls, pp 233-241, Chapter 21, CSIRO Publishing.
- Marchant, S & Higgins, PJ, (eds.) 1990, *Handbook of Australian, New Zealand and Antarctic Birds. Volume One - Ratites to Ducks*, Melbourne, Victoria: Oxford University Press.
- Marchant, S & Higgins, PJ, (eds.) 1993, *Handbook of Australian, New Zealand and Antarctic Birds, Volume 2 - Raptors to Lapwings*, Melbourne, Victoria: Oxford University Press.
- Mastrantonis, S, Craig, MD, Renton, M, Kirkby, T & Hobbs, RJ 2019, 'Climate change indirectly reduces breeding frequency of a mobile species through changes in food availability', *Ecosphere*, vol 10 (4), e02656. 10.1002/ecs2.2656.
- Mattiske Consulting 2021, 'Myara North Flora and Vegetation Survey Report', in prep.
- Mattiske, EM & Havel JJ 1998, Vegetation Mapping in the South West of Western Australia and Regional Forest Agreement vegetation complexes. Map sheets for Pemberton, Collie, Pinjarra, Busselton- Margaret River, Mt Barker, and Perth, Western Australia. Scale 1:250,000. Department of Conservation and Land Management, Perth.
- Mawson, PR & Johnstone, RE 1997, 'Conservation status of parrots and cockatoos in Western Australia', *Eclectus*, vol 2, pp 4-9.
- McGregor, RA, Stokes, VL & Craig, MD 2014, 'Does forest restoration in fragmented landscapes provide habitat for a wide-ranging carnivore?', *Animal Conservation*, vol 17, pp 467–475.
- Menkhorst, P & Knight, F 2010, *A Field Guide to Mammals of Australia*, third edition, South Melbourne, Australia, Oxford University Press.
- Morcombe, M 2004, *Field Guide to Australian Birds*, Steve Parish Publishing, Archerfield, Queensland.
- Nevill, SJ 2013, *Birds of Western Australia*, Simon Nevill Publications, Perth, Western Australia.
- Orell, P 2004, 'Fauna monitoring and staff training: Western Shield review—February 2003', *Conservation Science Western Australia*, vol 5 (2), pp. 51–95.
- Peake, PC, Debus, L, McIntyre, S & Bramwell, M 1993, 'The Masked Owl *Tyto novaehollandiae* in Victoria', *Australian Bird Watcher*, vol 15, pp 124-136.
- Phoenix Consulting 2021, 'Myara North Invertebrate Survey Report', in prep.
- Pizzey, G & Knight, F 2012, *The Field Guide to the Birds of Australia*, Harper Collins Publishers, Sydney, Australia.
- Saunders, DA 1974, 'Subspeciation in the White-tailed Black Cockatoo, *Calyptorhynchus baudinii*, in Western Australia', *Australian Wildlife Research*, vol 1, pp 55-69.
- Saunders, DA 1979, 'Distribution and Taxonomy of the White-tailed and Yellow-tailed Black-Cockatoos *Calyptorhynchus spp*', *Emu*, vol 79, pp 215--227.
- Saunders, DA 1982, 'The breeding behaviour of the short-billed form of the White-tailed Black Cockatoo *Calyptorhynchus funereus*', *Ibis*, vol 124, pp 422--455.
- Saunders, DA and Ingram, JA 1987, 'Factors affecting survival of breeding populations of Carnaby's Cockatoo, *Calyptorhynchus latirostris* in remnants of native vegetation', IN: Saunders, DA, Arnold, GW, Burbidge, AA and Hopkins, AJM, *Nature Conservation: the Role of Remnants of Native Vegetation*, Surrey Beatty and Sons, Chipping Norton, pp 249-58.
- Scida, M and Gratton, R 2017, 'Monitoring the threatened brush-tailed phascogale (*Phascogale tapoatafa tapoatafa*) at Sugarloaf Reservoir, Victoria', *Australian Mammalogy*, vol 40(2), pp 307-311.
- Stokes, V 2011, 'Orion Long Term Fauna Monitoring Program 2010', Internal report for Alcoa of Australia.
- Stokes, V 2012, 'Vertebrate Fauna Survey of Planned Mining Areas at Alcoa's Keats Mining Region 2011/12', Internal report for Alcoa of Australia.

- Storr, GM 1991, *Birds of the South-west Division of Western Australia*. Records of the Western Australian Museum, Suppl. 35.
- Storr, GM, Smith, LA & Johnstone, RE 1999, *Lizards of Western Australia, Volume 1: Skinks*, revised edition, Perth, Western Australian Museum.
- Storr, GM, Smith, LA & Johnstone, RE 2002, *Snakes of Western Australia*, Western Australian Museum, Perth, W.A.
- Threatened Species Scientific Committee (TSSC) 2016, '*Commonwealth Listing Advice on Cacatua pastinator pastinator (Muir's corella)*', Department of the Environment, Canberra.
- Tyler, MJ & Doughty, P 2009, *Field Guide to Frogs of Western Australia*, Fourth Edition, Western Australian Museum.
- Ugland, KI, Gray JS, & Ellingsen, KE 2003, '*The species–accumulation curve and estimation of species richness*', *Journal of Animal Ecology*. vol 72(5), pp 888-97.
- Van Dyck, S & Strahan, R 2008, *The Mammals of Australia*, third edition, Sydney, Australia, New Holland Publishers.
- Way, S, Stokes, V & Majer, J 2013, '*McCoy Long Term Fauna Monitoring Program Report of the 2013 Field Survey*', report prepared for Alcoa of Australia by Environmental Research Department.
- Webb, A, Kinloch, J, Keighery, G. & Pitt, G 2016, *The extension of vegetation complex mapping to landform boundaries within the Swan Coastal Plain landform and forested region of south west Western Australia*, Department of Parks and Wildlife, Bunbury, Western Australia.
- Wetland Research & Management (WRM) 2021, '*Aquatic Fauna Desktop Assessment Myara North and Holyoake Regions*', Prepared for GHD Pty Ltd.
- Williams, K & Mitchell, D 2001, Jarrah Forest (JF1 – Northern Jarrah Forest subregion), A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002.
- Wilson, S & Swan, G 2017, *A Complete Guide to Reptiles of Australia*, Fifth edition, Sydney, Australia, New Holland Press.

Appendices

Appendix A

Map figures

Figure 1 Location of Survey Area

Figure 2 Environmental constraints

Figure 3 Fauna survey methods

Figure 4a Threatened fauna

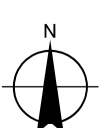
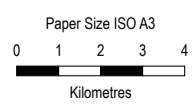
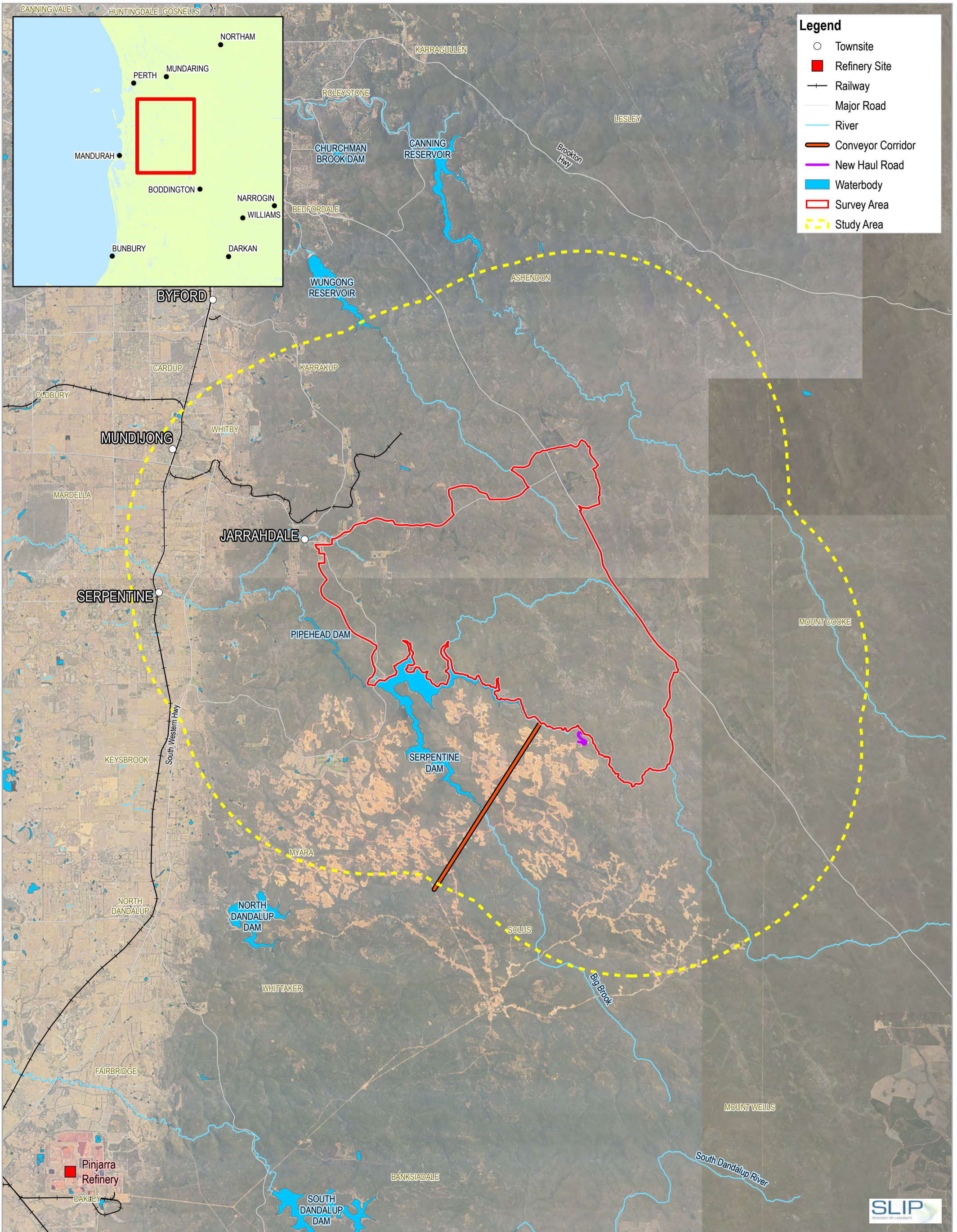
Figure 4b Forest Red tail black cockatoo recordings

Figure 4c Priority and other conservation dependent fauna

Figure 4d Black cockatoo results (*Calyptorhynchus spp.*)

Figure 5a Fauna habitats (Development Envelope)

Figure 5b Fauna habitats (Conveyor and Haul Road Corridor)

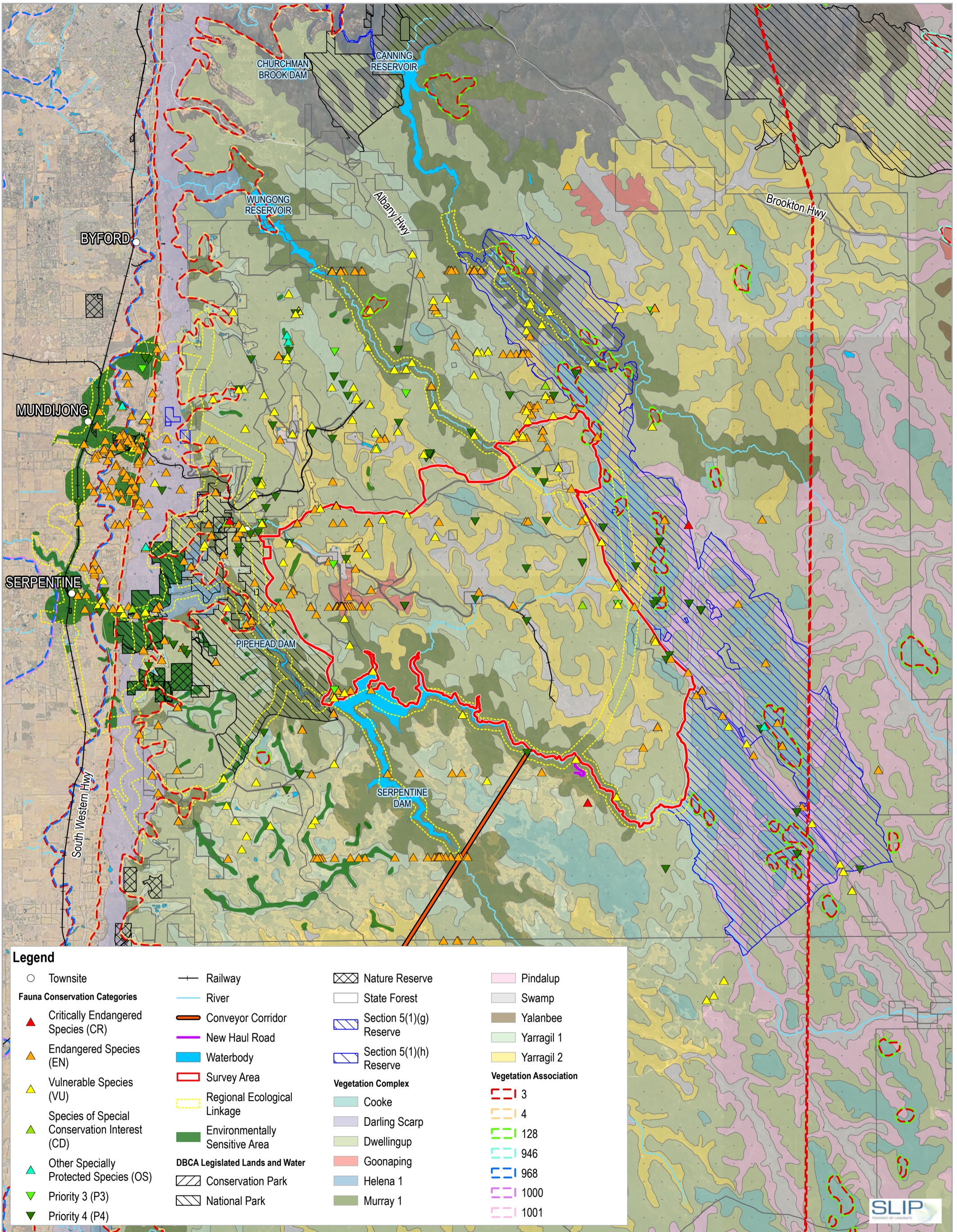


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Location of Survey Area

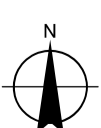
FIGURE 1



Legend

| | | | |
|---|-----------------------------------|----------------------------------|-------------------------------|
| ○ Townsite | — Railway | ▣ Nature Reserve | ▨ Pindalup |
| Fauna Conservation Categories | — River | ▢ State Forest | ▨ Swamp |
| ▲ Critically Endangered Species (CR) | — Conveyor Corridor | ▨ Section 5(1)(g) Reserve | ▨ Yalanbee |
| ▲ Endangered Species (EN) | — New Haul Road | ▨ Section 5(1)(h) Reserve | ▨ Yarragil 1 |
| ▲ Vulnerable Species (VU) | — Waterbody | ▨ Survey Area | ▨ Yarragil 2 |
| ▲ Species of Special Conservation Interest (CD) | — Regionally Ecological Linkage | ▨ Environmentally Sensitive Area | Vegetation Association |
| ▲ Other Specially Protected Species (OS) | — DBCA Legislated Lands and Water | ▨ Conservation Park | ▨ 3 |
| ▲ Priority 3 (P3) | ▨ National Park | ▨ Cooke | ▨ 4 |
| ▲ Priority 4 (P4) | | ▨ Darling Scarp | ▨ 128 |
| | | ▨ Dwellingup | ▨ 946 |
| | | ▨ Goonaping | ▨ 968 |
| | | ▨ Helena 1 | ▨ 1000 |
| | | ▨ Murray 1 | ▨ 1001 |

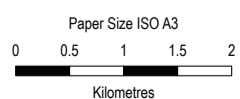
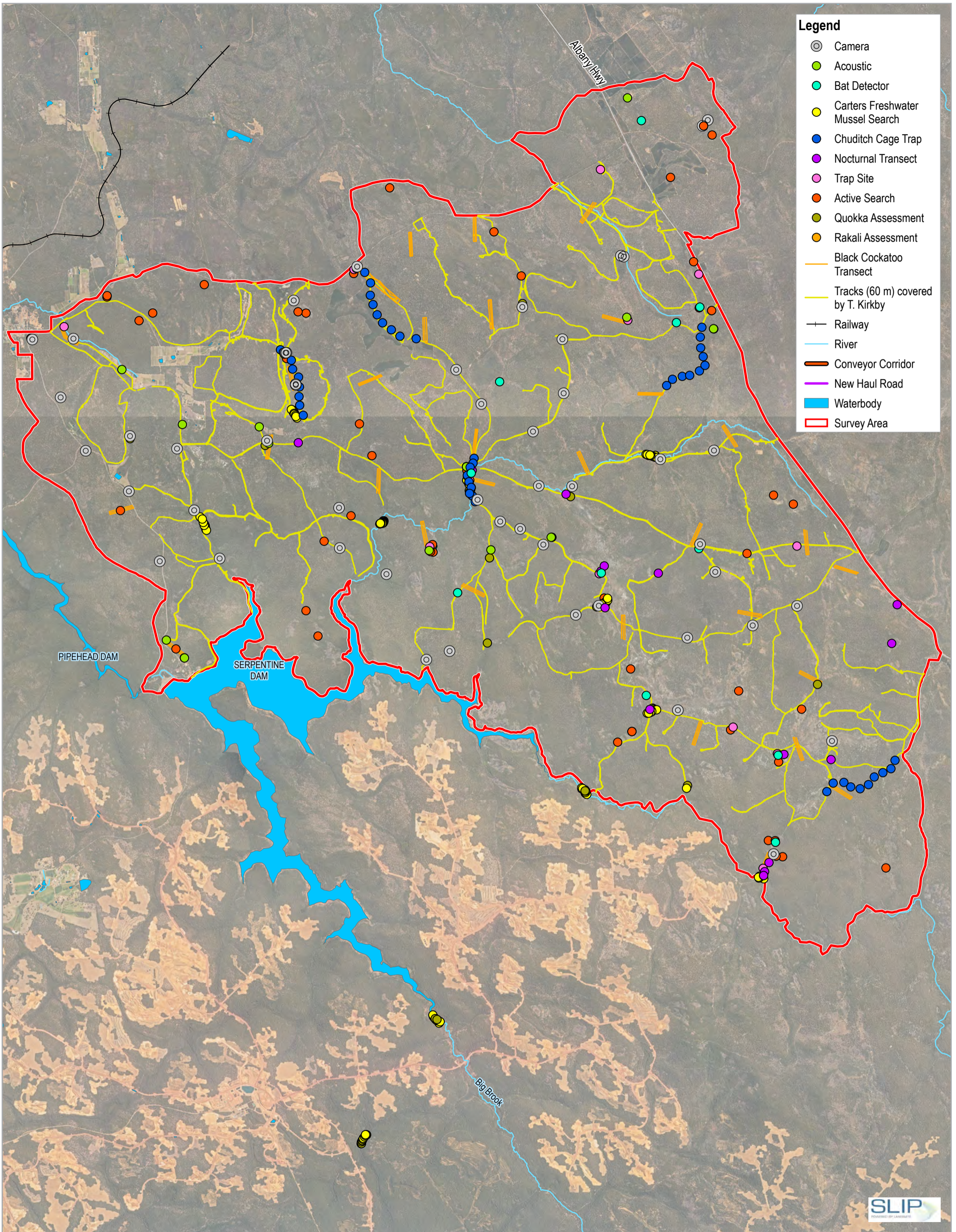
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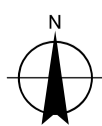
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Environmental Constraints

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FIGURE 2



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

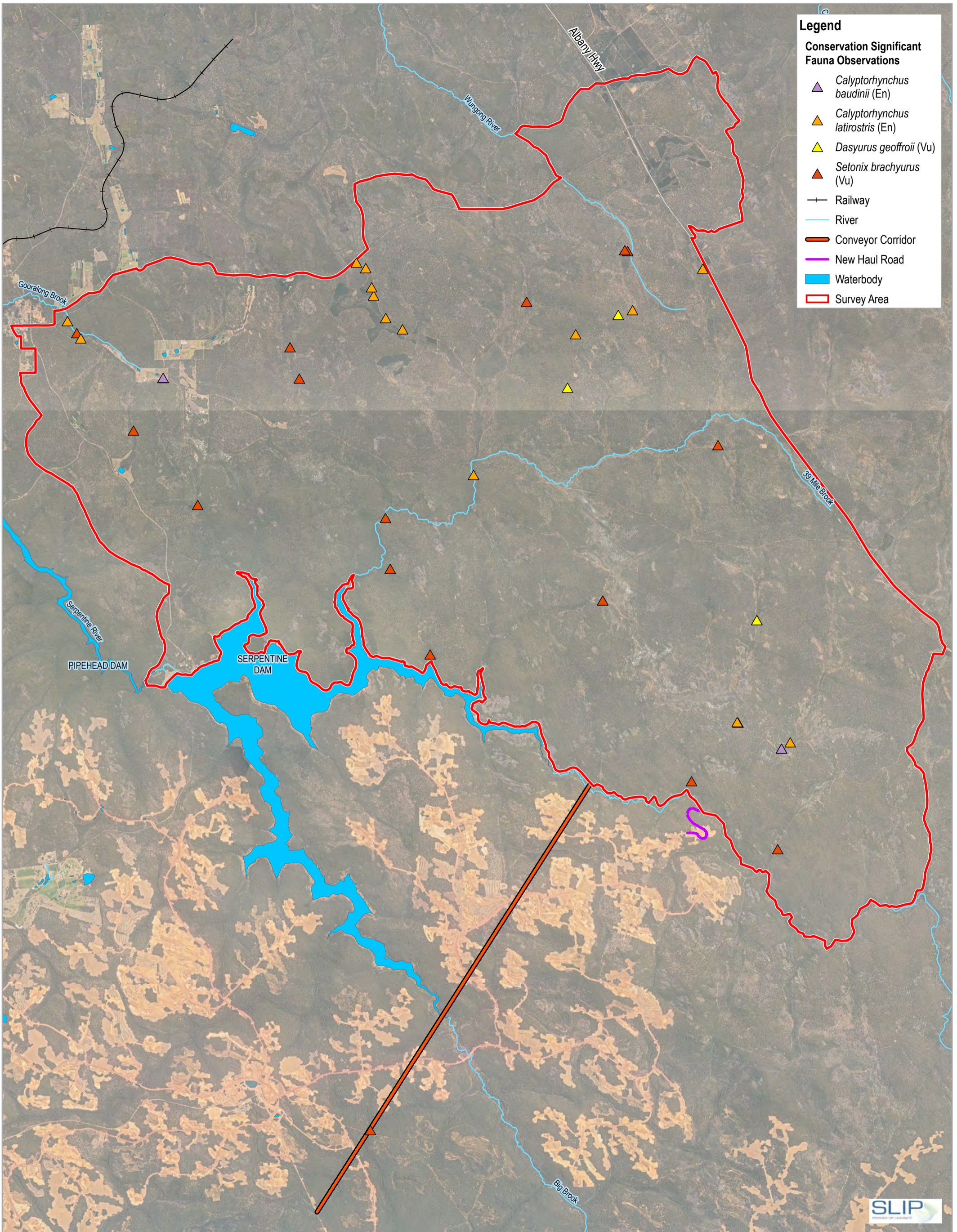


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Fauna Survey Methods

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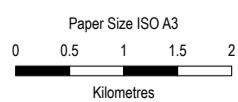
FIGURE 3



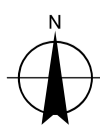
Legend

Conservation Significant Fauna Observations

- Calyptorhynchus baudinii* (En)
- Calyptorhynchus latirostris* (En)
- Dasyurus geoffroi* (Vu)
- Setonix brachyurus* (Vu)
- Railway
- River
- Conveyor Corridor
- New Haul Road
- Waterbody
- Survey Area



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50

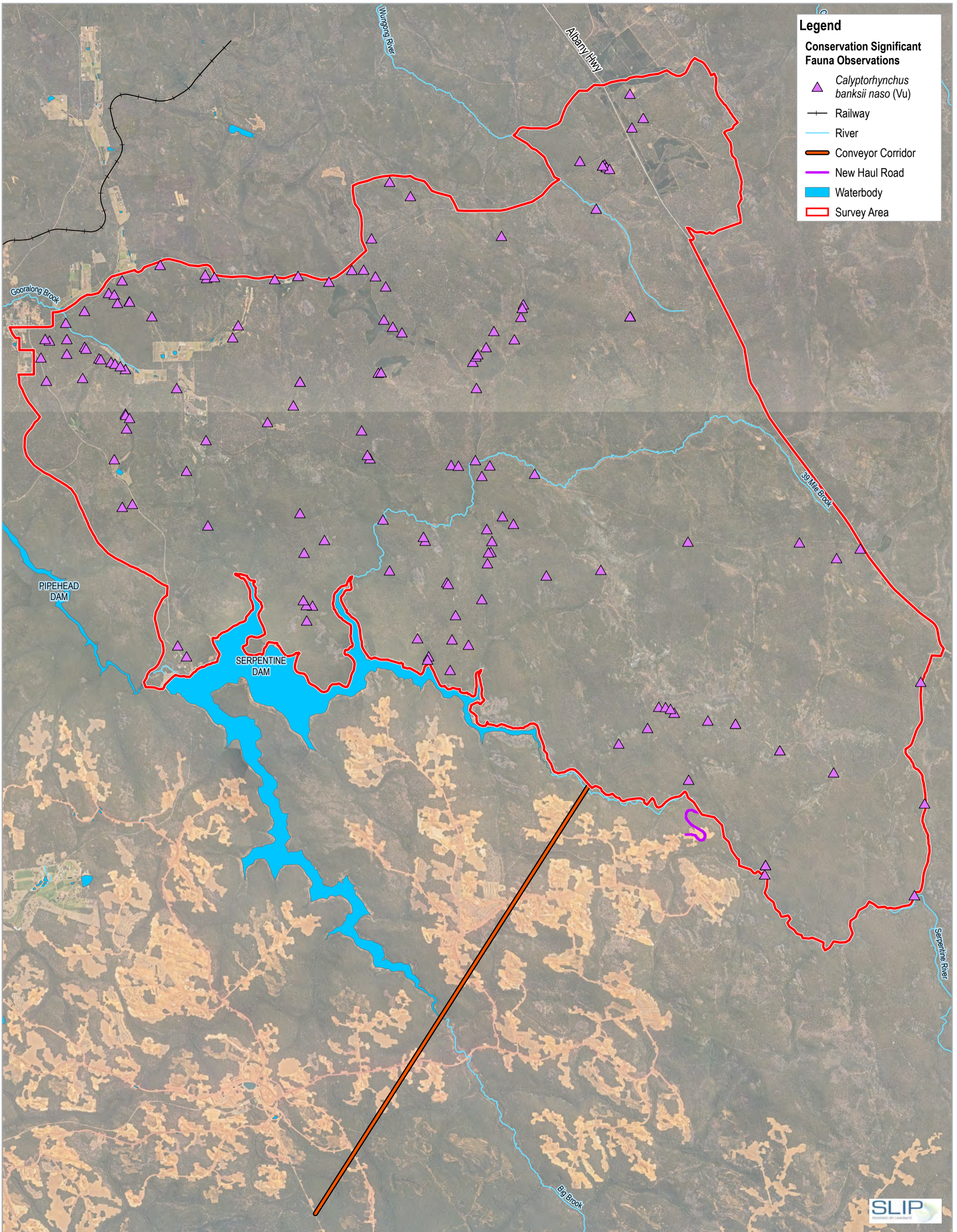


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Threatened Fauna species

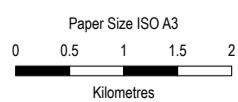
FIGURE 4A



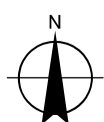
Legend

Conservation Significant Fauna Observations

- ▲ *Calyptorhynchus banksii naso* (Vu)
- +— Railway
- River
- Conveyor Corridor
- New Haul Road
- Waterbody
- Survey Area



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50

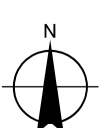
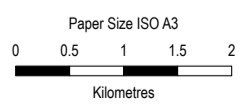
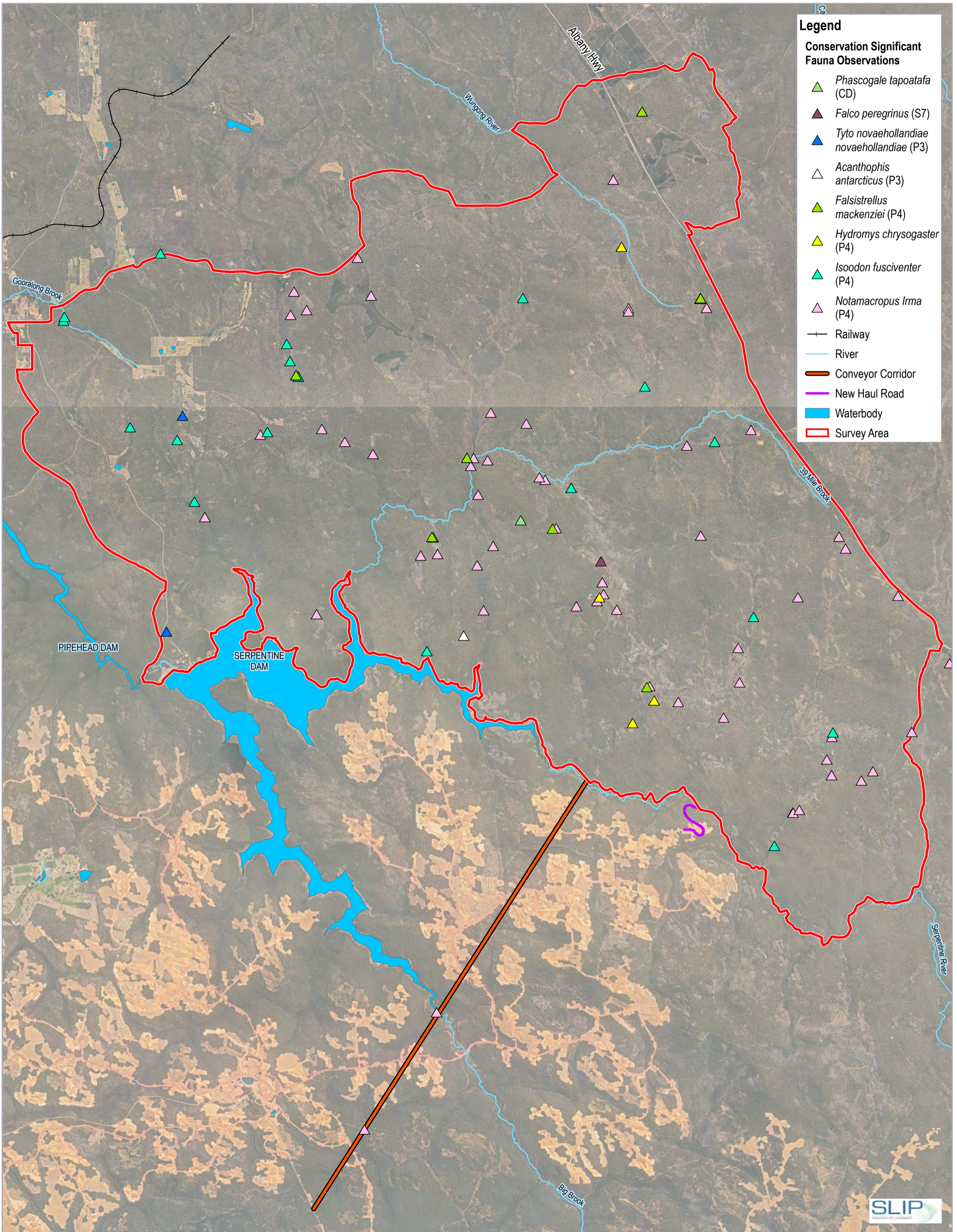


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**Forest Red-tailed Black
 Cockatoo recordings**

FIGURE 4B

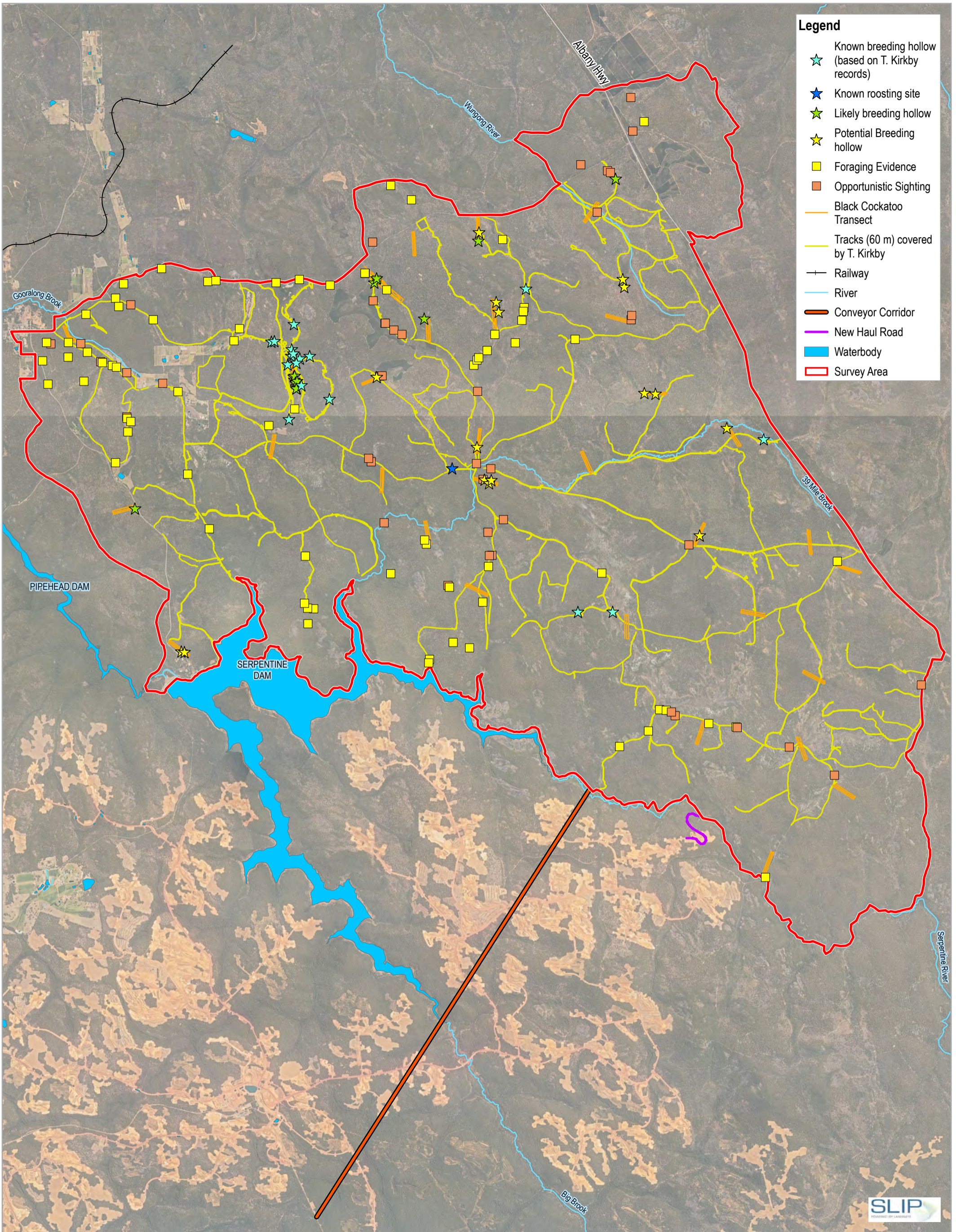


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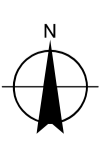
Priority and Other
Conservation Dependent Fauna

FIGURE 4C



- Legend**
- ★ Known breeding hollow (based on T. Kirkby records)
 - ★ Known roosting site
 - ★ Likely breeding hollow
 - ★ Potential Breeding hollow
 - Foraging Evidence
 - Opportunistic Sighting
 - Black Cockatoo Transect
 - Tracks (60 m) covered by T. Kirkby
 - Railway
 - River
 - Conveyor Corridor
 - New Haul Road
 - Waterbody
 - Survey Area

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 Kilometres
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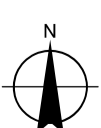
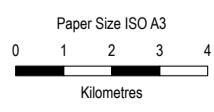
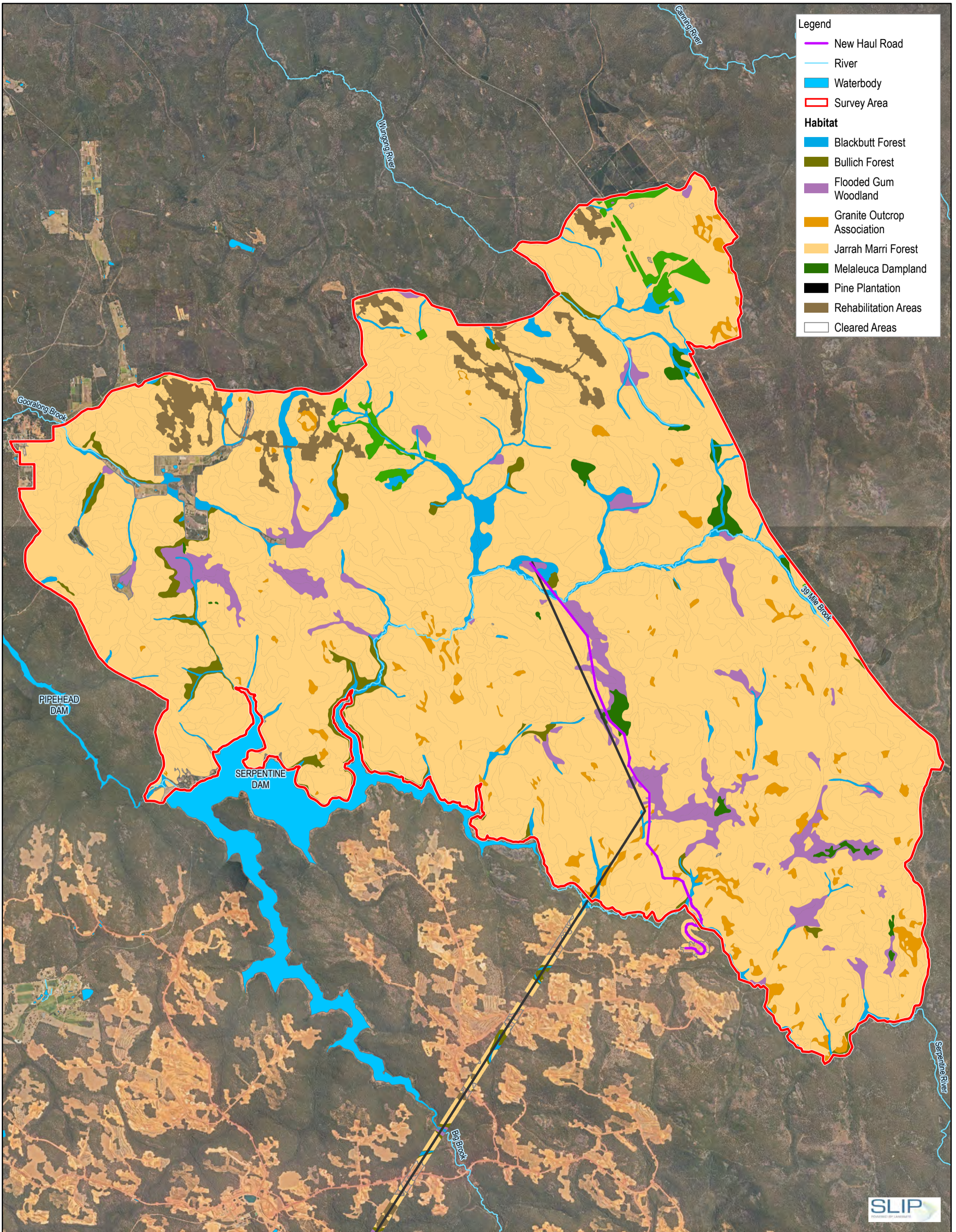


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**Black Cockatoo Results
 (Calyptorhynchus species)**

FIGURE 4D

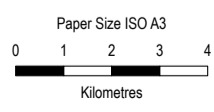
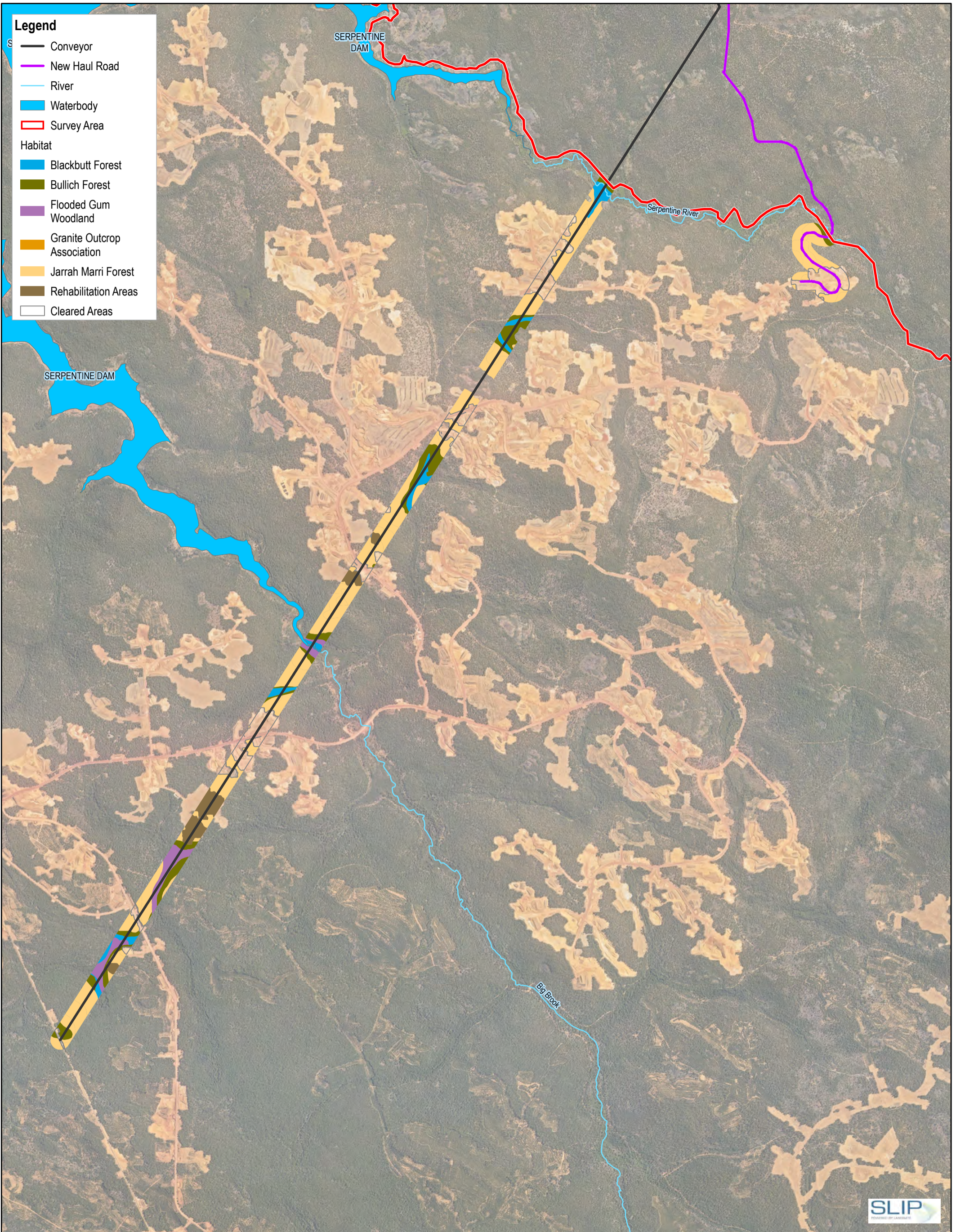


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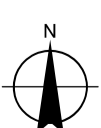
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**Fauna Habitats
(Development Envelope)**

FIGURE 5A



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



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**Fauna Habitats
(Conveyor and Haul Road Corridor)**

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FIGURE 5B

Appendix B

**Relevant legislation, background
information and conservation codes**

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Federal Minister for the Environment.

The EPBC Act is administered by the Department of the Environment and Energy (DEE).

State *Environment Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

- a. Native vegetation should not be cleared if it comprises a high level of biodiversity.
- b. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.
- c. Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.
- d. Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.
- e. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
- f. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
- g. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
- h. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
- i. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

- j. Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State Biodiversity and Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation and protection of biodiversity and biodiversity components, as well as the promotion of the ecologically sustainable use of biodiversity components in Western Australia. The BC Act replaces both the repealed *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act), as well as their associated regulations. To attain the objectives of the BC Act, principles of ecological sustainable development have been established:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- The conservation of biodiversity and ecological integrity should be a fundamental consideration in decision-making
- Improved valuation, pricing and incentive mechanisms should be promoted.

The BC Act is administered by the Department of Biodiversity Conservation and Attractions (DBCA).

State Biosecurity and Agriculture Management Act 2007

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976*. The main purposes of the BAM Act and its regulations are to:

Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
Manage the impact and spread of those pests already present in the state

Safely manage the use of agricultural and veterinary chemicals

Increased control over the sale of agricultural products that contain violative chemical residues.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

| Control class code | Description |
|---------------------------|--|
| C1 (Exclusion) | Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State. |
| C2 (Eradication) | Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility. |
| C3 (Management) | Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which is currently is free of that pest. |

Fauna Conservation codes

Conservation significant fauna

The Federal conservation level of fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act align with the International Union for Conservation of Nature (IUCN) Red List criteria, which are internationally recognised as providing best practice for assigning the conservation status of species. The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

The State conservation level of fauna species and their significance status also follows the IUCN Red List criteria. Under the BC Act fauna can be listed as Threatened, Extinct and as Specially Protected species.

Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such. The assessment of the conservation status of Threatened species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria. Specially protected species meet one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as Threatened or Extinct species under the BC Act cannot also be listed as Specially Protected species.

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

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

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

For the purposes of this assessment, all species listed under the EPBC Act, BC Act and DBCA Priority species are considered conservation significant.

Conservation categories and definitions for EPBC Act and BC Act listed fauna species

| Conservation category | Definition |
|--|---|
| Threatened species | |
| Critically Endangered (CR) | Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with criteria set out in section 20 and the ministerial guidelines. |
| Endangered (EN) | Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. |
| Vulnerable (VU) | Threatened species considered to be “facing a high risk of extinction in the wild in the medium term future as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. |
| Extinct species | |
| Extinct (EX) | Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). |
| Extinct in the Wild (EW) | Species that “is known only to survive in cultivation, in captivity or as a naturalized population well outside its past range, and it has not been recorded in its known habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its lifecycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). |
| Specially protected species | |
| Migratory (MI) | Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. |
| Species of special conservation interest (conservation dependent fauna) (CD) | Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. |
| Other specially protected fauna (OS) | Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). |

Conservation codes for DBCA listed Priority fauna

| Priority category | Definition |
|-------------------|---|
| Priority 1 | <p>Poorly-known taxa</p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p> |
| Priority 2 | <p>Poorly-known taxa</p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p> |
| Priority 3 | <p>Poorly-known taxa</p> <p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p> |
| Priority 4 | <p>Rare, Near Threatened and other taxa in need of monitoring</p> <p>Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.</p> <p>Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.</p> |

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

References

ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.

Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001–2005*, Canberra, AGPS.

EPA 2010, *Technical Guide – Terrestrial Fauna Surveys*, EPA, Perth, WA

Appendix C

Desktop searches

NatureMap Species Report

EPBC Act Protected Matter Search Tool Report

NatureMap Species Report

Created By Guest user on 18/06/2020

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 116° 11' 35" E, 32° 22' 24" S
Buffer 20km
Group By Species Group

| Species Group | Species | Records |
|---------------|------------|-------------|
| Amphibian | 12 | 235 |
| Bird | 115 | 5344 |
| Fish | 9 | 15 |
| Invertebrate | 360 | 1981 |
| Mammal | 30 | 509 |
| Reptile | 35 | 412 |
| TOTAL | 561 | 8496 |

| Name ID | Species Name | Naturalised | Conservation Code | Endemic To Query Area |
|------------------|--|-------------|-------------------|-----------------------|
| Amphibian | | | | |
| 1. | 25398 <i>Crinia georgiana</i> (Quacking Frog) | | | |
| 2. | 25399 <i>Crinia glauerti</i> (Clicking Frog) | | | |
| 3. | 25400 <i>Crinia insignifera</i> (Squelching Froglet) | | | |
| 4. | 25401 <i>Crinia pseudinsignifera</i> (Bleating Froglet) | | | |
| 5. | 25404 <i>Geocrinia leai</i> (Ticking Frog) | | | |
| 6. | 25409 <i>Heleioporus barycragus</i> (Hooting Frog) | | | |
| 7. | 25410 <i>Heleioporus eyrei</i> (Moaning Frog) | | | |
| 8. | 25411 <i>Heleioporus inornatus</i> (Whooping Frog) | | | |
| 9. | 25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog) | | | |
| 10. | 25378 <i>Litoria adelaidensis</i> (Slender Tree Frog) | | | |
| 11. | 25426 <i>Neobatrachus pelobatoides</i> (Humming Frog) | | | |
| 12. | 25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet) | | | |
| Bird | | | | |
| 13. | 24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill) | | | |
| 14. | 24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill) | | | |
| 15. | 24262 <i>Acanthiza inornata</i> (Western Thornbill) | | | |
| 16. | 24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill) | | | |
| 17. | 25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk) | | | |
| 18. | 25536 <i>Accipiter fasciatus</i> (Brown Goshawk) | | | |
| 19. | 25755 <i>Acrocephalus australis</i> (Australian Reed Warbler) | | | |
| 20. | 25544 <i>Aegotheles cristatus</i> (Australian Owllet-nightjar) | | | |
| 21. | 24312 <i>Anas gracilis</i> (Grey Teal) | | | |
| 22. | 24316 <i>Anas superciliosa</i> (Pacific Black Duck) | | | |
| 23. | 47414 <i>Anhinga novaehollandiae</i> (Australasian Darter) | | | |
| 24. | 24561 <i>Anthochaera carunculata</i> (Red Wattlebird) | | | |
| 25. | 24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird) | | | |
| 26. | 25670 <i>Anthus australis</i> (Australian Pipit) | | | |
| 27. | 24285 <i>Aquila audax</i> (Wedge-tailed Eagle) | | | |
| 28. | 24340 <i>Ardea novaehollandiae</i> (White-faced Heron) | | | |
| 29. | 24341 <i>Ardea pacifica</i> (White-necked Heron) | | | |
| 30. | 25566 <i>Artamus cinereus</i> (Black-faced Woodswallow) | | | |
| 31. | 24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow) | | | |
| 32. | <i>Barnardius zonarius</i> | | | |
| 33. | 24319 <i>Biziura lobata</i> (Musk Duck) | | | |
| 34. | 25714 <i>Cacatua pastinator</i> (Western Long-billed Corella) | | | |
| 35. | 24724 <i>Cacatua pastinator subsp. pastinator</i> (Muir's Corella, Muir's Corella (Western Corella SW WA)) | | S | |
| 36. | 25715 <i>Cacatua roseicapilla</i> (Galah) | | | |
| 37. | 25716 <i>Cacatua sanguinea</i> (Little Corella) | | | |
| 38. | 25598 <i>Cacomantis flabelliformis</i> (Fan-tailed Cuckoo) | | | |

| Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|---------|---|-------------|-------------------|------------------------------------|
| 39. | 42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo) | | | |
| 40. | 25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo) | | | |
| 41. | 24731 <i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black Cockatoo) | | T | |
| 42. | 24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo) | | T | |
| 43. | 24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo) | | T | |
| 44. | 48400 <i>Calyptorhynchus</i> sp. (white-tailed black cockatoo) | | T | |
| 45. | 24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck) | | | |
| 46. | 25601 <i>Chrysococcyx lucidus</i> (Shining Bronze Cuckoo) | | | |
| 47. | 25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush) | | | |
| 48. | 25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike) | | | |
| 49. | 25592 <i>Corvus coronoides</i> (Australian Raven) | | | |
| 50. | 25595 <i>Cracticus tibicen</i> (Australian Magpie) | | | |
| 51. | 25596 <i>Cracticus torquatus</i> (Grey Butcherbird) | | | |
| 52. | 30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra) | Y | | |
| 53. | 25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella) | | | |
| 54. | 25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird) | | | |
| 55. | 24470 <i>Dromaius novaehollandiae</i> (Emu) | | | |
| 56. | <i>Egretta novaehollandiae</i> | | | |
| 57. | <i>Elanus axillaris</i> | | | |
| 58. | <i>Eolophus roseicapillus</i> | | | |
| 59. | 25692 <i>Eopsaltria australis</i> (Yellow Robin) | | | |
| 60. | 24651 <i>Eopsaltria australis</i> subsp. <i>griseogularis</i> (Western Yellow Robin) | | | |
| 61. | 24652 <i>Eopsaltria georgiana</i> (White-breasted Robin) | | | |
| 62. | 25621 <i>Falco berigora</i> (Brown Falcon) | | | |
| 63. | 25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel) | | | |
| 64. | 25623 <i>Falco longipennis</i> (Australian Hobby) | | | |
| 65. | 25624 <i>Falco peregrinus</i> (Peregrine Falcon) | | S | |
| 66. | 24616 <i>Falculunculus frontatus</i> subsp. <i>leucogaster</i> (Western Shrike-tit, Crested Shrike-tit) | | | |
| 67. | 25727 <i>Fulica atra</i> (Eurasian Coot) | | | |
| 68. | 42314 <i>Gavicalis virescens</i> (Singing Honeyeater) | | | |
| 69. | 25530 <i>Gerygone fusca</i> (Western Gerygone) | | | |
| 70. | 24443 <i>Grallina cyanoleuca</i> (Magpie-lark) | | | |
| 71. | 47965 <i>Hieraaetus morphnoides</i> (Little Eagle) | | | |
| 72. | 24491 <i>Hirundo neoxena</i> (Welcome Swallow) | | | |
| 73. | 24557 <i>Leipoa ocellata</i> (Malleefowl) | | T | |
| 74. | 25661 <i>Lichmera indistincta</i> (Brown Honeyeater) | | | |
| 75. | <i>Lophoictinia isura</i> | | | |
| 76. | 25650 <i>Malurus elegans</i> (Red-winged Fairy-wren) | | | |
| 77. | 24551 <i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren) | | | |
| 78. | 25654 <i>Malurus splendens</i> (Splendid Fairy-wren) | | | |
| 79. | 25758 <i>Megalurus gramineus</i> (Little Grassbird) | | | |
| 80. | 47997 <i>Melanodryas cucullata</i> (Hooded Robin) | | | |
| 81. | 25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater) | | | |
| 82. | 24587 <i>Melithreptus chloropsis</i> (Western White-naped Honeyeater) | | | |
| 83. | 24598 <i>Merops ornatus</i> (Rainbow Bee-eater) | | | |
| 84. | <i>Microcarbo melanoleucos</i> | | | |
| 85. | 25693 <i>Microeca fascians</i> (Jacky Winter) | | | |
| 86. | 24738 <i>Neophema elegans</i> (Elegant Parrot) | | | |
| 87. | 25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron) | | | |
| 88. | 24407 <i>Ocyphaps lophotes</i> (Crested Pigeon) | | | |
| 89. | 25680 <i>Pachycephala rufiventris</i> (Rufous Whistler) | | | |
| 90. | 25681 <i>Pardalotus punctatus</i> (Spotted Pardalote) | | | |
| 91. | 24625 <i>Pardalotus punctatus</i> subsp. <i>punctatus</i> (Spotted Pardalote) | | | |
| 92. | 25682 <i>Pardalotus striatus</i> (Striated Pardalote) | | | |
| 93. | 24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote) | | | |
| 94. | 48061 <i>Petrochelidon nigricans</i> (Tree Martin) | | | |
| 95. | 48066 <i>Petroica boodang</i> (Scarlet Robin) | | | |
| 96. | 24659 <i>Petroica goodenovii</i> (Red-capped Robin) | | | |
| 97. | 24409 <i>Phaps chalcoptera</i> (Common Bronzewing) | | | |
| 98. | 25587 <i>Phaps elegans</i> (Brush Bronzewing) | | | |
| 99. | 48071 <i>Phylidonyris niger</i> (White-cheeked Honeyeater) | | | |
| 100. | 24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater) | | | |
| 101. | 25720 <i>Platycercus icterotis</i> (Western Rosella) | | | |
| 102. | 24745 <i>Platycercus icterotis</i> subsp. <i>icterotis</i> (Western Rosella) | | | |
| 103. | 24747 <i>Platycercus spurius</i> (Red-capped Parrot) | | | |
| 104. | 25721 <i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot) | | | |
| 105. | 25703 <i>Podargus strigoides</i> (Tawny Frogmouth) | | | |
| 106. | 25722 <i>Polytelis anthopeplus</i> (Regent Parrot) | | | |

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|---------|---|-------------|-------------------|------------------------------------|
| 107. | 25731 <i>Porphyrio porphyrio</i> (Purple Swamphen) | | | |
| 108. | 24771 <i>Porzana tabuensis</i> (Spotless Crane) | | | |
| 109. | 24702 <i>Pterodroma brevirostris</i> (Kerguelen Petrel) | | | |
| 110. | <i>Purpureicephalus spurius</i> | | | |
| 111. | 48096 <i>Rhipidura albiscapa</i> (Grey Fantail) | | | |
| 112. | 25614 <i>Rhipidura leucophrys</i> (Willie Wagtail) | | | |
| 113. | 25534 <i>Sericornis frontalis</i> (White-browed Scrubwren) | | | |
| 114. | 30948 <i>Smicromis brevirostris</i> (Weebill) | | | |
| 115. | 24645 <i>Stagonopleura oculata</i> (Red-eared Firetail) | | | |
| 116. | 25597 <i>Strepera versicolor</i> (Grey Currawong) | | | |
| 117. | 25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove) | Y | | |
| 118. | 25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove) | Y | | |
| 119. | 25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe) | | | |
| 120. | 24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck) | | | |
| 121. | 24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis) | | | |
| 122. | 25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher) | | | |
| 123. | 25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet) | | | |
| 124. | 48147 <i>Turnix varius</i> (Painted Button-quail) | | | |
| 125. | 25764 <i>Tyto novaehollandiae</i> (Masked Owl) | | | |
| 126. | 24855 <i>Tyto novaehollandiae subsp. novaehollandiae</i> (Masked Owl (southwest)) | | P3 | |
| 127. | 25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silvereye) | | | |

Fish

| | | | | |
|------|---|--|----|--|
| 128. | ?? | | | |
| 129. | <i>Acentrogobius bifrenatus</i> | | | |
| 130. | <i>Aldrichetta forsteri</i> | | | |
| 131. | <i>Bostockia porosa</i> | | | |
| 132. | 34028 <i>Galaxias occidentalis</i> (Western Minnow) | | | |
| 133. | 34030 <i>Geotria australis</i> (Pouched Lamprey) | | P3 | |
| 134. | <i>Nannoperca vittata</i> | | | |
| 135. | <i>Neosilurus hyrtlii</i> | | | |
| 136. | <i>Tandanus bostocki</i> | | | |

Invertebrate

| | | | | |
|------|--------------------------------------|--|--|---|
| 137. | <i>Acariformes sp.</i> | | | |
| 138. | <i>Acritoptila margaretae</i> | | | |
| 139. | <i>Acritoptila sp.</i> | | | |
| 140. | <i>Adoxotoma chionopogon</i> | | | |
| 141. | <i>Adoxotoma embolica</i> | | | Y |
| 142. | <i>Adoxotoma nitida</i> | | | Y |
| 143. | <i>Adversaeschna brevistyla</i> | | | |
| 144. | <i>Aeshnidae sp.</i> | | | |
| 145. | <i>Agraptocorixa sp.</i> | | | |
| 146. | <i>Ainudrilus nharna</i> | | | |
| 147. | <i>Allodessus bistrigatus</i> | | | |
| 148. | <i>Allothreua maculata</i> | | | |
| 149. | <i>Alotanypus dalyupensis</i> | | | |
| 150. | <i>Ambicodamus marae</i> | | | |
| 151. | <i>Amblyomma triguttatum</i> | | | |
| 152. | <i>Aname mainae</i> | | | |
| 153. | <i>Aname tepperi</i> | | | |
| 154. | <i>Anax papuensis</i> | | | |
| 155. | <i>Anisops hackeri</i> | | | |
| 156. | <i>Anisops hyperion</i> | | | |
| 157. | <i>Antiporus gilberti</i> | | | |
| 158. | <i>Antiporus sp.</i> | | | |
| 159. | <i>Arachnura higginsi</i> | | | |
| 160. | <i>Araneus amblycyphus</i> | | | Y |
| 161. | <i>Araneus cyphoxis</i> | | | |
| 162. | <i>Araneus eburneiventris</i> | | | |
| 163. | <i>Araneus eburnus</i> | | | |
| 164. | <i>Araneus senicaudatus</i> | | | |
| 165. | <i>Araneus stolidus</i> | | | |
| 166. | <i>Archaeosynthemis occidentalis</i> | | | |
| 167. | <i>Archaeosynthemis spiniger</i> | | | |
| 168. | <i>Archiargiolestes pusillus</i> | | | |
| 169. | <i>Archichauliodes sp.</i> | | | |
| 170. | <i>Argiope trifasciata</i> | | | |
| 171. | <i>Arkys alticephala</i> | | | |
| 172. | <i>Arkys walckenaeri</i> | | | |
| 173. | <i>Arrenuridae sp.</i> | | | |

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|---------|---|-------------|-------------------|------------------------------------|
| 174. | <i>Arteria flavimana</i> | | | |
| 175. | <i>Arteria flavimanus</i> | | | |
| 176. | <i>Arteria schizocoides</i> | | | |
| 177. | <i>Arteria taeniifera</i> | | | |
| 178. | <i>Asadipus kunderang</i> | | | |
| 179. | <i>Athericidae sp.</i> | | | |
| 180. | <i>Aturidae sp.</i> | | | |
| 181. | <i>Austracantha minax</i> | | | |
| 182. | <i>Australomimetes aurioculatus</i> | | | |
| 183. | <i>Australomimetes dunlopi</i> | | | |
| 184. | <i>Australomimetes ovidi</i> | | | |
| 185. | <i>Australopelopia prionopectera</i> | | | |
| 186. | <i>Australotiphys barmutai</i> | | | |
| 187. | <i>Austroagrion coeruleum</i> | | | |
| 188. | <i>Austrochthonius muchmorei</i> | | | |
| 189. | <i>Austrogomphus collaris</i> | | | |
| 190. | <i>Austrolestes analis</i> | | | |
| 191. | <i>Austrosynthemis cyanitincta</i> | | | |
| 192. | <i>Backbourkia brounii</i> | | | |
| 193. | <i>Backbourkia heroine</i> | | | |
| 194. | <i>Baiami volucripes</i> | | | |
| 195. | <i>Ballarra longipalpus</i> | | | |
| 196. | <i>Berosus approximans</i> | | | |
| 197. | <i>Berosus discolor</i> | | | |
| 198. | <i>Bibulmena kacjina</i> | | | |
| 199. | <i>Botryocladus bibulmun</i> | | | |
| 200. | <i>Botryocladus freemani</i> | | | |
| 201. | <i>Botryocladus petrophilus</i> | | | |
| 202. | <i>Calanoida sp.</i> | | | |
| 203. | <i>Carabidae sp.</i> | | | |
| 204. | <i>Ceinidae sp.</i> | | | |
| 205. | <i>Ceratopogonidae sp.</i> | | | |
| 206. | <i>Cercophonius granulatus</i> | | | |
| 207. | <i>Cercophonius sulcatus</i> | | | |
| 208. | <i>Cethegus fugax</i> | | | |
| 209. | 33939 <i>Cherax cainii</i> (Marron) | | | |
| 210. | <i>Cherax quinquecarinatus</i> | | | |
| 211. | <i>Cheumatopsyche sp. AV2</i> (SAP) | | | |
| 212. | <i>Chironominae sp.</i> | | | |
| 213. | <i>Chironomus aff. alternans</i> (V24) (CB) | | | |
| 214. | <i>Chironomus tepperi</i> | | | |
| 215. | <i>Chrysomelidae sp.</i> | | | |
| 216. | <i>Cladocera (unident.)</i> | | | |
| 217. | <i>Cladopelma curtivalva</i> | | | |
| 218. | <i>Cladotanytarsus sp. A</i> (SAP) | | | |
| 219. | <i>Clitrombium antares</i> | | | Y |
| 220. | <i>Cloeon sp.</i> | | | |
| 221. | <i>Cloeon sp. 2</i> (SFM) | | | |
| 222. | <i>Clynotis albobarbatus</i> | | | |
| 223. | <i>Clynotis severus</i> | | | |
| 224. | <i>Coenagrionidae sp.</i> | | | |
| 225. | <i>Condocerus aptus</i> | | | |
| 226. | <i>Copepoda sp.</i> | | | |
| 227. | <i>Corduliidae sp.</i> | | | |
| 228. | <i>Corixidae sp.</i> | | | |
| 229. | <i>Cormocephalus aurantiipes</i> | | | |
| 230. | <i>Cormocephalus hartmeyer</i> | | | |
| 231. | <i>Cormocephalus michaelseni</i> | | | |
| 232. | <i>Cormocephalus rubriceps</i> | | | |
| 233. | <i>Cormocephalus turneri</i> | | | |
| 234. | <i>Cricotopus 'brevicornis'</i> | | | |
| 235. | <i>Cricotopus 'parbicinctus'</i> | | | |
| 236. | <i>Crustulina bicrucata</i> | | | |
| 237. | <i>Cryptochironomus aff. griseidorsum</i> | | | |
| 238. | <i>Cryptochironomus griseidorsum</i> | | | |
| 239. | <i>Cryptoerithus melindae</i> | | | |
| 240. | <i>Culicidae sp.</i> | | | |
| 241. | <i>Curculionidae sp.</i> | | | |
| 242. | <i>Cyclosa bacilliformis</i> | | | Y |
| 243. | <i>Cyrtophora parnasia</i> | | | |

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|---------|--|-------------|-------------------|------------------------------------|
| 244. | <i>Demadiana cerula</i> | | | |
| 245. | <i>Diaprograpta striola</i> | | | |
| 246. | <i>Dicrotendipes conjunctus</i> | | | |
| 247. | <i>Dicrotendipes jobetus</i> | | | |
| 248. | <i>Dicrotendipes pseudoconjunctus</i> | | | |
| 249. | <i>Dicrotendipes</i> sp. | | | |
| 250. | <i>Dicrotendipes</i> sp. A (V47) (SAP) | | | |
| 251. | <i>Dinocambala ingens</i> | | | |
| 252. | <i>Diplacodes bipunctata</i> | | | |
| 253. | <i>Dolichopodidae</i> sp. | | | |
| 254. | <i>Dytiscidae</i> sp. | | | |
| 255. | <i>Ecnomina</i> F group | | | |
| 256. | <i>Empididae</i> sp. | | | |
| 257. | <i>Enchytraeidae</i> sp. | | | |
| 258. | <i>Ephydriidae</i> sp. | | | |
| 259. | <i>Erigone prominens</i> | | | |
| 260. | <i>Eriophora biapicata</i> | | | |
| 261. | <i>Ero aphana</i> | | | |
| 262. | <i>Eucyrtops latior</i> | | | |
| 263. | 48579 <i>Euoplos inornatus</i> (inornate trapdoor spider (northern Jarrah Forest)) | | P3 | |
| 264. | <i>Exocelina ater</i> | | | |
| 265. | <i>Geogarypus taylori</i> | | | |
| 266. | 34114 <i>Glacidorbis occidentalis</i> (Jarrah forest freshwater snail, freshwater snail) | | P3 | |
| 267. | <i>Gomphidae</i> sp. | | | |
| 268. | <i>Gripopterygidae</i> sp. | | | |
| 269. | <i>Gymnometricnemus</i> sp. 1 (=V44 = ortho sp. C & R) | | | |
| 270. | <i>Gyrinidae</i> sp. | | | |
| 271. | <i>Halacaridae</i> sp. | | | |
| 272. | <i>Haliplidae</i> sp. | | | |
| 273. | <i>Halipus fuscatus</i> | | | |
| 274. | <i>Halipus gibbus</i> | | | |
| 275. | <i>Halipus</i> sp. | | | |
| 276. | <i>Harrisius</i> sp. A (SAP) | | | |
| 277. | <i>Harrisius</i> sp. B (SFM) | | | |
| 278. | <i>Hellyethira litua</i> | | | |
| 279. | <i>Hellyethira</i> sp. | | | |
| 280. | <i>Helochares tenuistriatus</i> | | | |
| 281. | <i>Hemicordulia australiae</i> | | | |
| 282. | <i>Hemicordulia tau</i> | | | |
| 283. | <i>Henicops dentatus</i> | | | |
| 284. | <i>Hirudinea</i> sp. | | | |
| 285. | <i>Histosoma feroniarum</i> | | | Y |
| 286. | <i>Hogna crispipes</i> | | | |
| 287. | <i>Holoplatys dejongi</i> | | | |
| 288. | <i>Hyderodes</i> sp. | | | |
| 289. | <i>Hydrobiosella michaelsoni</i> | | | |
| 290. | <i>Hydrobiosidae</i> sp. | | | |
| 291. | <i>Hydrodromidae</i> sp. | | | |
| 292. | <i>Hydrophiliidae</i> sp. | | | |
| 293. | <i>Hydroptila losida</i> | | | |
| 294. | <i>Hydroptilidae</i> sp. | | | |
| 295. | <i>Hydryphantidae</i> sp. | | | |
| 296. | <i>Hygrobatidae</i> sp. | | | |
| 297. | <i>Hyphydrus elegans</i> | | | |
| 298. | <i>Hypomegalopsalis tanisphyros</i> | | | |
| 299. | <i>Idiommata blackwalli</i> | | | |
| 300. | <i>Isometroides vesicus</i> | | | |
| 301. | <i>Isopeda leishmanni</i> | | | |
| 302. | <i>Karaops ellenae</i> | | | |
| 303. | <i>Kiefferulus intertinctus</i> | | | |
| 304. | <i>Kiefferulus martini</i> | | | |
| 305. | <i>Lampona brevipes</i> | | | |
| 306. | <i>Lampona yanchep</i> | | | |
| 307. | <i>Lamponella ainslie</i> | | | |
| 308. | <i>Lamponusa gleneagle</i> | | | |
| 309. | <i>Lancetes lanceolatus</i> | | | |
| 310. | <i>Laperousea blattifera</i> | | | |
| 311. | <i>Larsia albiceps</i> | | | |
| 312. | <i>Latrodectus hasseltii</i> | | | |
| 313. | <i>Lectrides parilis</i> | | | |

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|---------|--|-------------|-------------------|------------------------------------|
| 314. | <i>Lepidoptera (non-pyralid)</i> | | | |
| 315. | <i>Leptoceridae sp.</i> | | | |
| 316. | <i>Leptoperla australica</i> | | | |
| 317. | <i>Leptophlebiidae sp.</i> | | | |
| 318. | <i>Lestidae sp.</i> | | | |
| 319. | <i>Limbodessus inornatus</i> | | | |
| 320. | <i>Limbodessus shuckhardi</i> | | | |
| 321. | <i>Limnesiidae sp.</i> | | | |
| 322. | <i>Limnophyes vestitus (V41)</i> | | | |
| 323. | <i>Limnoxenus zelandicus</i> | | | |
| 324. | <i>Longepi woodman</i> | | | |
| 325. | <i>Longrita insidiosa</i> | | | |
| 326. | <i>Lopescladius? V35 (=SO3 sp. D)</i> | | | |
| 327. | <i>Lycosa ariadnae</i> | | | |
| 328. | <i>Macrogyrus angustatus</i> | | | |
| 329. | <i>Macrogyrus sp.</i> | | | |
| 330. | <i>Maratus pavonis</i> | | | |
| 331. | <i>Maydenoptila baynesi</i> | | | |
| 332. | <i>Maydenoptila sp.</i> | | | |
| 333. | <i>Megaloptera sp.</i> | | | |
| 334. | <i>Megapodagrionidae sp.</i> | | | |
| 335. | <i>Megaporus sp.</i> | | | |
| 336. | <i>Microctenonyx subitaneus</i> | | | |
| 337. | <i>Micronecta gracilis</i> | | | |
| 338. | <i>Micronecta robusta</i> | | | |
| 339. | <i>Micronecta sp.</i> | | | |
| 340. | <i>Missulena granulosa</i> | | | |
| 341. | <i>Missulena hoggi</i> | | | |
| 342. | <i>Missulena occatoria</i> | | | |
| 343. | <i>Mituliodon tarantulinus</i> | | | |
| 344. | <i>Miturga agelenina</i> | | | Y |
| 345. | <i>Miturga catographa</i> | | | |
| 346. | <i>Molycria quadricauda</i> | | | |
| 347. | <i>Muscidae sp.</i> | | | |
| 348. | <i>Muziris carinatus</i> | | | |
| 349. | <i>Myandra bicincta</i> | | | |
| 350. | <i>Naididae sp.</i> | | | |
| 351. | <i>Necterosoma darwini</i> | | | |
| 352. | <i>Necterosoma penicillatus</i> | | | |
| 353. | <i>Necterosoma regulare</i> | | | |
| 354. | <i>Necterosoma sp.</i> | | | |
| 355. | <i>Nematoda sp.</i> | | | |
| 356. | <i>Nemertini sp.</i> | | | |
| 357. | <i>Neostorena vituperata</i> | | | Y |
| 358. | <i>Nephila edulis</i> | | | |
| 359. | <i>Newmanoperla exigua</i> | | | |
| 360. | <i>Nicodamus mainae</i> | | | |
| 361. | <i>Notalina nr. sp. AV14</i> | | | |
| 362. | <i>Notalina sp. AV15 (PSW)</i> | | | |
| 363. | <i>Notalina sp. AV17 (RCM)</i> | | | Y |
| 364. | <i>Notalina spira</i> | | | |
| 365. | <i>Notoperata sp. AV1 (SFM)</i> | | | |
| 366. | <i>Notoperata tenax</i> | | | |
| 367. | <i>Nousia sp. AV16</i> | | | |
| 368. | <i>Novakiella trituberculosa</i> | | | |
| 369. | <i>Nunciella aspera</i> | | | |
| 370. | <i>Nunciella karriensis</i> | | | Y |
| 371. | <i>Nyungara bunni</i> | | | |
| 372. | <i>Occiperipatoides gilesii</i> | | | |
| 373. | <i>Oecetis sp.</i> | | | |
| 374. | <i>Oecobius putus</i> | | | |
| 375. | <i>Offadens soror (ex genus 1 WA sp. 1)</i> | | | |
| 376. | <i>Oligochaeta sp.</i> | | | |
| 377. | <i>Oniscidae sp.</i> | | | |
| 378. | <i>Opisthopora sp.</i> | | | |
| 379. | <i>Oribatida sp.</i> | | | |
| 380. | <i>Orthetrum caledonicum</i> | | | |
| 381. | <i>Orthoclaadiinae 'woodminer' (SAP)</i> | | | |
| 382. | <i>Orthoclaadiinae SO3 sp. A (SAP)</i> | | | |
| 383. | <i>Orthoclaadiinae SO3 sp. C (V31) (SAP)</i> | | | |

| Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|---------|--|-------------|-------------------|------------------------------------|
| 384. | <i>Orthocladinae</i> sp. | | | |
| 385. | <i>Ostearius melanopygius</i> | | | |
| 386. | <i>Ostracoda</i> (unident.) | | | |
| 387. | <i>Oxidae</i> sp. | | | |
| 388. | <i>Oxyethira</i> sp. | | | |
| 389. | <i>Oxyopes gracilipes</i> | | | |
| 390. | <i>Ozarchaea harveyi</i> | | | |
| 391. | <i>Ozarchaea westraliensis</i> | | | |
| 392. | <i>Parachironomus</i> sp. 1 (VSCL35) (SAP) | | | |
| 393. | <i>Paracladopelma</i> M1 (SFM) | | | |
| 394. | <i>Paracymus pygmaeus</i> | | | |
| 395. | <i>Parakiefferiella</i> sp. S1 | | | |
| 396. | <i>Parakiefferiella variegatus</i> | | | |
| 397. | <i>Paralampona marangaroo</i> | | | |
| 398. | <i>Paralimnophyes pullulus</i> (V42) | | | |
| 399. | <i>Paramelitidae</i> sp. | | | |
| 400. | <i>Paramerina levidensis</i> | | | |
| 401. | <i>Paraplatoides nigrum</i> | | | |
| 402. | <i>Parastacidae</i> sp. | | | |
| 403. | <i>Penemideopsis pusilla</i> | | | Y |
| 404. | <i>Pentaneurini</i> genus V20 | | | |
| 405. | <i>Pentastemon securifer</i> | | | |
| 406. | <i>Perthiidae</i> sp. | | | |
| 407. | <i>Phenastemon longiconductor</i> | | | |
| 408. | <i>Phreodrilidae</i> sp. | | | |
| 409. | <i>Phryganoporus nigrinus</i> | | | |
| 410. | <i>Pinkfloydia harveii</i> | | | |
| 411. | <i>Planorbidae</i> sp. | | | |
| 412. | <i>Platorish gelorup</i> | | | |
| 413. | <i>Platynectes</i> sp. | | | |
| 414. | <i>Podonomopsis</i> sp. 1 | | | |
| 415. | <i>Poecilipta smaragdinea</i> | | | |
| 416. | <i>Polypedilum</i> nr. <i>convexum</i> (SAP) | | | |
| 417. | <i>Polypedilum nubifer</i> | | | |
| 418. | <i>Polypedilum watsoni</i> | | | |
| 419. | <i>Prionosternum nitidiceps</i> | | | |
| 420. | <i>Prionosternum scutatum</i> | | | |
| 421. | <i>Procladius</i> DEC sp. P1 (formerly <i>P. paludicola</i> P1 no U-claws) | | | |
| 422. | <i>Procladius paludicola</i> | | | |
| 423. | <i>Procladius</i> sp. | | | |
| 424. | <i>Procordulia affinis</i> | | | |
| 425. | <i>Pseudolampona jarrahdale</i> | | | |
| 426. | <i>Pyralidae</i> sp. | | | |
| 427. | <i>Raveniella cirrata</i> | | | |
| 428. | <i>Raveniella peckorum</i> | | | |
| 429. | <i>Rhantus suturalis</i> | | | |
| 430. | <i>Rheotanytarsus juliae</i> | | | |
| 431. | <i>Rheotanytarsus</i> sp. (SFM) | | | |
| 432. | <i>Rheotanytarsus trivittatus</i> | | | |
| 433. | <i>Rheotanytarsus underwoodi</i> | | | |
| 434. | <i>Riekoperla occidentalis</i> | | | |
| 435. | <i>Riethia</i> v4 | | | |
| 436. | <i>Riethia</i> v5 | | | |
| 437. | <i>Sandalodes scopifer</i> | | | |
| 438. | <i>Scirtidae</i> sp. | | | |
| 439. | <i>Scolopendra laeta</i> | | | |
| 440. | <i>Seltnickiella biunguiculata</i> | | | |
| 441. | <i>Simaetha thoracica</i> | | | Y |
| 442. | <i>Simuliidae</i> sp. | | | |
| 443. | <i>Siphonotus michaelsoni</i> | | | Y |
| 444. | <i>Skusella</i> "V12 ex-WA" (Cranston) | | | |
| 445. | <i>Sondra aurea</i> | | | |
| 446. | <i>Sondra tristicula</i> | | | |
| 447. | <i>Sternopriscus browni</i> | | | |
| 448. | <i>Sternopriscus marginatus</i> | | | |
| 449. | <i>Sternopriscus minimus</i> | | | |
| 450. | <i>Sternopriscus</i> sp. | | | |
| 451. | <i>Stictocladus occidentalis</i> | | | |
| 452. | <i>Storena formosa</i> | | | |
| 453. | <i>Storosa tetrica</i> | | | |

| Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|---------|---|-------------|-------------------|------------------------------------|
| 454. | <i>Stratiomyidae</i> sp. | | | |
| 455. | <i>Supunna funerea</i> | | | |
| 456. | <i>Supunna picta</i> | | | |
| 457. | <i>Symphytognatha picta</i> | | | |
| 458. | <i>Synothele harveyi</i> | | | |
| 459. | <i>Synothele longbottomi</i> | | | |
| 460. | <i>Synothele michaelseni</i> | | | |
| 461. | <i>Synsphyronus mimulus</i> | | | |
| 462. | <i>Synthemistidae</i> sp. | | | |
| 463. | <i>Tabanidae</i> sp. | | | |
| 464. | <i>Tamopsis darlingtoniana</i> | | | |
| 465. | <i>Tamopsis distinguenda</i> | | | |
| 466. | <i>Tamopsis perthensis</i> | | | |
| 467. | <i>Tanypodinae</i> sp. | | | |
| 468. | <i>Tanytarsus aff manleyensis</i> | | | |
| 469. | <i>Tanytarsus b1</i> | | | |
| 470. | <i>Tanytarsus fuscithorax/semibarbitarsus</i> | | | |
| 471. | <i>Tanytarsus nr K5</i> | | | |
| 472. | <i>Tanytarsus palmatus</i> | | | |
| 473. | <i>Tanytarsus</i> sp. I (SAP) | | | |
| 474. | <i>Taschorema pallescens</i> | | | |
| 475. | <i>Tasmanicosa leuckartii</i> | | | |
| 476. | <i>Tasmanocoenis tillyardi</i> | | | |
| 477. | <i>Temnocephalidea</i> sp. | | | |
| 478. | <i>Tetragnatha maeandrata</i> | | | Y |
| 479. | <i>Tetragnatha valida</i> | | | |
| 480. | <i>Thienemanniella</i> sp. (V19) (SAP) | | | |
| 481. | <i>Tinytrema yarra</i> | | | |
| 482. | <i>Tipulidae</i> sp. | | | |
| 483. | <i>Trachycosmus sculptilis</i> | | | |
| 484. | <i>Trachytrema castaneum</i> | | | |
| 485. | <i>Triplectides australis</i> | | | |
| 486. | <i>Triplectides</i> sp. AV1 (SFM) | | | |
| 487. | <i>Triplectides</i> sp. AV21 (SFM) | | | |
| 488. | <i>Turbellaria</i> sp. | | | |
| 489. | <i>Urodacus novaehollandiae</i> | | | |
| 490. | <i>Urodacus planimanus</i> | | | |
| 491. | <i>Venator immansueta</i> | | | |
| 492. | 34113 <i>Westralunio carteri</i> (Carter's Freshwater Mussel) | | T | |
| 493. | <i>Westrarchaea spinosa</i> | | | |
| 494. | <i>Wheenyooides cooki</i> | | | |
| 495. | <i>Xanthagrion erythroneurum</i> | | | |
| 496. | <i>Zebraplatus fractivittata</i> | | | |

Mammal

| | | | | |
|------|--|---|----|--|
| 497. | 25449 <i>Antechinus flavipes</i> (Yellow-footed Antechinus) | | | |
| 498. | 24088 <i>Antechinus flavipes</i> subsp. <i>leucogaster</i> (Yellow-footed Antechinus, Mardo) | | | |
| 499. | 47713 <i>Austronomus australis</i> (White-striped Free-tailed Bat) | | | |
| 500. | 24162 <i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> (Woylie, Brush-tailed Bettong) | | T | |
| 501. | 24086 <i>Cercartetus concinnus</i> (Western Pygmy-possum, Mundarda) | | | |
| 502. | 24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat) | | | |
| 503. | 24187 <i>Chalinolobus morio</i> (Chocolate Wattled Bat) | | | |
| 504. | 24092 <i>Dasyurus geoffroyi</i> (Chuditch, Western Quoll) | | T | |
| 505. | 24189 <i>Falsistrellus mackenziei</i> (Western False Pipistrelle, Western Falsistrelle) | | P4 | |
| 506. | 24041 <i>Felis catus</i> (Cat) | Y | | |
| 507. | 24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali) | | P4 | |
| 508. | 48588 <i>Isoodon fusciventer</i> (Quenda, southwestern brown bandicoot) | | P4 | |
| 509. | 24132 <i>Macropus fuliginosus</i> (Western Grey Kangaroo) | | | |
| 510. | 24223 <i>Mus musculus</i> (House Mouse) | Y | | |
| 511. | 24146 <i>Myrmecobius fasciatus</i> (Numbat, Walpurti) | | T | |
| 512. | 48022 <i>Notamacropus irma</i> (Western Brush Wallaby) | | P4 | |
| 513. | 24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat) | | | |
| 514. | 24195 <i>Nyctophilus gouldi</i> (Gould's Long-eared Bat) | | | |
| 515. | 24085 <i>Oryctolagus cuniculus</i> (Rabbit) | Y | | |
| 516. | 24166 <i>Pseudocheirus occidentalis</i> (Western Ringtail Possum, ngwayir) | | T | |
| 517. | 24245 <i>Rattus rattus</i> (Black Rat) | Y | | |
| 518. | 24145 <i>Setonix brachyurus</i> (Quokka) | | T | |
| 519. | 24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart) | | | |
| 520. | 24111 <i>Sminthopsis gilberti</i> (Gilbert's Dunnart) | | | |
| 521. | 24207 <i>Tachyglossus aculeatus</i> (Short-beaked Echidna) | | | |
| 522. | 24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger) | | | |

| Name ID | Species Name | Naturalised | Conservation Code | ¹ Endemic To Query Area |
|----------------|--|-------------|-------------------|------------------------------------|
| 523. | 25521 <i>Trichosurus vulpecula</i> (Common Brushtail Possum) | | | |
| 524. | 24158 <i>Trichosurus vulpecula</i> subsp. <i>vulpecula</i> (Common Brushtail Possum) | | | |
| 525. | 24206 <i>Vespadelus regulus</i> (Southern Forest Bat) | | | |
| 526. | 24040 <i>Vulpes vulpes</i> (Red Fox) | Y | | |
| Reptile | | | | |
| 527. | 25242 <i>Acanthophs antarcticus</i> (Southern Death Adder) | | P3 | |
| 528. | 42368 <i>Acritoscincus trilineatus</i> (Western Three-lined Skink) | | | |
| 529. | 24990 <i>Aprasia pulchella</i> (Granite Worm-lizard) | | | |
| 530. | 24980 <i>Christinus marmoratus</i> (Marbled Gecko) | | | |
| 531. | 30893 <i>Cryptoblepharus buchananii</i> | | | |
| 532. | 25020 <i>Cryptoblepharus plagiocephalus</i> | | | |
| 533. | 24883 <i>Ctenophorus ornatus</i> (Ornate Crevice-Dragon) | | | |
| 534. | 24884 <i>Ctenophorus pictus</i> (Painted Dragon) | | | |
| 535. | 25035 <i>Ctenotus delli</i> (Dell's skink, Darling Range southwest Ctenotus) | | P4 | |
| 536. | 25047 <i>Ctenotus impar</i> | | | |
| 537. | 25049 <i>Ctenotus labillardieri</i> | | | |
| 538. | 25766 <i>Delma fraseri</i> (Fraser's Legless Lizard) | | | |
| 539. | 24939 <i>Diplodactylus polyophthalmus</i> | | | |
| 540. | 25096 <i>Egernia kingii</i> (King's Skink) | | | |
| 541. | 25100 <i>Egernia napoleonis</i> | | | |
| 542. | 25474 <i>Hemiergis initialis</i> | | | |
| 543. | 25115 <i>Hemiergis initialis</i> subsp. <i>initialis</i> | | | |
| 544. | 25131 <i>Lerista distinguenda</i> | | | |
| 545. | 25005 <i>Lialis burtonis</i> | | | |
| 546. | 41416 <i>Liopholis pulchra</i> subsp. <i>pulchra</i> (South-western Rock Skink, Spectacled Rock Skink) | | | |
| 547. | 25184 <i>Menetia greyii</i> | | | |
| 548. | 25240 <i>Morelia spilota</i> subsp. <i>imbricata</i> (Carpet Python) | | | |
| 549. | 25191 <i>Morethia lineocellata</i> | | | |
| 550. | 25192 <i>Morethia obscura</i> | | | |
| 551. | 25253 <i>Parasuta gouldii</i> | | | |
| 552. | 25255 <i>Parasuta nigriceps</i> | | | |
| 553. | 25510 <i>Pogona minor</i> (Dwarf Bearded Dragon) | | | |
| 554. | 24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon) | | | |
| 555. | 25511 <i>Pseudonaja affinis</i> (Dugite) | | | |
| 556. | 25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite) | | | |
| 557. | 25203 <i>Tiliqua occipitalis</i> (Western Bluetongue) | | | |
| 558. | 25519 <i>Tiliqua rugosa</i> | | | |
| 559. | 24983 <i>Underwoodisaurus milii</i> (Barking Gecko) | | | |
| 560. | 25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor) | | | |
| 561. | 25225 <i>Varanus rosenbergi</i> (Heath Monitor) | | | |

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

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



EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 18/06/20 15:49:43

[Summary](#)

[Details](#)

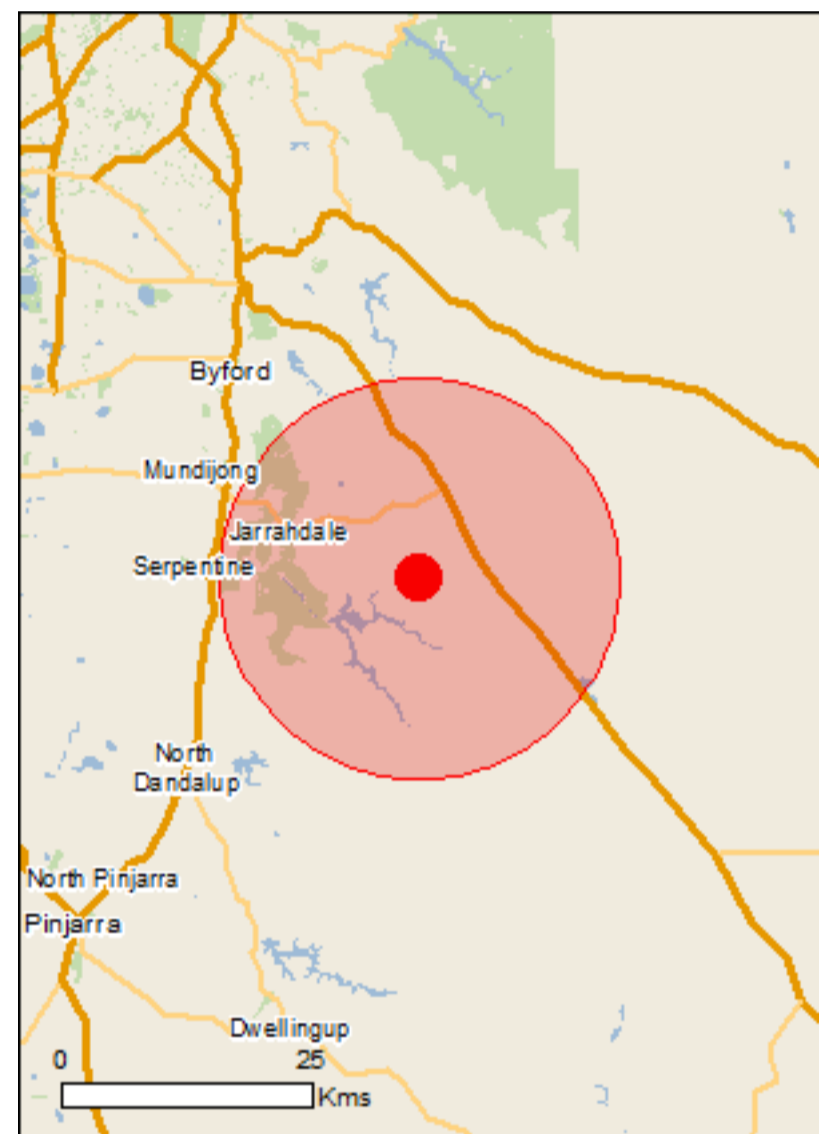
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

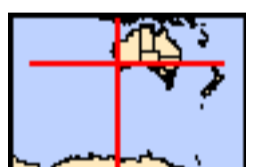
[Acknowledgements](#)



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[Coordinates](#)

Buffer: 20.0Km



Summary

Matters of National Environmental Significance

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

| | |
|---|------|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | 1 |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 2 |
| Listed Threatened Species: | 27 |
| Listed Migratory Species: | 8 |

Other Matters Protected by the EPBC Act

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

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

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

| | |
|--|------|
| Commonwealth Land: | 1 |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 14 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

Extra Information

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

| | |
|--|------|
| State and Territory Reserves: | 7 |
| Regional Forest Agreements: | 1 |
| Invasive Species: | 38 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)

[\[Resource Information \]](#)

| Name | Proximity |
|--------------------------------------|--------------------|
| Peel-yalgorup system | 20 - 30km upstream |

Listed Threatened Ecological Communities

[\[Resource Information \]](#)

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

| Name | Status | Type of Presence |
|--|-----------------------|---------------------------------------|
| . | Critically Endangered | Community may occur within area |
| Banksia Woodlands of the Swan Coastal Plain ecological community | Endangered | Community likely to occur within area |

Listed Threatened Species

[\[Resource Information \]](#)

| Name | Status | Type of Presence |
|--|-----------------------|--|
| Birds | | |
| Botaurus poiciloptilus Australasian Bittern [1001] | Endangered | Species or species habitat may occur within area |
| Calidris ferruginea Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034] | Vulnerable | Species or species habitat known to occur within area |
| Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769] | Endangered | Breeding known to occur within area |
| Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523] | Endangered | Species or species habitat known to occur within area |
| Leipoa ocellata Malleefowl [934] | Vulnerable | Species or species habitat known to occur within area |
| Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Rostratula australis Australian Painted Snipe [77037] | Endangered | Species or species habitat likely to occur within area |
| Mammals | | |
| Bettongia penicillata ogilbyi Woylie [66844] | Endangered | Species or species habitat known to occur within area |

| Name | Status | Type of Presence |
|---|-----------------------|--|
| Dasyurus geoffroii Chuditch, Western Quoll [330] | Vulnerable | Species or species habitat known to occur within area |
| Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911] | Critically Endangered | Species or species habitat may occur within area |
| Setonix brachyurus Quokka [229] | Vulnerable | Species or species habitat known to occur within area |
| Other | | |
| Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266] | Vulnerable | Species or species habitat known to occur within area |
| Plants | | |
| Anthocercis gracilis Slender Tailflower [11103] | Vulnerable | Species or species habitat may occur within area |
| Diuris micrantha Dwarf Bee-orchid [55082] | Vulnerable | Species or species habitat known to occur within area |
| Diuris purdiei Purdie's Donkey-orchid [12950] | Endangered | Species or species habitat likely to occur within area |
| Drakaea elastica Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753] | Endangered | Species or species habitat likely to occur within area |
| Eleocharis keigheryi Keighery's Eleocharis [64893] | Vulnerable | Species or species habitat may occur within area |
| Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816] | Endangered | Species or species habitat may occur within area |
| Grevillea flexuosa Zig Zag Grevillea [2957] | Vulnerable | Species or species habitat likely to occur within area |
| Lasiopetalum pterocarpum Wing-fruited Lasiopetalum [64922] | Endangered | Species or species habitat known to occur within area |
| Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881] | Critically Endangered | Species or species habitat likely to occur within area |
| Synaphea sp. Serpentine (G.R. Brand 103) [86879] | Critically Endangered | Species or species habitat may occur within area |
| Tetraria australiensis Southern Tetraria [10137] | Vulnerable | Species or species habitat likely to occur within area |
| Thelymitra dedmaniarum Cinnamon Sun Orchid [65105] | Endangered | Species or species habitat may occur within area |
| Thelymitra stellata Star Sun-orchid [7060] | Endangered | Species or species habitat may occur within area |
| Verticordia fimbrileps subsp. fimbrileps Shy Featherflower [24631] | Endangered | Species or species habitat known to occur |

| Name | Status | Type of Presence within area |
|--|-----------------------|--|
| Listed Migratory Species | | [Resource Information] |
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | | |
| Name | Threatened | Type of Presence |
| Migratory Marine Birds | | |
| Apus pacificus Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Migratory Terrestrial Species | | |
| Motacilla cinerea Grey Wagtail [642] | | Species or species habitat may occur within area |
| Migratory Wetlands Species | | |
| Actitis hypoleucos Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus Osprey [952] | | Species or species habitat likely to occur within area |

Other Matters Protected by the EPBC Act

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

| Listed Marine Species | | [Resource Information] |
|--|------------|--|
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | | |
| Name | Threatened | Type of Presence |
| Birds | | |
| Actitis hypoleucos Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Apus pacificus Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea alba Great Egret, White Egret [59541] | | Species or species habitat likely to occur within area |
| Ardea ibis Cattle Egret [59542] | | Species or species |

| Name | Threatened | Type of Presence |
|---|-----------------------|---|
| Calidris acuminata Sharp-tailed Sandpiper [874] | | habitat may occur within area Species or species habitat may occur within area |
| Calidris ferruginea Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Haliaeetus leucogaster White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Merops ornatus Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Motacilla cinerea Grey Wagtail [642] | | Species or species habitat may occur within area |
| Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area |
| Pandion haliaetus Osprey [952] | | Species or species habitat likely to occur within area |
| Rostratula benghalensis (sensu lato) Painted Snipe [889] | Endangered* | Species or species habitat likely to occur within area |
| Thinornis rubricollis Hooded Plover [59510] | | Species or species habitat may occur within area |

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

| Name | State |
|-------------------------------|-------|
| Gooralong | WA |
| Karnet | WA |
| Monadnocks | WA |
| NTWA Bushland covenant (0011) | WA |
| NTWA Bushland covenant (0076) | WA |
| Serpentine | WA |
| Unnamed WA50643 | WA |

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

| Name | State |
|-----------------------------------|-------------------|
| South West WA RFA | Western Australia |

Invasive Species [\[Resource Information \]](#)

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

| Name | Status | Type of Presence |
|--|--------|--------------------|
| Birds | | |
| Acridotheres tristis Common Myna, Indian Myna [387] | | Species or species |

| Name | Status | Type of Presence |
|--|--------|---|
| Anas platyrhynchos Mallard [974] | | habitat likely to occur within area Species or species habitat likely to occur within area |
| Carduelis carduelis European Goldfinch [403] | | Species or species habitat likely to occur within area |
| Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Passer domesticus House Sparrow [405] | | Species or species habitat likely to occur within area |
| Passer montanus Eurasian Tree Sparrow [406] | | Species or species habitat likely to occur within area |
| Streptopelia chinensis Spotted Turtle-Dove [780] | | Species or species habitat likely to occur within area |
| Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781] | | Species or species habitat likely to occur within area |
| Sturnus vulgaris Common Starling [389] | | Species or species habitat likely to occur within area |
| Turdus merula Common Blackbird, Eurasian Blackbird [596] | | Species or species habitat likely to occur within area |
| Mammals | | |
| Bos taurus Domestic Cattle [16] | | Species or species habitat likely to occur within area |
| Canis lupus familiaris Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Capra hircus Goat [2] | | Species or species habitat likely to occur within area |
| Felis catus Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129] | | Species or species habitat likely to occur within area |
| Mus musculus House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus norvegicus Brown Rat, Norway Rat [83] | | Species or species habitat likely to occur within area |
| Rattus rattus Black Rat, Ship Rat [84] | | Species or species |

| Name | Status | Type of Presence |
|--|--------|--|
| <p>Sus scrofa Pig [6]</p> | | <p>habitat likely to occur within area</p> <p>Species or species habitat likely to occur within area</p> |
| <p>Vulpes vulpes Red Fox, Fox [18]</p> | | <p>Species or species habitat likely to occur within area</p> |
| Plants | | |
| <p>Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Brachiaria mutica Para Grass [5879]</p> | | <p>Species or species habitat may occur within area</p> |
| <p>Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]</p> | | <p>Species or species habitat may occur within area</p> |
| <p>Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]</p> | | <p>Species or species habitat may occur within area</p> |
| <p>Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Genista sp. X Genista monspessulana Broom [67538]</p> | | <p>Species or species habitat may occur within area</p> |
| <p>Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Lycium ferocissimum African Boxthorn, Boxthorn [19235]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Olea europaea Olive, Common Olive [9160]</p> | | <p>Species or species habitat may occur within area</p> |
| <p>Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]</p> | | <p>Species or species habitat may occur within area</p> |
| <p>Rubus fruticosus aggregate Blackberry, European Blackberry [68406]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]</p> | | <p>Species or species habitat likely to occur within area</p> |
| <p>Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple,</p> | | <p>Species or species habitat likely to occur within area</p> |

| Name | Status | Type of Presence |
|---|--------|--|
| Silverleaf-nettle, Trompillo [12323] | | |
| Tamarix aphylla | | |
| Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018] | | Species or species habitat likely to occur within area |
| Reptiles | | |
| Hemidactylus frenatus | | |
| Asian House Gecko [1708] | | Species or species habitat likely to occur within area |

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.37319 116.18017

Acknowledgements

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- [-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.

Appendix D

Fauna field data

Fauna likelihood of occurrence assessment guideline and definitions

Fauna likelihood of occurrence assessment

Combined phase species list

Phase 1 survey data

Phase 2 survey data

Trap Line habitat assessment

Results from bird acoustic analysis

Results from bat acoustic analysis

Carters Freshwater Mussel transect data

Rakali transect data

Species recorded from studies and database searches

The table presents all vertebrate fauna species recorded in previous studies within or in proximity to the Survey Area, and database searches within a 20 kilometre radius of the Survey Area.

Fauna likelihood of occurrence assessment guidelines

| Assessment outcome | Description |
|--------------------|--|
| Known | Species recorded during the field survey or from recent, reliable records from within or close proximity to the Survey Area. |
| Likely | Species are likely to occur in the Survey Area where there is suitable habitat within the Survey Area and there are recent records of occurrence of the species in close proximity to the Survey Area. OR Species known distribution overlaps with the Survey Area and there is suitable habitat within the Survey Area. |
| Unlikely | Species assessed as unlikely include those species previously recorded within 40 km of the Survey Area however: There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the Survey Area. The suitable habitat within the Survey Area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the Survey Area. OR Those species that have a known distribution overlapping with the Survey Area however: There is limited habitat in the Survey Area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). The suitable habitat within the Survey Area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the Survey Area. |
| Highly unlikely | Species that are considered highly unlikely to occur in the Survey Area include: Those species that have no suitable habitat within the Survey Area. Those species that have become locally extinct, or are not known to have ever been present in the region of the Survey Area. |

Source information - desktop searches

NM – DBCA *NatureMap* (accessed May 2020)

PMST – DAWE Protected Matters Search Tool (PMST) to identify fauna listed under the EPBC Act potentially occurring within the Survey Area (accessed June 2020)

Definitions

| Term | Description |
|----------------------|---|
| Database search area | a 10 km buffer around the Survey Area |
| Survey Area | the area subject to the current survey |
| CR | Critically endangered under the EPBC Act or BC Act |
| EN | Endangered under the EPBC Act or BC Act |
| VU | Vulnerable under the EPBC Act or BC Act |
| IA | Migratory birds protected under an international agreement |
| MI, MA | Migratory, Marine |
| CD | Conservation dependent fauna |
| OS | Other specially protected fauna under the BC Act |
| P1 | Priority 1: Poorly known fauna. Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey. |
| P2 | Priority 2: Poorly known species. Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey. |
| P3 | Priority 3: Poorly known species. Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey. |
| P4 | Priority 4: Rare, Near Threatened and other species in need of monitoring. (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy. |

Fauna likelihood of occurrence assessment of conservation significant species identified in the desktop assessment as potentially occurring within the Survey Area.

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|---------------------------|-------------------|--------|---------|-----------|------|-----------------------|--|---|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| Birds | | | | | | | | |
| <i>Actitis hypoleucos</i> | Common Sandpiper | MI | MI | | X | | Habitat for the Common Sandpiper is varied: coastal and interior wetlands – narrow muddy edges of billabongs, river pools, mangroves, among rocks and snags, reefs or rocky beaches. Avoids wide open mudflats. This species is widespread and scattered, common on the north and west coasts and uncommon in the south-east and interior (Morcombe 2004). | Unlikely Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species. However, the species may occasionally occur along the shore of the nearby Serpentine Dam. Occurrence within the Survey Area would be as a vagrant at best. |
| <i>Apus pacificus</i> | Fork-tailed Swift | MI | MI | | X | | In Western Australia, there are sparsely scattered records of the Fork-tailed Swift along the south coast, ranging from near the Eyre Bird Observatory and west to Denmark. They are widespread in coastal and subcoastal areas between Augusta and Carnarvon, including some on nearshore and offshore islands. They are scattered along the coast from south-west Pilbara to the north and east Kimberley region, near Wyndham. There are sparsely scattered inland records, especially in the Wheatbelt, from Lake Annean and Wittenoom. They are found in the north and north-west Gascoyne Region, north through much of the Pilbara Region, and the south and east Kimberley. They are also recorded in the Timor Sea, both at sea and around islands such as the Ashmore Reef. Isolated records occur at Neale Junction in the Great Victoria Desert and on the Nullarbor Plain (Higgins 1999). | Unlikely Suitable habitat is not available to support this species however the species may occasionally occur in the Survey Area as a vagrant. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|--------------------------------------|----------------------|--------|---------|-----------|------|-----------------------|--|---|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Atrichornis clamosus</i> | Noisy Scrub-bird | EN | EN | X | | | The Noisy Scrub-bird inhabits areas with dense understorey or lower stratum of sedges and shrubs, dense leaf litter and abundant litter-dwelling invertebrates. It mainly occurs in low closed forests 5–15 m in height that are dominated by <i>Eucalyptus</i> or <i>Agonis</i> and <i>Banksia littoralis</i> , and occur in the steep and wetter gullies, and drainage lines of hills and granite mountains (<i>Eucalyptus</i>), and on the margins of freshwater lakes (<i>Agonis</i> and <i>B. littoralis</i>). It is also common in low closed forests up to 5 m in height that are dominated by <i>Hakea elliptica</i> , <i>Eucalyptus</i> or <i>Agonis</i> and <i>B. littoralis</i> and occur around granite outcrops, in shallower and drier gullies and on the margins of freshwater lakes. It mostly occurs at sites that have not been burnt for 10 or more years. It occurs at two locations in the south west; on the mainland in coastal areas from Two Peoples Bay Nature Reserve to Cheyne Beach, and on Bald Island (DAWE 2021a). | Unlikely Previously known from small populations in the Jarrah Forest however this population is now considered locally extinct. |
| <i>Botaurus poiciloptilus</i> | Australasian Bittern | EN | EN | | X | | The Australasian Bittern occurs mainly in densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands. The species favours foraging in tall, dense vegetation in shallow permanent or seasonal fresh water. In the southwest of Western Australia the Bittern is now largely confined to coastal areas especially along the south coast where it is found in beds of tall rush mixed with or near short fine sedge or open pools (Burbidge 2004). It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum <i>Muehlenbeckia</i> , canegrass <i>Eragrostis</i> or other dense vegetation (Marchant & Higgins 1990). It occasionally ventures into areas of open water or onto banks. | Unlikely Suitable habitat such as expansive wetland with emergent native reeds is not available to support this species however the Survey Area borders habitat which may be suitable (Serpentine Dam) and the species may occur in the Survey Area as a vagrant. |
| <i>Cacatua pastinator pastinator</i> | Muir's Corella | CD | | X | | X | Muir's Corella lives in woodland on the drier, eastern side of the main forest block in the south west, in woodlands that are dominated by Wandoo (<i>E. wandoo</i>), Marri, (<i>Corymbia calophylla</i>), or Jarrah, (<i>Eucalyptus marginata</i>). Most suitable habitat for this species now consists of remnant patches that occur in or adjacent to farmland, or along roadsides, paddock boundaries or watercourses, and sometimes as a few, isolated shade trees in otherwise cleared paddocks (Garnett & Crowley 2000). The bird nests in large hollows in trees at least 160 years old. Its now has a restricted distribution in the Tone Bridge, Rocky Gully, Frankland River and Lake Muir area (TSSC 2016). | Highly unlikely This species is not known from the region. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|---------------------------|------------------------|--------|---------|-----------|------|-----------------------|--|--|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Calidris acuminata</i> | Sharp-tailed Sandpiper | MI | MI | | X | | In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. Sometimes they occur on rocky shores (DAWE 2021b). They are found throughout many wetlands on the Swan Coastal Plain, in Perth lakes with wet grassed margins and receding waters, Vasse and Harvey Estuaries, and the Busselton wetlands, but are less common on the south coast until the Esperance region (Nevill 2013). | Unlikely Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species. However, the species may occasionally occur along the shore of the nearby Serpentine Dam. Occurrence within the Survey Area would be as a vagrant at best. |
| <i>Calidris canutus</i> | Red Knot | EN, MI | EN, MI | | X | | In Australasia the Red Knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (DAWE 2021b). They are found near mudflats and estuaries from Murchison to Bunbury but are then uncommon from Wilson Inlet to Esperance. In the Perth region they are mainly found in Alfred Cove and Peel Inlet (Nevill 2013). | Unlikely. Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species. However, the species may occasionally occur along the shore of the nearby Serpentine Dam. Occurrence within the Survey Area would be as a vagrant at best. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|----------------------------|--------------------|--------|---------|-----------|------|-----------------------|---|---|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Calidris ferruginea</i> | Curlew Sandpiper | MI | MI | | X | | Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (DAWE 2020). | Unlikely Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species. However, the species may occasionally occur along the shore of the nearby Serpentine Dam. Occurrence within the Survey Area would be as a vagrant at best. |
| <i>Calidris melanotos</i> | Pectoral Sandpiper | MI | MI | | X | | In Australia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum (DAWE 2021e). The bird can be seen on the Swan Coastal Plain but is rare to scarce on Lake Thompson, and as well on any freshwater wetland in the southwest with shallow, well-grassed margins. They are seen at Lake Warden, Esperance, and at Lake McLarty (Nevill 2013). | Unlikely Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species. However, the species may occasionally occur along the shore of the nearby Serpentine Dam. Occurrence within the Survey Area would be as a vagrant at best. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|-------------------------------------|----------------------------------|--------|---------|-----------|------|-----------------------|--|--|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Calyptorhynchus banksii naso</i> | Forest Red-tailed Black Cockatoo | VU | VU | X | X | X | The Forest Red-tailed Black Cockatoo inhabits the dense Jarrah, karri, and Marri forests receiving more than 600 mm annual average rainfall but also occurs in a range of other forest and woodland types, including Blackbutt (<i>E. patens</i>), Wandoo (<i>E. wandoo</i>), Tuart (<i>E. gomphocephala</i>), Albany Blackbutt (<i>E. staeri</i>), Yate (<i>E. cornuta</i>), and Flooded Gum (<i>E. rudis</i>) (DAWE 2021c). Habitats tend to have an understorey of balga (<i>Xanthorrhoea</i> spp.), kingia (<i>Kingia australis</i>), snottygobble (<i>Persoonia</i> spp.), parrot bush (<i>Banksia sessilis</i>), holly-leaved mirbelia (<i>Mirbelia dilatata</i>), bull banksia (<i>B. grandis</i>), bullich (<i>Taxandria</i> spp.) and sheoak (<i>Allocasuraina fraseriana</i>). They are most common in the Jarrah forest region of the northern Darling Range from Collie north to Mundaring and are very local throughout the lower south-west. They can be found on the Swan Coastal Plain, mainly in search of food the exotic white cedar (<i>Melia azedarach</i>). There are also several small isolated populations in the eastern parts of its range (DAWE 2021c). | Known This species was recorded during both phases of the survey. The Survey Area contains suitable breeding and foraging habitat to support this species. |
| <i>Calyptorhynchus baudinii</i> | Baudin's Black Cockatoo | EN | EN | X | X | X | Baudin's Black Cockatoo mainly occurs in eucalypt forests, especially Jarrah, Marri and karri forest that receives 750 mm of annual rainfall. The species is less frequently in woodlands of wandoo (<i>Eucalyptus wandoo</i>), blackbutt (<i>E. patens</i>), flooded gum (<i>E. rudis</i>), yate (<i>E. cornuta</i>), partly cleared farmlands and urban areas. The range of the species extends from Albany northward to Gidgegannup and Mundaring (east of Perth), and inland to the Stirling Ranges and near Kojonup. Preferred roosts are in areas with a dense canopy close to permanent sources of water (DAWE 2021d). | Known This species was recorded during both phases of the survey. The Survey Area contains suitable breeding and foraging habitat to support this species. |
| <i>Calyptorhynchus latirostris</i> | Carnaby's Black Cockatoo | EN | EN | X | X | X | Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain salmon gum, wandoo, Marri, Jarrah and karri, and in shrubland or kwongan heathland dominated by Hakea, Dryandra, Banksia and Grevillea species. Breeding activity is restricted to eucalypt woodlands mainly in the semiarid and subhumid interior, from Kalbarri in the north, Three Springs District south to the Stirling Range, west to Cockleshell Gully and east to Manmanning. The species has expanded 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, including the Yanchep area, Lake Clifton and near Bunbury. It nests in trees older than 120-150 years (DAWE 2021e). | Known This species was recorded during both phases of the survey. The Survey Area contains suitable breeding and foraging habitat to support this species. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|----------------------------------|------------------|--------|---------|-----------|------|-----------------------|---|--|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Falco peregrinus</i> | Peregrine Falcon | OS | | X | | X | The Peregrine Falcon is found on and near cliffs, gorges, timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings, though less frequently in desert regions (Morcombe 2004; Pizzey & Knight 2012). They are not common but can be found almost anywhere throughout WA and in the southwest, including particularly at Fitzgerald River, Stirling Range, Porongurup National Parks, Kondinin, and Peak Charles, with many more locations north of Perth (Nevill 2013). | Known One individual of this species was recorded during the Phase 2 survey and suitable habitat is available within the Survey Area. |
| <i>Leipoa ocellata</i> | Malleefowl | VU | VU & MI | X | X | X | The Malleefowl generally occurs in semi-arid areas of Western Australia, in shrublands and low woodlands that are dominated by mallee vegetation, as well as native pine <i>Callitris</i> woodlands, <i>Acacia</i> shrublands, paperbark, sheoak, Broombush <i>Melaleuca uncinata</i> vegetation, eucalypt woodlands, or coastal heathlands. Mostly they are found where there are sandy or gravel soils. The nest is a large mound of sand or soil and organic matter (Jones & Goth 2008; Morcombe 2004; Nevill 2013). In WA they are found from the southwest Nullarbor to Albany, north, and then west from Moore River up to Shark Bay, past Cue, across to Wiluna and east to the northern Victoria Desert south of the Blackstone Ranges (Nevill 2013; Pizzey & Knight 2012). | Highly unlikely The Survey Area does not contain suitable habitat to support this species. |
| <i>Motacilla cinerea</i> | Grey Wagtail | MI | MI | | X | | The Grey Wagtail is strongly associated with water, particularly rocky substrates along water courses but also lakes and marshes. It breeds from Western Europe to Asia, migrates to Africa, Malaysia, Indonesia and New Guinea. In the nonbreeding season the species may visit northern Australia and Christmas Island (Pizzey & Knight 2012) | Highly Unlikely This species does not frequent southern Australia and is not considered likely to be vagrant within the Survey Area. |
| <i>Numenius madagascariensis</i> | Eastern Curlew | CR | CR & MI | X | X | | The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, sometimes within the mangroves, and in coastal saltworks and sewage farms. In the south west, Eastern Curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet (Marchant & Higgins 1993). They are uncommon further south of | Unlikely Suitable habitat such as open shallow flood plain or tidal mud flat is not present to support this species. However, the species may occasionally occur along the shore of the nearby Serpentine Dam. Occurrence within the |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|--|-----------------------------|--------|---------|-----------|------|-----------------------|---|---|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| | | | | | | | Geraldton, but can be spotted in Alfred Cove, Peel Inlet and the Albany region (Nevill 2013). | Survey Area would be as a vagrant at best. |
| <i>Pandion haliaetus</i> | Osprey | MI | MI | | X | | Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range but may also occur on low sandy, muddy or rocky shores and over coral cays. They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging (DSEWPaC 2016) | Unlikely Suitable habitat such as open estuarine inlets or lakes is not available to support this species however the Survey Area borders habitat which may be suitable (Serpentine Dam) and the species may occur in the Survey Area as a vagrant. |
| <i>Rostratula australis</i> | Australian Painted Snipe | EN | EN | | X | | The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Australian Painted Snipe breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. The species rarely occurs in south-western Australia, where it was once more common (Marchant & Higgins 1993; Garnett & Crowley 2000). | Unlikely Suitable habitat is not available to support this species however the Survey Area borders habitat which may be suitable (Serpentine Dam) and the species may occur in the Survey Area as a vagrant. |
| <i>Tyto novaehollandiae subsp. novaehollandiae</i> | Masked Owl (southern subsp) | P3 | | X | | X | The Masked Owl is found in forests (wet and dry sclerophyll, non-eucalypt dominated), open woodlands, farmlands or scrub with large trees (12-20 m) and adjacent cleared country, timbered watercourses, paperbark woodlands, and caves (Pizzey & Knight 2012). It requires large hollows in old growth eucalypts or bare sand or the earth of a cave for nesting, and often favours areas with dense understorey or ecotones comprising dense and sparse ground cover. It is often recorded foraging within 100-300 m of the boundary of two vegetation types (Bell & Mooney 2002). The bird is restricted to the thicker humid forests of the south west region, particularly in the Pemberton and Manjimup area and along the Murray River in the Lane Poole area. It nests in hollows in large Karri (<i>Eucalyptus diversicolor</i>), Marri (<i>Corymbia calophylla</i>) and Jarrah (<i>E. marginata</i>) trees (Nevill 2013). | Known This species was detected at two locations within the Survey Area during the Phase 1 survey. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|--------------------------------------|---------------------------|--------|---------|-----------|------|-----------------------|---|--|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| Mammals | | | | | | | | |
| <i>Falsistrellus mackenziei</i> | Western False Pipistrelle | P4 | | X | | X | The Western False Pipistrelle occurs in wet sclerophyll forest dominated by Karri (<i>Eucalyptus diversicolor</i>), and in the high rainfall zones of the Jarrah (<i>E. marginata</i>) and Tuart (<i>E. gomphocephala</i>) dry sclerophyll forests. The species is restricted to areas in or adjacent to stands of old growth forest. It has also been recorded in mixed Tuart-Jarrah tall woodlands on the adjacent coastal plain. Marri (<i>Corymbia calophylla</i>), Sheoak (<i>Casuarina heugeliana</i>) and Peppermint (<i>Agonis flexuosa</i>) trees are often co-dominant at its collection localities (Churchill 2008; McKenzie & Start 1999). | Known This species was recorded on bat detectors during both Phase 1 and Phase 2 surveys and suitable habitat is available to support this species. |
| <i>Bettongia penicillata ogilbyi</i> | Woylie | CR | EN | X | X | X | Preferred habitat for the Woylie includes dense undergrowth, logs and rock-cavities and occasionally in burrows (Burbidge 2004). Scattered Woylie populations may be found throughout the Jarrah forest in the south-west corner of WA. Extant naturally occurring populations of the species are restricted to three small wheatbelt reserves – Dryandra Woodland, Tutanning Nature Reserve and Perup Forest. All are characterised by the presence of thickets of the plant <i>Gastrolobium</i> (Van Dyck and Strahan 2008). The species is now restricted to forests and areas where predation has been controlled (or excluded). It rests during the day in a well-concealed nest, built over a shallow depression. The nest is most commonly built using long strands, of grasses, but other material such as strips of bark are also used (in the forest) or dried seagrass and/or triodia (in arid coastal areas) (Freegard 2007). | Unlikely Suitable habitat is present within the Survey Area however the species is not expected to occur within, or vagrant to, the Survey Area due to the presence of predators such as foxes and cats. |
| <i>Dasyurus geoffroii</i> | Chuditch | VU | VU | X | X | X | The Chuditch inhabits eucalypt forest (especially Jarrah, <i>Eucalyptus marginata</i>), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. They also occur at lower densities in drier woodland and mallee shrubland in the goldfields and wheatbelt, as well as in Kalbarri National Park (translocated). Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) to survive (DEC 2011b). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest (Van Dyck & Strahan 2008). The species can travel large distances, and for this reason requires habitats that are of a suitable size and not excessively fragmented. | Known This species was recorded during the survey on two remote cameras. The Survey Area provides suitable denning and foraging/hunting habitat to support this species. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|-----------------------------------|-------------------------|--------|---------|-----------|------|-----------------------|---|---|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Hydromys chrysogaster</i> | Rakali, Water-rat | P4 | | X | | X | The Water Rat lives in the vicinity of permanent bodies of fresh, brackish, or marine water, lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. In the south-west of WA they have been shown to prefer areas with riparian vegetation, better water quality and a degree of habitat complexity. Woody debris, rock ledges and wetland islands are likely to be important areas for feeding and refuge (DEC 2012). It is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck & Strahan 2008). | Known This species was recorded on one remote camera deployed on a flowing stream section of Big Brook that bisects the proposed conveyor location. |
| <i>Phascogale calura</i> | Red-tailed Phascogale | CD | VU | | X | | The Red-tailed Phascogale inhabits Wandoo (<i>Eucalyptus wandoo</i>) and dense Sheoak (<i>Allocasuarina huegeliana</i>) woodland associations, with populations being most dense in the latter vegetation type. The species prefers vegetation that is unburnt for a long time, which provides continuous canopy cover to assist their arboreal habits. Trees need to be of a sufficient age to provide hollows for nesting in limbs or logs, and grass trees need to have ample skirts to provide cover. Small, scattered populations still occur in remnant vegetation in the Wheatbelt (DEC 2007). | Unlikely. Not recorded during the survey. The Survey Area is beyond the known range of this species. |
| <i>Phascogale tapoatafa</i> | Brush Tailed Phascogale | CD | | | | X | The Brush-tailed Phascogale is sparsely distributed outside the semi-arid zone in dry sclerophyll forest and monsoonal forest and woodland. The species is generally rare and threatened by habitat fragmentation in the south west of Western Australia. | Known This species was detected at one remote camera within the south-eastern portion of the Survey Area and suitable habitat is available to support this species. |
| <i>Pseudocheirus occidentalis</i> | Western Ringtail Possum | CR | CR | X | X | | The Western Ringtail Possum occurs in coastal and near coastal and Peppermint Tree (<i>Agonis flexuosa</i>) forest and Tuart (<i>Eucalyptus gomphocephala</i>) dominated forest with a Peppermint Tree understorey from Bunbury to Albany. Also occurs in Jarrah (<i>E. marginata</i>) forest and Jarrah-Marri (<i>Corymbia calophylla</i>) forest associated with Peppermint Tree (Van Dyck & Strahan 2008). | Unlikely Suitable habitat Tuart over peppermint understorey is not present to support this species and the Study Area is beyond the current natural range of the species. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|------------------------------|-----------------------------------|--------|---------|-----------|------|-----------------------|--|--|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Isoodon fusciventer</i> | Quenda (Southern Brown Bandicoot) | P4 | | X | | X | The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck & Strahan 2008). | Known This species was recorded during the survey via both remote cameras, diggings and trapping. The Survey Area provides suitable breeding and foraging habitat to support this species. |
| <i>Myrmecobius fasciatus</i> | Numbat | EN | EN | X | | X | Current Numbat populations occupy several different habitat types: upland Jarrah forest, open eucalypt woodland, banksia woodland and tall closed shrubland. The only remaining original subpopulations are at Dryandra Woodland and the Upper Warren area (including Tone Perup Nature Reserve, Greater Kingston National Park and adjoining State Forest). In WA there are nine translocation sites, including Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve (see DPaW 2015 for complete list and details). At Dryandra, numbats inhabit brown mallet (<i>Eucalyptus astringens</i>) plantations. Habitats usually have an abundance of termites in the soil, and hollow logs, tree hollows, burrows and branches for shelter (DAWE 2021e; Van Dyck & Strahan 2008). | Highly unlikely Suitable habitat is not available to support this species. The Survey Area is outside the current known range of the Numbat however it has previously been recorded at Jarrahdale. |
| <i>Notamacropus irma</i> | Western Brush Wallaby | P4 | | X | | X | The Western Brush Wallaby is found primarily in open forest or woodland, particularly favouring open, seasonally- wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland and is uncommon in karri forest (DEC 2011b; Van Dyck & Strahan 2008). | Known This species was recorded numerous during the survey. The Survey Area provides suitable breeding and foraging habitat to support this species. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|--------------------------------|----------------------|--------|---------|-----------|------|-----------------------|--|---|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Setonix brachyurus</i> | Quokka | Vu | Vu | X | X | X | The current distribution of the Quokka includes Rottneest and Bald Islands, and at least 25 sites on the mainland, including Two Peoples Bay Nature Reserve and Torndirrup, Mt Manypeaks and Walpole-Nornalup National Parks, and swamp areas through the south-west forests from Jarrahdale to Walpole. The last known population on the Swan Coastal Plain occurs in Muddy Lakes near Bunbury. Quokkas have also been reintroduced to Karakamia Sanctuary (DEC 2013). They occupy dense forests and thickets, streamside vegetation, heaths, shrublands, <i>Agonis linearifolia</i> -dominated swamps in the Jarrah (<i>Eucalyptus marginata</i>) forest, and sometimes tea-tree thickets on sandy soils along creek systems. The northern extent on the mainland is in the Jarrah forest immediately south-east of the Perth metropolitan area, from where it extends southward through the southern Jarrah, Marri and Karri forests to the south coast, but largely confined throughout to areas receiving an annual rainfall of 1,000 mm or more (DEC 2013; Van Dyck & Strahan 2008). | Known This species was recorded during the survey on remote cameras. The Survey Area provided suitable breeding and foraging habitat to support this species. |
| Reptiles | | | | | | | | |
| <i>Acanthophis antarcticus</i> | Southern Death Adder | P3 | | X | | X | The Southern Death Adder habitat ranges from rainforest to shrublands and heaths. This species is declining in many areas, probably due to habitat destruction and altered fire regimes (Wilson & Swan 2013). | Known Two individuals were recorded during the Mattiske vegetation and flora survey (2020). |
| <i>Ctenotus delli</i> | Dell's Skink | P4 | | X | | X | Dell's Skink is associated with Jarrah-Marri woodland that has a shrub-dominated understorey, on laterite, sandy or clay soils. It is found in the north Darling Range and inhabits dry sclerophyll forest on granite outcrops, stony hills and ranges. It is absent from the Swan Coastal Plain (Cogger 2014; Wilson & Swan 2013). | Likely The Survey Area contains suitable breeding and foraging habitat to support this species however it was not detected during the surveys. |
| <i>Geotria australis</i> | Pouched Lamprey | P3 | | X | | | This species utilises freshwater streams in the south west (Perth to Albany) to breed and grow before migrating to the ocean to mature (Allen <i>et al.</i> 2002). Dams and weirs are the main obstacles for the species. Sporadic records exist throughout the South West Coast Drainage Division between Perth and Albany including the Swan, Canning, Serpentine, Margaret, Donnelly, Warren and Goodga rivers. | Highly Unlikely Permanent suitable habitat was not recorded during the survey and no creeks are linked to coastal water due to Serpentine Dam. |

| Species name | Common name | Status | | Source | | | Habitat requirements | Likelihood of occurrence |
|----------------------------|----------------------------|--------|---------|-----------|------|-----------------------|--|--|
| | | State | Federal | NatureMap | PMST | DBCA threatened fauna | | |
| <i>Westralunio carteri</i> | Carter's Freshwater Mussel | Vu | Vu | | X | | <p>Carter's Freshwater Mussel is usually found in freshwater river pools. They are most common in areas with muddy, silty and sandy bottoms and flowing permanent water. Environmental tolerances of <i>W. carteri</i> are not precisely known but they can be found where water temperatures range from 4° C to over 30° C. Formerly this species occurred widely through the southwest including interior rivers of southwest such as Avon, Murray and Blackwood, however Salination of many waterways has severely reduced this species distribution.</p> | <p>Known. Occurs in the adjacent Serpentine Reservoir however the Survey Area lacks adequate permanent streams to provide suitable aquatic habitat.</p> |

Combined Phase Species List

| Family | Scientific Name | Species | EPBC listing | DBCA listing | Phase 1 | Phase 2 |
|------------------|---------------------------------|-------------------------------|--------------|--------------|---------|---------|
| Mammals | | | | | | |
| Canidae | <i>Vulpes vulpes</i> | Fox | Int | Int | X | X |
| Dasyuridae | <i>Sminthopsis gilberti</i> | Gilberts Dunnart | | | X | X |
| Dasyuridae | <i>Phascogale tapoatafa</i> | Brush-tailed Phascogale | | CD | | X |
| Dasyuridae | <i>Antechinus flavipes</i> | Mardo | | | X | X |
| Dasyuridae | <i>Dasyurus geoffroii</i> | Chuditch | Vu | Vu | X | X |
| Felidae | <i>Felis catus</i> | Feral Cat | Int | Int | X | X |
| Leporidae | <i>Oryctolagus cuniculus</i> | European Rabbit | Int | Int | X | X |
| Macropodidae | <i>Notamacropus irma</i> | Western Brush Wallaby | | P4 | X | X |
| Macropodidae | <i>Macropus fuliginosus</i> | Western Grey Kangaroo | | | X | X |
| Macropodidae | <i>Setonix brachyurus</i> | Quokka | Vu | Vu | X | X |
| Molossidae | <i>Austronomus australis</i> | White-striped Free-tailed Bat | | | | X |
| Molossidae | <i>Ozimops kitcheneri</i> | South-western Free-tailed Bat | | | X | X |
| Muridae | <i>Hydromys chrysogaster</i> | Rakali | | P4 | X | |
| Muridae | <i>Mus musculus</i> | House Mouse | Int | Int | X | X |
| Muridae | <i>Rattus rattus</i> | Black Rat | Int | Int | X | X |
| Peramelidae | <i>Isoodon fusciventer</i> | Quenda | | P4 | X | X |
| Phalangeridae | <i>Trichosurus vulpecula</i> | Common Brushtail Possum | | | X | X |
| Suidae | <i>Sus scrofa</i> | Feral Pig | Int | Int | X | X |
| Tachyglossidae | <i>Tachyglossus aculeatus</i> | Short-beaked Echidna | | | X | X |
| Vespertilionidae | <i>Chalinolobus gouldii</i> | Gould's Wattled Bat | | | X | X |
| Vespertilionidae | <i>Chalinolobus morio</i> | Chocolate Wattled Bat | | | X | X |
| Vespertilionidae | <i>Falsistrellus mackenziei</i> | Western False Pipistrelle | | P4 | X | X |
| Vespertilionidae | <i>Vespadelus regulus</i> | Southern Forest Bat | | | X | X |
| Birds | | | | | | |
| Acanthizidae | <i>Acanthiza apicalis</i> | Inland Thornbill | | | X | X |

| Family | Scientific Name | Species | EPBC listing | DBCA listing | Phase 1 | Phase 2 |
|---------------|------------------------------------|----------------------------------|--------------|--------------|---------|---------|
| Acanthizidae | <i>Smicronis brevirostris</i> | Weebill | | | X | X |
| Acanthizidae | <i>Gergoyne fusca</i> | Western Gerygone | | | X | X |
| Acanthizidae | <i>Acanthiza inornata</i> | Western Thornbill | | | X | X |
| Acanthizidae | <i>Sericornis frontalis</i> | White-browed Scrubwren | | | X | X |
| Acanthizidae | <i>Acanthiza chrysorrhoa</i> | Yellow-rumped Thornbill | | | | X |
| Accipitridae | <i>Aquila audax</i> | Wedge-tailed Eagle | | | X | X |
| Accipitridae | <i>Accipiter fasciatus</i> | Brown Goshawk | | | | X |
| Aegothelidae | <i>Aegotheles cristatus</i> | Australian Owlet-nightjar | | | | X |
| Alcedinidae | <i>Dacelo novaeguineae</i> | Laughing Kookaburra | | Int | X | X |
| Alcedinidae | <i>Todiramphus sanctus</i> | Sacred Kingfisher | | | | X |
| Anatidae | <i>Chenonetta jubata</i> | Australian Wood Duck | | | X | X |
| Anatidae | <i>Anas superciliosa</i> | Pacific Black Duck | | | X | |
| Artamidae | <i>Cracticus torquatus</i> | Grey Butcherbird | | | X | X |
| Artamidae | <i>Strepera versicolor</i> | Grey Currawong | | | X | X |
| Artamidae | <i>Cracticus tibicen</i> | Australian Magpie | | | X | X |
| Artamidae | <i>Artamus cinereus</i> | Black-faced Wood Swallow | | | | X |
| Artamidae | <i>Artamus cyanopterus</i> | Dusky Woodswallow | | | | X |
| Cacatuidae | <i>Calyptorhynchus baudinii</i> | Baudin's Cockatoo | En | En | X | X |
| Cacatuidae | <i>Calyptorhynchus latirostris</i> | Carnaby's Cockatoo | En | En | X | X |
| Cacatuidae | <i>Calyptorhynchus banksii</i> | Forest Red-tailed Black Cockatoo | Vu | Vu | X | X |
| Cacatuidae | <i>Eolophus roseicapilla</i> | Galah | | | | X |
| Campephagidae | <i>Coracina novaehollandiae</i> | Black-faced Cuckoo-shrike | | | X | X |
| Casuariidae | <i>Dromaius novaehollandiae</i> | Emu | | | X | X |
| Charadriidae | <i>Vanellus tricolor</i> | Banded Lapwing | | | X | |
| Climacteridae | <i>Climacteris rufus</i> | Rufous Tree Creeper | | | X | X |
| Climacteridae | <i>Climacteris affinis</i> | White-browed Treecreeper | | | | X |
| Columbidae | <i>Phaps elegans</i> | Brush Bronzewing | | | X | |

| Family | Scientific Name | Species | EPBC listing | DBCA listing | Phase 1 | Phase 2 |
|-----------------|--------------------------------------|--------------------------|--------------|--------------|---------|---------|
| Columbidae | <i>Phaps chalcoptera</i> | Common Bronzewing | | | X | X |
| Corvidae | <i>Corvus coronoides</i> | Australian Raven | | | X | X |
| Corvidae | <i>Corvus bennetti</i> | Little Crow | | | X | |
| Cuculidae | <i>Cacomantis flabelliformis</i> | Fan-tailed Cuckoo | | | X | |
| Cuculidae | <i>Chrysococcyx lucidus</i> | Shining Bronze-cuckoo | | | | X |
| Dicaeidae | <i>Dicaeum hirundinaceum</i> | Mistletoebird | | | X | |
| Estrildidae | <i>Stagonopleura oculata</i> | Red-eared Firetail Finch | | | | X |
| Falconidae | <i>Falco peregrinus</i> | Peregrine Falcon | | OS | | X |
| Hirundinidae | <i>Petrochelidon ariel</i> | Fairy Martin | | | X | |
| Hirundinidae | <i>Petrochelidon nigricans</i> | Tree Martin | | | X | X |
| Locustellidae | <i>Megalurus cruralis</i> | Brown Songlark | | | X | |
| Maluridae | <i>Malurus elegans</i> | Red-winged Fairywren | | | X | X |
| Maluridae | <i>Malurus splendens</i> | Splendid Fairywren | | | X | X |
| Maluridae | <i>Stipiturus malachurus</i> | Southern Emu-wren | | | X | |
| Meliphagidae | <i>Phylidonyris novaehollandiae</i> | New Holland Honeyeater | | | X | X |
| Meliphagidae | <i>Anthochaera carunculata</i> | Red Wattlebird | | | X | X |
| Meliphagidae | <i>Acanthorhynchus superciliosus</i> | Western Spinebill | | | X | X |
| Meliphagidae | <i>Lichmera indistincta</i> | Brown Honeyeater | | | | X |
| Meliphagidae | <i>Melithreptus brevirostris</i> | Brown-headed Honeyeater | | | | X |
| Meliphagidae | <i>Lichenostomus virescens</i> | Singing Honeyeater | | | | X |
| Meliphagidae | <i>Anthochaera lunulata</i> | Western Wattlebird | | | | X |
| Meliphagidae | <i>Melithreptus lunatus</i> | White-napped Honeyeater | | | | X |
| Meropidae | <i>Merops ornatus</i> | Rainbow Bee-eater | | | | X |
| Monarchidae | <i>Myiagra inquieta</i> | Restless Flycatcher | | | X | |
| Monarchidae | <i>Grallina cyanoleuca</i> | Magpie-lark | | | | X |
| Neosittidae | <i>Daphoenositta chrysoptera</i> | Varied Sitella | | | | X |
| Pachycephalidae | <i>Pachycephala occidentalis</i> | Western Whistler | | | X | X |

| Family | Scientific Name | Species | EPBC listing | DBCA listing | Phase 1 | Phase 2 |
|-------------------|------------------------------------|----------------------------|--------------|--------------|---------|---------|
| Pachycephalidae | <i>Colluricincla harmonica</i> | Grey Strike Thrush | | | X | X |
| Pachycephalidae | <i>Pachycephala rufiventris</i> | Rufous Whistler | | | X | X |
| Pardalotidae | <i>Pardalotus punctatus</i> | Spotted Pardalote | | | | X |
| Pardalotidae | <i>Pardalotus striatus</i> | Striated Pardalote | | | | X |
| Petroicidae | <i>Petroica boodang</i> | Scarlet Robin | | | X | X |
| Petroicidae | <i>Eopsaltria griseogularis</i> | Western Yellow Robin | | | X | X |
| Petroicidae | <i>Eopsaltria georgiana</i> | White-breasted Robin | | | X | X |
| Podargidae | <i>Podargus strigoides</i> | Tawny Frogmouth | | | X | X |
| Psittaculidae | <i>Platycercus zonarius</i> | Australian Ringneck Parrot | | | X | X |
| Psittaculidae | <i>Purpureicephalus spurius</i> | Red-capped Parrot | | | X | X |
| Psittaculidae | <i>Platycercus icterotis</i> | Western Rosella | | | X | X |
| Psittaculidae | <i>Neophema elegans</i> | Elegant Parrot | | | | X |
| Psittaculidae | <i>Parvipsitta porphyrocephala</i> | Purple-crowned Lorikeet | | | | X |
| Psittaculidae | <i>Trichoglossus moluccanus</i> | Rainbow Lorikeet | | Int | | X |
| Rallidae | <i>Fulica atra</i> | Eurasian coot | | | X | |
| Rhipiduridae | <i>Rhipidura albiscapa</i> | Grey Fantail | | | X | X |
| Strigidae | <i>Ninox boobook</i> | Southern Boobook | | | X | X |
| Threskiornithidae | <i>Threskiornis spinicollis</i> | Straw-necked Ibis | | | | X |
| Turnicidae | <i>Turnix varius</i> | Painted Button Quail | | | X | X |
| Tytonidae | <i>Tyto novaehollandiae</i> | Masked Owl | | P3 | X | |
| Zosteropidae. | <i>Zosterops lateralis</i> | Silvereye | | | X | X |
| Reptiles | | | | | | |
| Agamidae | <i>Ctenophorus ornatus</i> | Ornate Crevice-dragon | | | X | X |
| Agamidae | <i>Pogona minor</i> | Western Bearded Dragon | | | | X |
| Boidae | <i>Morelia spilota</i> | Carpet Python | | | X | X |
| Carphodactylidae | <i>Underwoodisaurus milii</i> | Barking Gecko | | | X | |
| Elapidae | <i>Acanthophis antarcticus</i> | Southern Death Adder | | P3 | X | |

| Family | Scientific Name | Species | EPBC listing | DBCA listing | Phase 1 | Phase 2 |
|-------------------|-----------------------------------|------------------------------------|--------------|--------------|---------|---------|
| Elapidae | <i>Pseudonaja affinis</i> | Dugite | | | | X |
| Elapidae | <i>Parasuta gouldii</i> | Gould's Hooded Snake | | | X | X |
| Elapidae | <i>Suta nigriceps</i> | Mallee Black-backed Snake | | | | X |
| Elapidae | <i>Notechis scutatus</i> | Tiger Snake | | | | X |
| Gekkonidae | <i>Christinus marmoratus</i> | Marbled Gecko | | | | X |
| Gekkonidae | <i>Diplodactylus lateroides</i> | Speckled stone gecko | | | X | X |
| Pygopodidae | <i>Aprasia pulchella</i> | Pretty Worm-lizard | | | | X |
| Scincidae | <i>Tiliqua rugosa</i> | Bobtail | | | X | |
| Scincidae | <i>Cryptoblepharus buchananii</i> | Buchanan's Snake-eyed Skink | | | X | X |
| Scincidae | <i>Menetia greyii</i> | Common Dwarf Skink | | | X | X |
| Scincidae | <i>Ctenotus labillardieri</i> | Common south-west Ctenotus | | | X | X |
| Scincidae | <i>Egernia kingii</i> | King's Skink | | | | X |
| Scincidae | <i>Egernia napoleonis</i> | Napoleon Skink | | | | X |
| Scincidae | <i>Morethia obscura</i> | Shrubland Skink | | | X | X |
| Scincidae | <i>Acritoscincus trilineatus</i> | South-western cool-skink | | | X | X |
| Scincidae | <i>Hemiergis initialis</i> | South-western earless skink | | | X | X |
| Scincidae | <i>Lerista distinguenda</i> | South-western Orange-tailed Slider | | | X | X |
| Typhlopidae | <i>Anilius australis</i> | Southern Blind Snake | | | | X |
| Varanidae | <i>Varanus tristis</i> | Black-headed Monitor | | | X | |
| Varanidae | <i>Varanus gouldii</i> | Gould's Monitor | | | X | X |
| Varanidae | <i>Varanus rosenbergi</i> | Rosenburg's Monitor | | | X | X |
| Amphibians | | | | | | |
| Limnodynastidae | <i>Heleioporus eyrei</i> | Moaning Frog | | | X | X |
| Myobatrachidae | <i>Crinia pseudinsignifera</i> | Bleating Froglet | | | X | |
| Myobatrachidae | <i>Crinia georgiana</i> | Quacking Frog | | | X | X |
| Myobatrachidae | <i>Crinia glauerti</i> | Rattling Froglet | | | | X |
| Myobatrachidae | <i>Crinia pseudinsignifera</i> | False western froglet | | | X | |

| Family | Scientific Name | Species | EPBC listing | DBCA listing | Phase 1 | Phase 2 |
|----------------|-----------------------------|---------------------|--------------|--------------|---------|---------|
| Myobatrachidae | <i>Geocrinia leai</i> | Leas (ticking) frog | | | X | X |
| Pelodyadidae | <i>Litoria adelaidensis</i> | Slender Tree Frog | | | X | X |

Phase 1 (June/July 2020): Species recorded during the trapping program including bat detection, bird acoustic, bird census, opportunistic observations, active searches and remote cameras

| Family | Taxa | Common name | TL 1 | TL2 | TL3 | TL4 | TL5 | TL6 | TL7 | TL8 | TL9 | TL10 | TL11 | TL12 | Cage Line 1 | Cage Line 2 | Cage Line 3 | Cage Line 4 | Cage Line 5 | Other (eg. active search etc) | Bird acoustic | Bat acoustic | Camera | Total |
|------------------|------------------------------------|----------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------------|-------------|-------------|-------------|-------------|-------------------------------|---------------|--------------|--------|-------|
| Mammals | | | | | | | | | | | | | | | | | | | | | | | | |
| Canidae | <i>Vulpes vulpes</i> | Fox | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 3 | 3 |
| Dasyuridae | <i>Sminthopsis gilberti</i> | Gilberts Dunnart | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | 6 | 7 |
| Dasyuridae | <i>Antechinus flavipes</i> | Mardo | 2 | 2 | 0 | 0 | 4 | 5 | 5 | 21 | 0 | 5 | 4 | 1 | | | | | | 0 | | | 287 | 336 |
| Dasyuridae | <i>Dasyurus geoffroii</i> | Chuditch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | 1 | 2 |
| Felidae | <i>Felis catus</i> | Domestic Cat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 2 | 2 |
| Leporidae | <i>Oryctolagus cuniculus</i> | European Rabbit | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 1 | 1 |
| Macropodidae | <i>Notamacropus irma</i> | Western Brush Wallaby | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 47 | | | 18 | 65 |
| Macropodidae | <i>Macropus fuliginosus</i> | Western Grey Kangaroo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 19 | | | 76 | 95 |
| Macropodidae | <i>Setonix brachyurus</i> | Quokka | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 54 | 54 |
| Molossidae | <i>Austronomus australis</i> | White-striped Free-tailed Bat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | 4 | | 4 |
| Molossidae | <i>Ozimops kitcheneri</i> | South-western Free-tailed Bat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | 20 | | 20 |
| Muridae | <i>Hydromys chrysogaster</i> | Rakali | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | 1 | 1 |
| Muridae | <i>Mus musculus</i> | House Mouse | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 38 | 38 |
| Muridae | <i>Rattus rattus</i> | Black Rat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 61 | 63 |
| Peramelidae | <i>Isoodon fusciventer</i> | Quenda | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | 7 | | | 81 | 89 |
| Phalangeridae | <i>Trichosurus vulpecula</i> | Common Brushtail Possum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | 19 | 20 |
| Suidae | <i>Sus scrofa</i> | Feral Pig | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 22 | 24 |
| Tachyglossidae | <i>Tachyglossus aculeatus</i> | Short-beaked Echidna | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | 30 | 31 |
| Vespertilionidae | <i>Chalinolobus gouldii</i> | Gould's Wattled Bat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | 6 | | 6 |
| Vespertilionidae | <i>Chalinolobus morio</i> | Chocolate Wattled Bat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | 2 | | 2 |
| Vespertilionidae | <i>Falsistrellus mackenziei</i> | Western False Pipistrelle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | 3 | | 3 |
| Vespertilionidae | <i>Vespadelus regulus</i> | Southern Forest Bat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | 28 | | 28 |
| Birds | | | | | | | | | | | | | | | | | | | | | | | | |
| Acanthizidae | <i>Acanthiza apicalis</i> | Inland Thornbill | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 4 | X | | | 9 |
| Acanthizidae | <i>Smicromis brevirostris</i> | Weebill | 2 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 6 | 4 | 1 | 0 | | | | | | 9 | X | | | 27 |
| Acanthizidae | <i>Gerygone fusca</i> | Western Gerygone | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | X | | | 3 |
| Acanthizidae | <i>Acanthiza inornata</i> | Western Thornbill | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | X | | | 3 |
| Acanthizidae | <i>Sericornis frontalis</i> | White-browed Scrub-wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | 2 | | | 5 | 3 |
| Accipitridae | <i>Aquila audax</i> | Wedge-tailed Eagle | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | | 1 |
| Alcedinidae | <i>Dacelo novaeguineae</i> | Laughing Kookaburra | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | 10 | X | | 8 | 20 |
| Anatidae | <i>Chenonetta jubata</i> | Australian Wood Duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 3 | 3 |
| Anatidae | <i>Anas superciliosa</i> | Pacific Black Duck | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 2 | 6 |
| Artamidae | <i>Cracticus torquatus</i> | Grey Butcherbird | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 0 | 1 |
| Artamidae | <i>Strepera versicolor</i> | Grey Currawong | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 2 | 0 | 1 | 1 | | | | | | 10 | | | 1 | 20 |
| Artamidae | <i>Cracticus tibicen</i> | Magpie | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | | | | | | 9 | | | 8 | 20 |
| Cacatuidae | <i>Calyptorhynchus baudinii</i> | Baudin's Cockatoo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 49 | X | | | 49 |
| Cacatuidae | <i>Calyptorhynchus latirostris</i> | Carnaby's Cockatoo | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 524 | X | | | 526 |
| Cacatuidae | <i>Calyptorhynchus banksii</i> | Forest Red-tailed Black Cockatoo | 10 | 2 | 1 | 0 | 0 | 0 | 0 | | 25 | 0 | 1 | 4 | | | | | | 233 | | | 4 | 280 |

| Family | Taxa | Common name | TL 1 | TL2 | TL3 | TL4 | TL5 | TL6 | TL7 | TL8 | TL9 | TL10 | TL11 | TL12 | Cage Line 1 | Cage Line 2 | Cage Line 3 | Cage Line 4 | Cage Line 5 | Other (eg. active search etc) | Bird acoustic | Bat acoustic | Camera | Total | |
|------------------|--------------------------------------|----------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------------|-------------|-------------|-------------|-------------|-------------------------------|---------------|--------------|--------|-------|--|
| Campephagidae | <i>Coracina novaehollandiae</i> | Black-faced Cuckoo-shrike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 0 | 2 | |
| Casuariidae | <i>Dromaius novaehollandiae</i> | Emu | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 4 | X | | 2 | 8 | |
| Charadriidae | <i>Vanellus tricolor</i> | Banded Lapwing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 1 | 1 | |
| Climacteridae | <i>Climacteris rufus</i> | Rufous Tree Creeper | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | 0 | 5 | |
| Columbidae | <i>Phaps elegans</i> | Brush Bronzewing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 1 | 1 | |
| Columbidae | <i>Phaps chalcoptera</i> | Common Bronzewing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 3 | X | | 1 | 4 | |
| Corvidae | <i>Corvus coronoides</i> | Australian Raven | 0 | 1 | 15 | 1 | 1 | 0 | 1 | 2 | 5 | 0 | 0 | 2 | | | | | | 6 | | | 15 | 49 | |
| Corvidae | <i>Corvus bennetti</i> | Little Crow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 4 | 4 | |
| Cuculidae | <i>Cacomantis flabelliformis</i> | Fan-tailed Cuckoo | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | 1 | X | | 0 | 3 | |
| Dicaeidae | <i>Dicaeum hirundinaceum</i> | Mistletoebird | | | | | | | | | | | | | | | | | | 1 | | | | 1 | |
| Hirundinidae | <i>Petrochelidon ariel</i> | Fairy Martin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 4 | X | | 0 | 4 | |
| Hirundinidae | <i>Petrochelidon nigricans</i> | Tree Martin | | | | | | | | | | | | | | | | | | 1 | | | | 1 | |
| Locustellidae | <i>Megalurus cruralis</i> | Brown Songlark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 3 | 3 | |
| Maluridae | <i>Malurus elegans</i> | Red-winged Fairywren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 2 | 3 | |
| Maluridae | <i>Malurus splendens</i> | Splendid Fairywren | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 6 | 0 | | | | | | 1 | X | | 76 | 88 | |
| Maluridae | <i>Sericornis maculatus</i> | Spotted Scrubwren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 2 | 2 | |
| Maluridae | <i>Malurus lamberti</i> | Variiegated Fairy Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 23 | 23 | |
| Meliphagidae | <i>Phylidonyris novaehollandiae</i> | New Holland Honeyeater | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | 1 | 2 | |
| Meliphagidae | <i>Anthochaera carunculata</i> | Red Wattlebird | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | | | | | | 5 | X | | 0 | 11 | |
| Meliphagidae | <i>Acanthorhynchus superciliosus</i> | Western Spinebill | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 1 | 2 | |
| Monarchidae | <i>Myiagra inquieta</i> | Restless Flycatcher | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 0 | 1 | |
| Pachycephalidae | <i>Pachycephala pectoralis</i> | Golden Whistler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | 3 | X | | 0 | 4 | |
| Pachycephalidae | <i>Colluricincla harmonica</i> | Grey Strike Thrush | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | | | | | | 5 | | | 0 | 11 | |
| Pachycephalidae | <i>Pachycephala occidentalis</i> | Western Whistler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 1 | 1 | |
| Petroicidae | <i>Petroica boodang</i> | Scarlet Robin | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | 9 | | | 17 | 28 | |
| Petroicidae | <i>Eopsaltria griseogularis</i> | Western Yellow Robin | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 6 | | | 0 | 8 | |
| Petroicidae | <i>Eopsaltria georgiana</i> | White-breasted Robin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | 2 | | | 1 | 4 | |
| Podargidae | <i>Podargus strigoides</i> | Tawny Frogmouth | | | | | | | | | | | | | | | | | | 2 | | | | 2 | |
| Psittaculidae | <i>Platycercus zonarius</i> | Australian Ringneck Parrot | 0 | 1 | 1 | 0 | 0 | 3 | 0 | 4 | 2 | 2 | 5 | 0 | | | | | | 4 | | | 1 | 23 | |
| Psittaculidae | <i>Purpureicephalus spurius</i> | Red-capped Parrot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | | | | | 4 | | | 1 | 6 | |
| Psittaculidae | <i>Platycercus icterotis</i> | Western Rosella | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 6 | X | | 5 | 11 | |
| Rallidae | <i>Fulica atra</i> | Eurasian coot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 1 | 1 | |
| Rhipiduridae | <i>Rhipidura albiscapa</i> | Grey Fantail | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | | | | | | 3 | | | 0 | 12 | |
| Strigidae | <i>Ninox boobook</i> | Southern Boobook | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 2 | 2 | |
| Turnicidae | <i>Turnix varius</i> | Painted Button Quail | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | X | | 7 | 7 | |
| Tytonidae | <i>Tyto novaehollandiae</i> | Masked Owl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 2 | 2 | |
| Reptiles | | | | | | | | | | | | | | | | | | | | | | | | | |
| Agamidae | <i>Ctenophorus ornatus</i> | Ornate Crevice-dragon | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 15 | | | 0 | 20 | |
| Boidae | <i>Morelia spilota imbricata</i> | Carpet Python | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 0 | 2 | |
| Carphodactylidae | <i>Underwoodisaurus milii</i> | Barking Gecko | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | | | | | | 45 | | | 0 | 52 | |

| Family | Taxa | Common name | TL 1 | TL2 | TL3 | TL4 | TL5 | TL6 | TL7 | TL8 | TL9 | TL10 | TL11 | TL12 | Cage Line 1 | Cage Line 2 | Cage Line 3 | Cage Line 4 | Cage Line 5 | Other (eg. active search etc) | Bird acoustic | Bat acoustic | Camera | Total | |
|-------------------|-----------------------------------|------------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------------|-------------|-------------|-------------|-------------|-------------------------------|---------------|--------------|--------|-------|--|
| Elapidae | <i>Acanthophis antarcticus</i> | Southern Death Adder | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 0 | 2 | |
| Elapidae | <i>Suta gouldii</i> | Gould's hooded snake | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 0 | 2 | |
| Gekkonidae | <i>Diplodactylus lateroides</i> | Speckled stone gecko | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | 0 | 2 | |
| Scincidae | <i>Tiliqua rugosa</i> | Bobtail | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 5 | 5 | |
| Scincidae | <i>Cryptoblepharus buchananii</i> | Buchanan's Snake-eyed Skink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 2 | | | | 2 | |
| Scincidae | <i>Menetia greyii</i> | Common Dwarf skink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | 0 | | | 0 | 1 | |
| Scincidae | <i>Ctenotus labillardieri</i> | Common south-west Ctenotus | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 4 | | | 0 | 4 | |
| Scincidae | <i>Morethia obscura</i> | Shrubland Skink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | | | | | | 0 | | | 0 | 2 | |
| Scincidae | <i>Acritoscincus trilineatus</i> | South western cool-skink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | | | | | | 0 | | | 0 | 3 | |
| Scincidae | <i>Hemiergis initialis</i> | Southwestern earless skink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | | | | | | 5 | | | 0 | 7 | |
| Scincidae | <i>Lerista distinguenda</i> | South-western Orange-tailed Slider | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | | 1 | |
| Varanidae | <i>Varanus gouldii</i> | Gould's Monitor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 1 | 1 | |
| Varanidae | <i>Varanus tristis</i> | Black-headed Monitor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 1 | | | | 1 | |
| Varanidae | <i>Varanus rosenbergi</i> | Rosenberg's Monitor | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 0 | | | 1 | 1 | |
| Amphibians | | | | | | | | | | | | | | | | | | | | | | | | | |
| Limnodynastidae | <i>Heleioporus eyrei</i> | Moaning Frog | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | 0 | | | 0 | 2 | |
| Myobatrachidae | <i>Crinia pseudinsignifera</i> | Bleating Froglet | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | 0 | | | 0 | 4 | |
| Myobatrachidae | <i>Crinia georgiana</i> | Quacking Frog | 0 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | | | | | | 54 | | | 0 | 63 | |
| Myobatrachidae | <i>Crinia glauerti</i> | Glauert's Froglet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 51 | | | 0 | 51 | |
| Myobatrachidae | <i>Geocrinia leai</i> | Lea's (ticking) frog | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | 22 | | | 0 | 22 | |
| Pelodyadidae | <i>Litoria adelaidensis</i> | Slender Tree Frog | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | 0 | | | 0 | 1 | |

*Note: numbers per trap line include animals physically captured in traps as well as those detected via active search, bird census or opportunistically at that trap site.

X – indicates the presence of a species detected either by signs (scat, tracks, feathers, etc.) as well as those detected on an acoustic recorder where number of individuals could not be determined however presence of species could be confirmed.

Trap Line habitat assessment summary

| Trap Line I.D | Location | | Habitat type/structure | Veg condition | Aspect | Slope | Soil type | Soil colour | Drainage | Bare ground cover | Litter cover | Last fire | Disturbance |
|---------------|----------|----------|---|---------------|------------|--------|-------------------|--------------|--------------|-------------------|--------------|---|---------------|
| | Easting | Northing | | | | | | | | | | | |
| Trap Line 1 | 426987 | 6413519 | Upland Jarrah Marri forest over mid storey shrubland. Mid to upper slope areas on gravel-lateritic clay loam soil. | Excellent | North/East | none | gravel sandy clay | orange/brown | Good | 2-10% | 31-70% | Moderate (3 to 5 yr) but for phase 2 the site was burnt 3 weeks prior | road |
| Trap Line 2 | 424252 | 6425012 | Blackbutt forest over sparse <i>Banksia littoralis</i> . | Excellent | south | gentle | clay loam | brown | Good | 2-10% | 31-70% | Moderate (3 to 5 yr) | frequent fire |
| Trap Line 3 | 427900 | 6412972 | Melaleuca dampland - with isolated Jarrah over sparse isolated <i>Banksia littoralis</i> low shrubs on grey clay loam. | Excellent | Flat | none | clay | pale brown | poor | 2-10% | 50-10% | Moderate (3 to 5 yr) | negligible |
| Trap Line 4 | 426279 | 6422853 | Upland Jarrah Marri forest over mid storey shrubland. Mid to upper slope areas on gravel-lateritic clay loam soil. | Excellent | Flat | none | gravel sandy clay | orange/brown | Good | 2-10% | 31-70% | Old (6+ yr) | road |
| Trap Line 5 | 419173 | 6422951 | Granite Outcrop with <i>Banksia</i> woodland - <i>Melaleuca pressiana</i> , Jarrah Marri forest, over mid shrubland. | Very Good | Flat | none | Sand | grey | Good | 2-10% | 31-70% | Moderate (3 to 5 yr) | fire |
| Trap Line 6 | 420734 | 6417238 | Flooded Gum woodland - tall open forest associated with drainage lines. Low sparse woodland over long low shrub/sedgeland | Very Good | Flat | none | Clay | brown | Seasonal wet | 2-10% | 11-30% | Moderate (3 to 5 yr) | negligible |
| Trap Line 7 | 421559 | 6418605 | Jarrah Marri forest with Sheoak over low closed shrub | Excellent | Flat | | Gritty sand | yellow/brown | Good | 11-30% | 11-30% | Moderate (3 to 5 yr) | negligible |

| | | | | | | | | | | | | | |
|--------------|--------|---------|--|-----------|-------------|----------|-------------|--------|--------------|--------|--------|-------------|--------------------|
| Trap Line 8 | 428302 | 6417251 | Upland Jarrah Marri forest with Sheoak. | Excellent | West | gentle | Gritty sand | yellow | Good | 2-10% | 31-70% | Old (6+ yr) | road |
| Trap Line 9 | 427604 | 6410609 | Jarra Marri forest with Sheoak over low open woodland and shrubland | Excellent | North/ East | none | Gritty sand | orange | Good | 11-30% | 31-70% | Old (6+ yr) | negligible |
| Trap Line 10 | 413197 | 6421772 | Jarra Marri forest Low Hills - occasional Sheoak, over <i>Banksia grandis</i> , low-mid shrubland. | Excellent | East | gentle | Gritty sand | yellow | Good | 2-10% | 31-70% | Old (6+ yr) | negligible |
| Trap Line 11 | 424815 | 6421905 | Granite Outcrop amongst Jarrah Marri forest with Sheoak | Excellent | North/ East | moderate | Gritty sand | yellow | Good | <2% | 31-70% | Old (6+ yr) | Dieback (?) uphill |
| Trap Line 12 | 418020 | 6420561 | <i>Banksia littoralis</i> Riparian, Jarrah Marri forest, with Sheoak over shrubs | Very Good | Flat | gentle | Gritty sand | orange | Seasonal wet | 2-10% | 11-30% | Old (6+ yr) | road |

Results from bird acoustic analysis

Bat call analysis summary report

Call identification was assisted by consulting distribution information for potential species (Armstrong 2011; Churchill 2008; Van Dyck *et al.* 2013) and records from NatureMap (2020). No reference calls were collected during the survey.

Data was processed and analysed using a combination of manual review and automated processes using Kaleidoscope Pro (Wildlife Acoustic, version 5.3.6) and Anabat Insight (Titley Scientific, version 1.9.2) using the following process:

1. Files were downloaded from the units and saved to an external hard drive (back up copy) following the survey for later processing and analysis
2. For compressed .wav4 and .wac files (full spectrum) collected using the Song Meter units, files were converted to standard .wav using the conversion function in Kaleidoscope Pro
3. For each night data was manually reviewed for bat calls using Kaleidoscope Pro or Anabat Insight from sunset onwards for approximately 30 minutes by visually comparing the time-frequency graph and call characteristics (e.g. peak frequency, characteristic frequency and call shape) with species call descriptions from published guidelines (e.g. Webala *et al.* 2010, Burgar *et al.* various dates)
4. Data was then processed using Wildlife Acoustic Kaleidoscope Pro signal parameter batch processing, then cluster analysis features
5. Data from the cluster analysis process was then labelled and reviewed against the data labelled during step 3 for validation purposes to accurately identify species.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency. Calls with less than three defined consecutive pulses of similar frequency and shape were not unambiguously identified to a species but may be used as part of the activity count for the Survey Area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills *et al.* 1996 & Duffy *et al.* 2000) during the manual validation process as summarised in the table below.

Confidence rating applied to calls

| Identification | Description |
|-----------------------|---|
| D - Definite | Species identification not in doubt. |
| PR - Probable | Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail. |
| SG - Species Group | Call made by one of two or more species. Call characteristics overlap, particularly poor quality calls or mixed species calls making it difficult to distinguish between species. |

Bat detector effort and site location

| Bat detector site | Phase | Detector name | Start Date | End Date | Easting | Northing | Location details |
|-------------------|-------|---------------|------------|----------|---------|----------|---|
| 1 | 1 | sm4-1 | 24/06/20 | 30/06/20 | 426282 | 6417199 | Along cage line 41-50 |
| 2 | 1 | sm4-5 | 24/06/20 | 29/06/20 | 419249 | 6423008 | TL1 |
| 3 | 1 | sm2-3 | 24/06/20 | 30/06/20 | 417973 | 6420593 | Drainage line |
| 4 | 1 | sm4-4 | 24/06/20 | 30/06/20 | 417931 | 6422315 | Drainage line |
| 5 | 1 | sm4-5 | 29/06/20 | 2/07/20 | 421589 | 6418754 | Near TL2 in blackbutt |
| 6 | 1 | sm4-1 | 30/06/20 | 2/07/20 | 427915 | 6412940 | TL5 |
| 7 | 1 | sm4-4 | 30/06/20 | 3/07/20 | 425197 | 6414173 | open Jarrah between tl2 and tl3 |
| 8 | 1 | sm2-3 | 30/06/20 | 2/07/20 | 424270 | 6416696 | near TL3 - melaleuca lowland/Jarrah |
| 9 | 1 | sm4-5 | 2/07/20 | 6/07/20 | 427860 | 6411147 | on granite boulder, surface water present, near tl6 |
| 10 | 1 | sm4-1 | 2/07/20 | 4/07/20 | 425818 | 6421856 | upland Jarrah/Marri woodland |
| 11 | 1 | sm4-4 | 3/07/20 | 6/07/20 | 421309 | 6416290 | Jarrah woodland |
| 12 | 2 | SM4-4 | 3/11/20 | 5/11/20 | 415676 | 6414950 | Granite |
| 13 | 2 | SM4-1 | 3/11/20 | 6/11/20 | 420798 | 6417251 | Granite |
| 14 | 2 | SM4-4 | 3/11/20 | 6/11/20 | 420771 | 6417263 | Serpentine Dam carpark |
| 15 | 2 | SM4-1 | 6/11/20 | 9/11/20 | 426302 | 6422178 | Near eastern survey boundary |
| 16 | 2 | SM4-2 | 6/11/20 | 9/11/20 | 425097 | 6426021 | Northern Survey Area |
| 17 | 2 | SM2-3 | 6/11/20 | 9/11/20 | 423254 | 6417433 | Undulating low hills |
| 18 | 2 | SM4-4 | 6/11/20 | 9/11/20 | 421492 | 6418891 | TL2 |
| 19 | 2 | SM4 -1 | 9/11/20 | 11/11/20 | 422176 | 6420640 | Central north - drainage line? |

Results

Approximately 59,516 full spectrum .wav files were analysed (all sites all nights combined) of which approximately 68% were identified as bat call of some description. At least seven species were positively (Definite) identified of the 11 or so species that are known to occur from the locality of the Study Area. As many as two other species may also have been recorded, but poor data quality and/or interspecific call similarities precluded reliable identification of additional species. Table 3, 4, 5 and 3 provides a list of definite and probable species recorded for each night.

No threatened species listed under the *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999* were recorded (Definite) as a result of call analysis.

Myara North Phase 1 bat call analysis results per site

| Site / date | White-striped Free-tailed Bat <i>Austronomus australis</i> | South-Western Free-tailed Bat <i>Ozimops kitcheneri</i> | Gould's Wattled Bat <i>Chalinolobus gouldii</i> | <i>C. gouldii/O. kitcheneri</i> | Western False Pipistrelle <i>Falsistrellus mackenziei</i> | Southern Forest Bat <i>Vespardelus regulus</i> | Chocolate Wattled Bat <i>Chalinolobus morio</i> | Long-eared Bat sp <i>Nyctophilus geoffroyi/gouldii/major</i> |
|--------------|--|---|---|---------------------------------|---|--|---|--|
| SM2-3 | | | | | | | | |
| 24/06/2020 | D | | | | | D | | |
| 25/06/2020 | | | | | | D | | |
| 26/06/2020 | D | | | | D | D | | |
| 27/06/2020 | | | | | D | D | | |
| SM4-1 | | | | | | | | |
| 26/06/2020 | | D | | | | D | | |
| 27/06/2020 | | D | | SG | | D | | |
| 28/06/2020 | | | | SG | | | | |
| 30/06/2020 | | D | D | | | D | | |
| 1/07/2020 | | D | D | | PR | D | | SG |
| 3/07/2020 | | | | | | D | | |
| SM4-4 | | | | | | | | |
| 24/06/2020 | | D | | SG | | D | | |
| 25/06/2020 | D | | | | | D | | |
| 26/06/2020 | | D | | SG | | D | PR | |
| 27/06/2020 | | | D | SG | | D | | |
| 28/06/2020 | | | | | | PR | | |
| 30/06/2020 | | PR | PR | | | | | |
| 1/07/2020 | | PR | | | | D | | |
| 3/07/2020 | | | | | | D | | SG |
| 4/07/2020 | | D | | SG | | D | | |
| 5/07/2020 | | D | D | | D | D | | |
| 6/07/2020 | | | | | | PR | | |
| SM4-5 | | | | | | | | |
| 24/06/2020 | | | | | | D | | |
| 25/06/2020 | | PR | | | | PR | | |
| 27/06/2020 | D | | | | | D | PR | |
| 28/06/2020 | | | | | | D | | SG |
| 29/06/2020 | | | | SG | | | | |
| 30/06/2020 | | | | | | D | | SG |
| 1/07/2020 | | | | | | D | | |
| 2/07/2020 | | | | | | D | | |
| 3/07/2020 | | | | | | D | | |
| 4/07/2020 | | D | D | | | D | | |

Myara North Phase 2 bat call analysis results per site

| Site / date | White-striped Free-tailed Bat <i>Austronomus australis</i> | South-Western Free-tailed Bat <i>Ozimops kitcheneri</i> | Gould's Wattled Bat <i>Chalinolobus gouldii</i> | C. gouldii/ F. mackenzie | Western False Pipistrelle <i>Falsistrellus mackenziei</i> | Southern Forest Bat <i>Vespadelus regulus</i> | Chocolate Wattled Bat <i>Chalinolobus morio</i> |
|---------------|---|--|--|--------------------------|--|--|--|
| SM2-3 | | | | | | | |
| 6/11/2020 | D | PR | D | SG | | D | D |
| 7/11/2020 | D | D | D | SG | PR | D | D |
| 8/11/2020 | D | D | D | SG | PR | D | D |
| 9/11/2020 | | PR | D | SG | | D | |
| SM4-1A | | | | | | | |
| 3/11/2020 | | D | | | | D | |
| 4/11/2020 | D | PR | | | | D | |
| 5/11/2020 | D | D | | SG | | D | |
| 6/11/2020 | D | D | D | SG | D | D | D |
| 7/11/2020 | | PR | D | SG | D | D | D |
| 8/11/2020 | D | D | D | SG | D | D | PR |
| 9/11/2020 | D | | | | | PR | |
| SM4-2 | | | | | | | |
| 6/11/2020 | D | PR | | SG | PR | D | |
| 7/11/2020 | D | | D | SG | D | D | |
| 8/11/2020 | D | D | D | SG | | D | |
| 9/11/2020 | D | PR | D | SG | PR | D | |
| SM4-4 | | | | | | | |
| 3/11/2020 | D | PR | | | | D | |
| 4/11/2020 | | D | | | | D | |
| 5/11/2020 | D | PR | | SG | D | D | |
| 6/11/2020 | D | D | D | SG | D | D | D |
| 7/11/2020 | D | D | D | SG | PR | D | D |
| 8/11/2020 | D | D | D | SG | D | D | D |
| 9/11/2020 | | PR | | | | D | PR |

References

- Armstrong, K. N. (2011). The current status of bats in Western Australia. In: 'The biology and conservation of Australasian bats.' (Eds B. Law, P. Eby, D. Lunney and L. Lumsden.) pp. 257–269. (Royal Zoological Society of New South Wales: Mosman.)
- Burgar, Joanna (2014) Bat habitat use of restored Jarrah eucalypt forests in south-western Australia. Submitted PHD. School of Veterinary & Life Sciences Murdoch University, Perth, Western Australia.
- Burgar, Joanna & Craig, Michael & Stokes, Vicki. (2012). Investigating the congruence between vegetation succession and faunal recolonization in a production landscape: A case study of bats in south-western Australia.
- Burgar, Joanna & Stokes, Vicki & Craig, Michael. (2017). Habitat features act as unidirectional and dynamic filters to bat use of production landscapes. *Biological Conservation*. 209. 280-288. 10.1016/j.biocon.2017.02.024.
- Burgar, Joanna & Craig, Michael & Stokes, Vicki. (2015). The importance of mature forest as bat roosting habitat within a production landscape. *Forest Ecology and Management*. 356. 10.1016/j.foreco.2015.07.027.
- Churchill, S (2008). *Australian Bats*, Allen and Unwin, Australia.
- Duffy, AM, Lumsden, LF, Caddle, CR, Chick, RR & Newell, GR (2000). The efficacy of Anabat ultrasonic detectors and harp traps for surveying microchiropterans in southeastern Australia, *Acta Chiropterologica* 2: 127-144.
- Mills, DJ, Norton, TW, Parnaby, HE, Cunningham, RB & Nix, HA (1996), Designing surveys for microchiropteran bats in complex forest landscapes – a pilot study from south-east Australia. *Forest Ecology and management* 85 (1-3):149-161.
- Reardon, T. B., McKenzie, N. L., Cooper, S. J. B., Appleton., B., Carthew, S. and Adams, M (2014) A molecular and morphological investigation of species boundaries and phylogenetic relationships in Australian free-tailed bats *Mormopterus* (Chiroptera : Molossidae). *Australian Journal of Zoology* 62: 109-136.
- Van Dyke, S, Gynther, I, and Baker, A. (2013). *Field Companion To The Mammals of Australia*. New Holland Publishers.
- Webala, Paul & Craig, Michael & Law, Bradley & Armstrong, Kyle & Wayne, Adrian & Bradley, J. (2010). Bat habitat use in logged Jarrah eucalypt forests of south-western Australia. *Journal of Applied Ecology*. 48. 398 - 406. 10.1111/j.1365-2664.2010.01934.x

Rakali transect data

| Myara North Rakali | | | | | | | | | | | | Rakali evidence | | | Other evidence | | | | | | Suitability | | |
|--------------------|-----------|--------|---------|-------|---------|----------|-----------|---|---------|------------------------|-----------|-----------------|-------|-------|----------------|-------|----------------|------|------|-------|-------------|---|--------------------------------|
| Plot | date | Lats | Long | type | size | bank | substrate | vegetation | TsFire | water prnt/size | condition | shtig | print | midn. | tdpls | frogs | Crust. | fish | Roo | Pig | water plant | Rakali | Comments |
| | | | | | (width) | (height) | (type) | (Broad type) | (years) | | | | | | | | | | | | | | |
| R1 | 11/11/20 | 423939 | 6412164 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri, Jarrah, Blackbutt | 3-5y | yes-pool 4x1.5m x 15cm | Excellent | | | | | | burrow, shells | | | trots | | Potential seasonally | Mid Serpentine River |
| R2 | 11/11/20 | 427580 | 6410417 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E. rudis</i> and Blackbutt | 3-5y | yes-pool 6x0.5m x 10cm | Excellent | | | | | | burrow | | | yes | | Too seasonal | Upper reaches Serpentine River |
| R3 | 10/11/20 | 425302 | 6413889 | creek | 3.5m | 1m | mud | Low mixed shrubs over Marri, Jarrah, Melaleuca | 3-5y | yes-pool 15x3m x 20cm | excellent | | | | 2 | | burrow | | | | | Too seasonal | |
| R4 | 10/11/20 | 424314 | 6416065 | creek | 2m | 0.6m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | digs | | Too seasonal | |
| R5 | 10/11/20 | 425384 | 6419120 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah, Marri | 3-5y | dry, damp soil | excellent | | | | 3 | 3 | | | | | yes | Too seasonal | |
| R6 | 10/11/20 | 421498 | 6418609 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt, Marri | 5-10y | dry | excellent | | | | | | | | | | | Too seasonal | |
| R7 | 10/11/20 | 416107 | 6417671 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarrah | 3-5y | dry | excellent | | | | 2 | | | | | | | Too seasonal | |
| R8 | 10/11/20 | 417942 | 6420003 | creek | 3m | 0.6m | bauxite | nothing | 1y | yes-pool 3x10mx20cm | burnt | | | | | 2 | | | | | | Too seasonal | |
| R9 | 11/11/20 | 420847 | 6407516 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | 2 | shells | | scat | trot | | suitable, large water body, specimen recorded on camera | Section of Big Brook |
| R10 | 11/11/20 | 419328 | 6404941 | creek | 3m | 0.8m | rock/loam | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | scat | | | suitable | |
| R11 | 5/11/20 | 419780 | 6417774 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | 6 | | | | 2 | | | suitable | |
| R12 | 4/11/2020 | 424220 | 6416019 | creek | 2m | 0.6m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Too seasonal | |
| R13 | 4/11/2020 | 425346 | 6413895 | creek | 4m | 1.2m | rock/sand | mixed shrubs on granite | 3-5y | yes-pool 4x3mx 40 cm | excellent | | | | | | | | | | | Too seasonal | |
| R14 | 5/11/2020 | 424902 | 6413431 | creek | 5m | 1.5m | rock/sand | mixed shrubs on granite | 3-5y | yes-pool 6 x 5mx 50 cm | excellent | | | | 4 | | burrow | | | | | Too seasonal | |

Carters Freshwater Mussel transect data

| Myara North Carters Freshwater Mussel | | | | | | | | | | Mussel evidence | | | Other evidence | | | | | | Suitability | | | |
|---------------------------------------|----------|---------|----------|-------|---------|--------|-----------|---|--------|---------------------|-----------|----------|----------------|--------|-------|-------|--------|------|-------------|------|---------|--------------------------------------|
| Plot | date | Easting | Northing | type | size | bank | substrate | vegetation | TsFire | water present/ size | condition | sighting | shells | shells | tdpls | frogs | Yabbie | fish | Roo | Pig | wtrpInt | Mussel |
| | | | | | (width) | (hght) | (type) | (Broad type) | (yrs) | (cm) | | (Live) | (water) | (bank) | | | | | | | | |
| CFM1 | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 11/11/20 | 423939 | 6412164 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | water 4x1.5m x 15cm | Excellent | | | | | | burrow | | | | | Not suitable, too seasonal |
| 2 | 11/11/20 | 423959 | 6412148 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| 3 | 11/11/20 | 423965 | 6412141 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| 4 | 11/11/20 | 423973 | 6412134 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| 5 | 11/11/20 | 423948 | 6412176 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| 6 | 11/11/20 | 423953 | 6412203 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| 7 | 11/11/20 | 423934 | 6412229 | creek | 4m | 1.8m | mud/rock | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| 8 | 11/11/20 | 423906 | 6412241 | creek | 4m | 1.8m | mud/rock | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | shells | | | | | Not suitable, too seasonal |
| 9 | 11/11/20 | 423887 | 6412256 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | trot | | Not suitable, too seasonal |
| 10 | 11/11/20 | 423867 | 6412273 | creek | 4m | 1.8m | mud | mixed shrubs/sedge over Marri/Jarrah/Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal |
| CFM2 | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 11/11/20 | 427580 | 6410417 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | water 6x0.5m x 10cm | Excellent | | | | | | burrow | | | | yes | Not suitable, too seasonal and small |
| 2 | 11/11/20 | 427593 | 6410412 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 3 | 11/11/20 | 427612 | 6410413 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | dry, damp | Excellent | | | | | | burrow | | | | | Not suitable, too seasonal and small |
| 4 | 11/11/20 | 427620 | 6410395 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 5 | 11/11/20 | 427556 | 6410443 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 6 | 11/11/20 | 427531 | 6410448 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 7 | 11/11/20 | 427532 | 6410420 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | dry, damp | Excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 8 | 11/11/20 | 427519 | 6410412 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | water 15x4m x 50cm | Excellent | | | | | | burrow | | | | | Not suitable, too seasonal and small |
| 9 | 11/11/20 | 427511 | 6410427 | creek | 4m | 1.6m | mud | mixed shrubs/sedge over <i>E.rudis</i> /Blackbutt | 3-5y | water 15x4m x 50cm | Excellent | | | | | | burrow | | | | | Not suitable, too seasonal and small |
| CFM3 | | | | | | | | | | | | | | | | | | | | | | |

| Myara North Carters Freshwater Mussel | | | | | | | | | | | | Mussel evidence | | | Other evidence | | | | | | Suitability | |
|---------------------------------------|----------|---------|----------|-------|---------|--------|-----------|---|--------|---------------------|-----------|-----------------|---------|--------|----------------|-------|--------|------|-----|-----|-------------|--------------------------------------|
| Plot | date | Easting | Northing | type | size | bank | substrate | vegetation | TsFire | water present/ size | condition | sighting | shells | shells | tdpls | frogs | Yabbie | fish | Roo | Pig | wtrplnt | Mussel |
| | | | | | (width) | (hght) | (type) | (Broad type) | (yrs) | (cm) | | (Live) | (water) | (bank) | | | | | | | | |
| 1 | 10/11/20 | 425302 | 6413889 | creek | 3.5m | 1m | mud | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | water 15x3m x 20cm | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 2 | 10/11/20 | 425328 | 6413913 | creek | 3.5m | 1m | mud | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | water 4x3m x 10cm | excellent | | | | 2 | | burrow | | | | | Not suitable, too seasonal and small |
| 3 | 10/11/20 | 425349 | 6413897 | creek | 3.5m | 1m | granite | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | water 12x3m x 30cm | excellent | | | | | | burrow | | | | | Not suitable, too seasonal and small |
| 4 | 10/11/20 | 425383 | 6413884 | creek | 3.5m | 1m | granite | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 5 | 10/11/20 | 425411 | 6413878 | creek | 3.5m | 1m | granite | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 6 | 10/11/20 | 425306 | 6413865 | creek | 3.5m | 1m | sand/rock | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 7 | 10/11/20 | 425312 | 6413842 | creek | 3.5m | 1m | sand/rock | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 8 | 10/11/20 | 425283 | 6413823 | creek | 3.5m | 1m | sand/rock | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 9 | 10/11/20 | 425246 | 6413809 | creek | 3.5m | 1m | sand/rock | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 10 | 10/11/20 | 425217 | 6413809 | creek | 3.5m | 1m | sand/rock | Low mixed shrubs over Marri/Jarra/Melaleuca | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| CFM4 | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 10/11/20 | 424314 | 6416065 | creek | 2m | 0.6m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 2 | 10/11/20 | 424340 | 6416092 | creek | 2m | 0.6m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 3 | 10/11/20 | 424368 | 6416108 | creek | 3m | 0.6m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 4 | 10/11/20 | 424404 | 6416136 | creek | 2m | 0.6m | sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 5 | 10/11/20 | 424400 | 6416176 | creek | 2m | 0.6m | sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 6 | 10/11/20 | 424291 | 6416034 | creek | 2m | 0.6m | sand damp | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 7 | 10/11/20 | 424269 | 6416056 | creek | 2m | 1m | sand damp | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | digs | Not suitable, too seasonal and small |

| Myara North Carters Freshwater Mussel | | | | | | | | | | | | Mussel evidence | | | Other evidence | | | | | | Suitability | |
|---------------------------------------|----------|---------|----------|-------|---------|--------|-----------|---|--------|---------------------|-----------|-----------------|---------|--------|----------------|-------|--------|------|-----|-----|-------------|--------------------------------------|
| Plot | date | Easting | Northing | type | size | bank | substrate | vegetation | TsFire | water present/ size | condition | sighting | shells | shells | tdpls | frogs | Yabbie | fish | Roo | Pig | wtrplnt | Mussel |
| | | | | | (width) | (hght) | (type) | (Broad type) | (yrs) | (cm) | | (Live) | (water) | (bank) | | | | | | | | |
| 8 | 10/11/20 | 424231 | 6416035 | creek | 2m | 1m | sand damp | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | digs | Not suitable, too seasonal and small |
| 9 | 10/11/20 | 424197 | 6416010 | creek | 2m | 1m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | digs | Not suitable, too seasonal and small |
| 10 | 10/11/20 | 424176 | 6416000 | creek | 2m | 1m | rock/sand | regrowth mixed shrub | 2y | dry | excellent | | | | | | | | | | digs | Not suitable, too seasonal and small |
| CFM5 | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 10/11/20 | 425384 | 6419120 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 2 | 10/11/20 | 425343 | 6419098 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | water 6x4mx40cm | excellent | | | | 3 | 3 | | | | | yes | Not suitable, too seasonal and small |
| 3 | 10/11/20 | 425316 | 6419108 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 4 | 10/11/20 | 425381 | 6419083 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 5 | 10/11/20 | 425414 | 6419077 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 6 | 10/11/20 | 425292 | 6419119 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | water 6x4mx30cm | excellent | | | | 1 | 1 | | | | | yes | Not suitable, too seasonal and small |
| 7 | 10/11/20 | 425271 | 6419130 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | water 3x3mx20cm | excellent | | | | 1 | 1 | | | | | yes | Not suitable, too seasonal and small |
| 8 | 10/11/20 | 425247 | 6419119 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 9 | 10/11/20 | 425218 | 6419138 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | water 35x2mx30cm | excellent | | | | 2 | | | | | | yes | Not suitable, too seasonal and small |
| 10 | 10/12/20 | 425193 | 6419143 | creek | 2.5m | 1.2m | rock/sand | Mixed shrubs and sedge over Jarrah/Marri | 3-5y | dry, damp soil | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| CFM6 | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 10/11/20 | 421498 | 6418609 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 2 | 10/11/20 | 421539 | 6418540 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 3 | 10/11/20 | 421557 | 6418506 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |
| 4 | 10/11/20 | 421592 | 6418460 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | Not suitable, too seasonal and small |

| Myara North Carters Freshwater Mussel | | | | | | | | | | | | Mussel evidence | | | Other evidence | | | | | | Suitability | | |
|---------------------------------------|----------|---------|----------|-------|---------|--------|-----------|--|--------|---------------------|-----------|-----------------|---------|--------|----------------|-------|--------|------|-----|-----|-------------|--------|--------------------------------------|
| Plot | date | Easting | Northing | type | size | bank | substrate | vegetation | TsFire | water present/ size | condition | sighting | shells | shells | tdpls | frogs | Yabbie | fish | Roo | Pig | wtrplnt | Mussel | |
| | | | | | (width) | (hght) | (type) | (Broad type) | (yrs) | (cm) | | (Live) | (water) | (bank) | | | | | | | | | |
| 5 | 10/11/20 | 421580 | 6418419 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 6 | 10/11/20 | 421549 | 6418394 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry, moist | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 7 | 10/11/20 | 421559 | 6418365 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 8 | 10/11/20 | 421573 | 6418340 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 9 | 10/11/20 | 421585 | 6418327 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 10 | 10/11/20 | 421596 | 6418303 | creek | 3m | 1.6m | rocky/mud | Mixed shrub/ Bracken over Blackbutt/Marri | 5-10y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| CFM7 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 10/11/20 | 416107 | 6417671 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 2 | 10/11/20 | 416107 | 6417651 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 3 | 10/11/20 | 416114 | 6417626 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 4 | 10/11/20 | 416122 | 6417597 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 5 | 10/11/20 | 416133 | 6417579 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | water 3x1mx20cm | excellent | | | | 2 | | | | | | | | Not suitable, to seasonal and small |
| 6 | 10/11/20 | 416093 | 6417700 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 7 | 10/11/20 | 416086 | 6417680 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, to seasonal and small |
| 8 | 10/11/20 | 416068 | 6417739 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 9 | 10/11/20 | 416047 | 6417809 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| 10 | 10/11/20 | 416002 | 6417853 | creek | 2m | 1m | loam | mixed shrub/sedge/Banksia over Marri/Jarra | 3-5y | dry | excellent | | | | | | | | | | | | Not suitable, too seasonal and small |
| CFM8 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 10/11/20 | 417942 | 6420003 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | 1 | | | | | | | Not suitable, too seasonal and rocky |

| Myara North Carters Freshwater Mussel | | | | | | | | | | | | Mussel evidence | | | Other evidence | | | | | | Suitability | | |
|---------------------------------------|----------|---------|----------|-------|---------|--------|-----------|---|--------|----------------------|-----------|-----------------|---------|--------|----------------|-------|--------|------|-----|-----|-------------|--------|--------------------------------------|
| Plot | date | Easting | Northing | type | size | bank | substrate | vegetation | TsFire | water present/ size | condition | sighting | shells | shells | tdpls | frogs | Yabbie | fish | Roo | Pig | wtrplnt | Mussel | |
| | | | | | (width) | (hght) | (type) | (Broad type) | (yrs) | (cm) | | (Live) | (water) | (bank) | | | | | | | | | |
| 2 | 10/11/20 | 417924 | 6420010 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | 1 | | | | | | | Not suitable, too seasonal and rocky |
| 3 | 10/11/20 | 417913 | 6420038 | creek | 3m | 0.6m | bauxite | nothing | 1y | puddle 30x30cm | burnt | | | | | | | | | | | | Not suitable, too seasonal and rocky |
| 4 | 10/11/20 | 417906 | 6420057 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | 1 | | | | | | | Not suitable, too seasonal and rocky |
| 5 | 10/11/20 | 417883 | 6420068 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | 1 | | | | | | | Not suitable, too seasonal and rocky |
| 6 | 10/11/20 | 417937 | 6419988 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | | | | | | | | Not suitable, too seasonal and rocky |
| 7 | 10/11/20 | 417946 | 6419970 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | | | | | | | | Not suitable, too seasonal and rocky |
| 8 | 10/11/20 | 417969 | 6419946 | creek | 3m | 0.6m | bauxite | nothing | 1y | water 3x10mx20cm | burnt | | | | | 2 | | | | | | | Not suitable, too seasonal and rocky |
| 9 | 10/11/20 | 417977 | 6419923 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | 1 | | | | | | | Not suitable, too seasonal and rocky |
| 10 | 10/11/20 | 417998 | 6419892 | creek | 3m | 0.6m | bauxite | nothing | 1y | dry | burnt | | | | | 1 | | | | | | | Not suitable, too seasonal and rocky |
| CFM9 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 11/11/20 | 420847 | 6407516 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | 2 | | | | | | | Possibly suitable |
| 2 | 11/11/20 | 420834 | 6407529 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | | | | | | | | Possibly suitable |
| 3 | 11/11/20 | 420821 | 6407540 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | | shells | | | | trot | | Possibly suitable |
| 4 | 11/11/20 | 420811 | 6407555 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | | | | | | | | Possibly suitable |
| 5 | 11/11/20 | 420799 | 6407589 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | | | | | | | | Possibly suitable |
| 6 | 11/11/20 | 420855 | 6407510 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | | | | | | | | Possibly suitable |
| 7 | 11/11/20 | 420884 | 6407472 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | yes -flow 1m deep | excellent | | | | | 1 | | | | | | | Possibly suitable |
| 8 | 11/11/20 | 420914 | 6407469 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | dry bit | excellent | | | | | | | | | | | digs | Possibly suitable |
| 9 | 11/11/20 | 420949 | 6407450 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | dry bit | excellent | | | | | | | | | | | digs | Possibly suitable |
| 10 | 11/11/20 | 420927 | 6407421 | creek | 20m | 0.6m | rock/loam | regrowth mixed shrub and sedge | 3-5y | dry bit | excellent | | | | | | | | | | | digs | Possibly suitable |
| CFM10 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 11/11/20 | 419328 | 6404941 | creek | 3m | 0.8m | rock/loam | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |

| Myara North Carters Freshwater Mussel | | | | | | | | | | | | Mussel evidence | | | Other evidence | | | | | | Suitability | | |
|---------------------------------------|----------|---------|----------|-------|---------|--------|-----------|---|--------|----------------------|-----------|-----------------|---------|--------|----------------|-------|--------|------|------|-----|-------------|--------|----------|
| Plot | date | Easting | Northing | type | size | bank | substrate | vegetation | TsFire | water present/ size | condition | sighting | shells | shells | tdpls | frogs | Yabbie | fish | Roo | Pig | wtrplnt | Mussel | |
| | | | | | (width) | (hght) | (type) | (Broad type) | (yrs) | (cm) | | (Live) | (water) | (bank) | | | | | | | | | |
| 2 | 11/11/20 | 419327 | 6404972 | creek | 3m | 0.8m | rock/loam | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| 3 | 11/11/20 | 419339 | 6404993 | creek | 3m | 0.8m | rock/loam | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| 4 | 11/11/20 | 419344 | 6405002 | creek | 3m | 0.8m | clay | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| 5 | 11/11/20 | 419356 | 6405027 | creek | 3m | 0.8m | sand/clay | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| 6 | 11/11/20 | 419364 | 6405047 | creek | 3m | 0.8m | rock/loam | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | scat | | | | suitable |
| 7 | 11/11/20 | 419391 | 6405078 | creek | 3m | 0.8m | sand/clay | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| 8 | 11/11/20 | 419407 | 6405105 | creek | 3m | 0.8m | sand/clay | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| 9 | 11/11/20 | 419411 | 6405121 | creek | 3m | 0.8m | sand/clay | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | scat | | | | suitable |
| 10 | 11/11/20 | 419431 | 6405120 | creek | 3m | 0.8m | sand/clay | mixed shrub/sedge/Banksia over Marri/Jarrah | 5-10y | yes -flow to 3m deep | excellent | | | | | 1 | | | | | | | suitable |
| CFM11 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 5/11/20 | 419780 | 6417774 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | 2 | | | | suitable |
| 2 | 5/11/20 | 419781 | 6417765 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | | | | | suitable |
| 3 | 5/11/20 | 419787 | 6417750 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | | | | | suitable |
| 4 | 5/11/20 | 419782 | 6417742 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | 2 | | | | | | | | suitable |
| 5 | 5/11/20 | 419777 | 6417730 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | 2 | | | | | | | | suitable |
| 6 | 5/11/20 | 419767 | 6417730 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | | | | | suitable |
| 7 | 5/11/20 | 419754 | 6417719 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | 2 | | | | | | | | suitable |
| 8 | 5/11/20 | 419729 | 6417721 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | | | | | suitable |
| 9 | 5/11/20 | 419717 | 6417721 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | | | | | suitable |
| 10 | 5/11/20 | 419711 | 6417717 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes -flow 1m deep | pristine | | | | | | | | | | | | suitable |
| 11 | 5/11/20 | 419705 | 6417709 | creek | 5m | 1.5m | mud/sand | mixed shrubs over Jarrah/Marri | 10y | yes - ends granite | pristine | | | | | | | | | | | | suitable |



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