Targeted Vertebrate Fauna Survey
Collie Green Steel Recycling Mill

Prepared for Green Steel WA Pty Ltd
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3	D. Brearley	V.Lim M.Güldenpfennig	26/08/24	D. Brearley	V.Lim A.Ho M.Güldenpfennig	05/09/24

ACN 095 837 120
PO Box 227
YALLINGUP WA 6282
Telephone 0427339842
E-mail: info@onshoreenvironmental.com.au

ACN 660 873 058
Level 28/140 St Georges Terrace
PERTH WA 6000
0411 832 899
www.greensteelwa.com.au

EXECUTIVE SUMMARY

Onshore Environmental Consultants Pty Ltd (Onshore Environmental) was commissioned by Green Steel WA Pty Ltd (GSWA) to undertake a targeted fauna survey at the proposed Collie Green Steel Recycling Mill situated east of the Collie townsite in south-west Western Australia.

Three naturally occurring habitat types were recorded within the study area: Jarrah-Sheoak Forest, parkland cleared Jarrah-Marri Forest, and *Melaleuca* Scrub. The Jarrah-Sheoak Forest habitat occurs along the western edge of state forest in the southern sector where the rail spur line will connect the recycling mill to the existing rail loop. The proposed site for the recycling mill consists of paddocks on private farmland with parkland cleared Jarrah-Marri Forest occurring as isolated remnants. A small remnant area of *Melaleuca* Scrub habitat occurs along the previously cleared transmission line (infrastructure corridor) in the north-west sector and will not be disturbed by the proposal.

The targeted fauna survey included establishment of infra-red motion sensor cameras, intensive ground truthing of the entire study area to record primary and secondary evidence of fauna activity, nocturnal spotlighting and a habitat assessment for black cockatoos including breeding, roosting and foraging habitats. Four site visits were undertaken in October 2023, November 2023, February 2024 and August 2024.

The ten infra-red motion sensor cameras recorded a total of 96 fauna observations from 16 fauna species across three species groups over a 28 night sampling period. The total fauna included three introduced species (feral animals): Cow *(Bos taurus),* Rabbit *(Oryctolagus cuniculus)* and Red Fox *(Vulpes vulpes).*

Two of the three species of black cockatoo were recorded from the study area, both listed under the EPBC Act and the BC Act:

- Forest Red-tailed Black Cockatoo *(Calyptorhynchus banksii naso)* listed as Vulnerable under the EPBC Act and BC Act; and
- Baudin's Black Cockatoo (*Zanda baudinii*) listed as Endangered under the EPBC Act and BC Act.

One fauna species recorded from the study area is listed under the BC Act:

- Brush-tailed Phascogale *(Phascogale tapoatafa wambenger)* listed as Conservation Dependant under the BC Act.

One fauna species recorded from the study area is recognised as conservation significant by the DBCA:

- Western Brush Wallaby *(Notamacropus irma)* listed as Priority 4.

Despite intensive survey effort, there was no evidence of three other conservation significant fauna species determined from the desktop assessment as being likely to occur within the study area: Chuditch (*Dasyurus geoffroii,* listed as Vulnerable under the EPBC Act and the BC Act), Western False Pipistrelle *(Falsistrellus mackenziei)* and Quenda *(Isoodon fusciventer,* both listed as Priority 4 by the DBCA). Similarly, the Western Ringtail Possum *(Pseudocheirus occidentalis,* listed as Critically Endangered

under the EPBC Act and BC Act) which was determined as possibly occurring within the study area, was not recorded from the study area despite intensive ground truthing and spotlighting.

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1.0 INTRODUCTION

1.1 Preamble

Green Steel of WA Pty Ltd (GSWA) is proposing to develop the Collie Green Steel Recycling Mill situated approximately 7 km east of the Collie townsite in south-west Western Australia (Figure 1). The recycling mill will convert Western Australian scrap steel into rebar for both local, domestic, and international consumption. The site is situated adjacent to the Griffin Coal Mining Company's Ewington Coal Mine. The proposed green steel recycling mill will be constructed within privately owned farmland, with a spur line extending to the existing rail loop constructed within state forest at the southern extent of the study area.

1.2 Objective

Onshore Environmental was commissioned to undertake a targeted vertebrate fauna survey for conservation significant fauna species determined as being likely to occur within the study area. Targeted searches included the use of infra-red motion sensor camera traps to monitor fauna activity over a 28 night period, spotlighting over a three night period, assessment of black cockatoo habitat and activity across four separate survey periods and intensive ground truthing to record evidence of fauna activity.

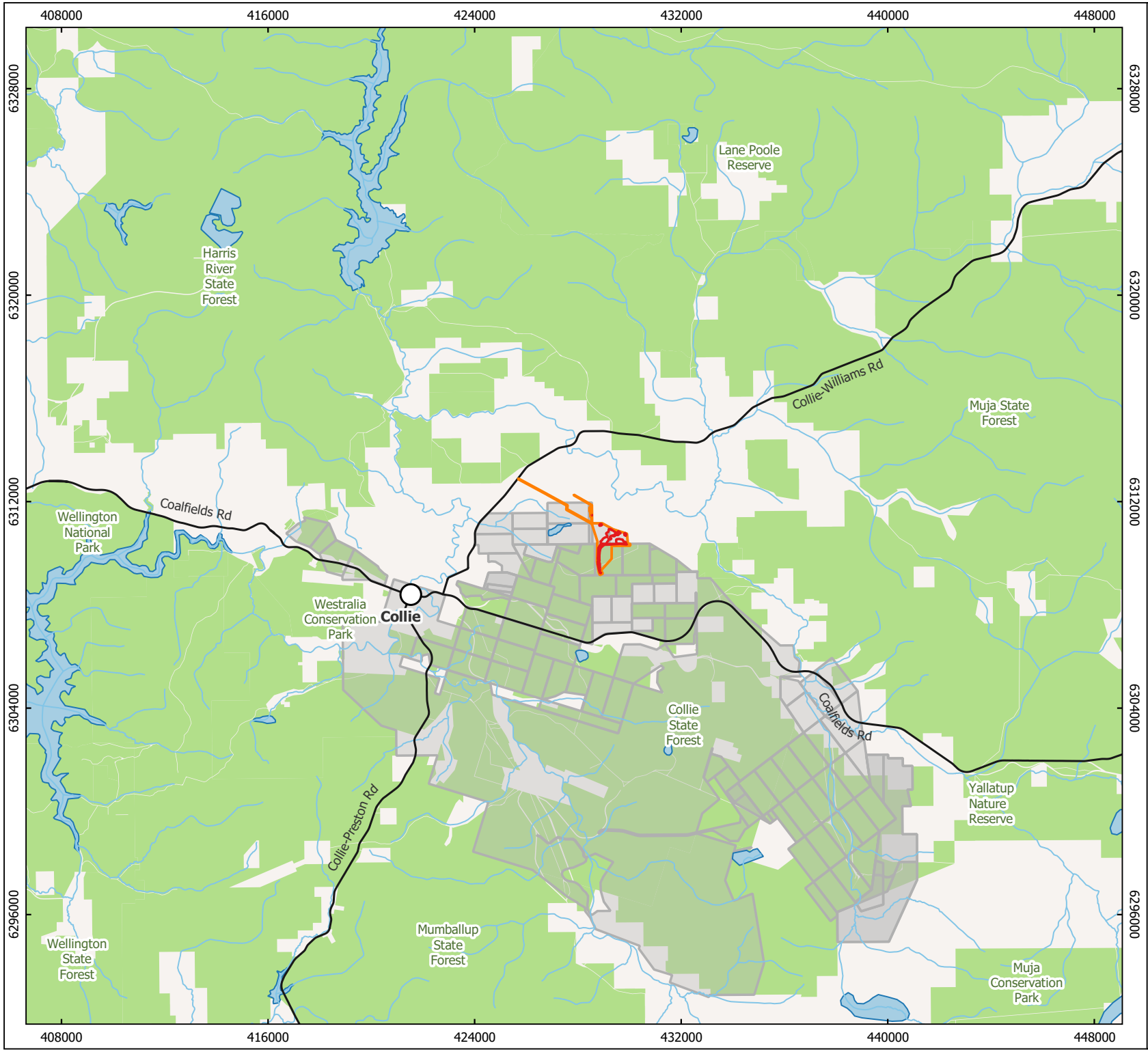

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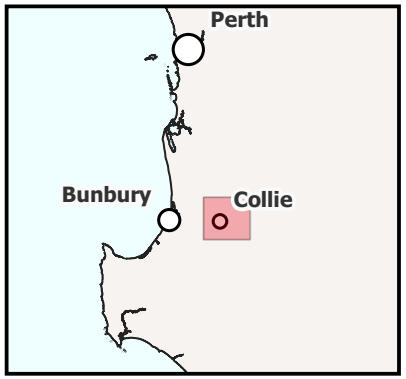
Figure 1
Location of the Study Area

Legend

- Study Area
- Griffin Coal Tenements
- Clearing Footprint
- DBCA Lands



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2.0 EXISTING ENVIRONMENT

2.1 Climate

The climate of south-west Western Australia is Mediterranean, with hot, dry summers and mild, wet winters. The Collie weather station is located nearby to the study area and has a long-term annual rainfall average of 925.7mm (1899 to 2023), with the highest monthly rainfall received during June (172 mm) and July (175 mm). Average maximum summer temperatures range between 28.3°C and 30.5°C, with average winter minimum temperatures ranging from 4.2°C to 5.0°C (Figure 2).

Rainfall for 2023 (566.1 mm) was well below the long-term average of 925.7 mm, and was followed by just 9.1 mm over the four months from January to April 2024 (Figure 2). Winter rainfall for May, June and July 2024 reflected long-term average monthly totals (Figure 2).

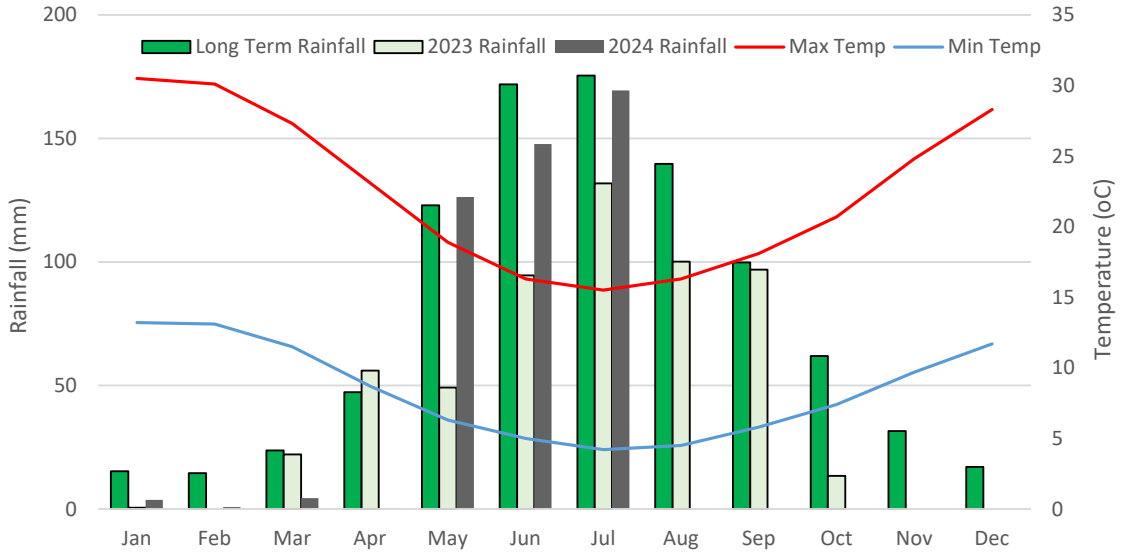

Figure 2 Monthly rainfall data from the Collie weather station for 2023 and January to July 2024, with long term averages (Bureau of Meteorology [BOM] 2024).

2.2 Biogeographic Regions

The study area is located on the border of the Northern and Southern Jarrah Forest (JF1 and JF2) sub-regions of the Interim Biogeographic Regionalisation for Australia (IBRA7). Both subregions occur on the duricrusted plateau of the Yilgarn Craton with vegetation comprised of Jarrah-Marri forest on laterite gravels grading to Wandoo woodlands on clayey soils in the east. The climate of the sub-regions is Warm Mediterranean (Hearn *et al*. 2002).

The vegetation of the Southern Jarrah forest is described as “Jarrah-Marri forest in the west grading to Marri and Wandoo woodlands in the east. There are extensive areas of swamp vegetation in the south-east, dominated by Paperbarks and Swamp Yate. The understorey component of the forest and woodland reflects the more mesic nature of this area.

The Northern Jarrah forest also supports Jarrah-Marri forest in the west with vegetation in

valleys including Bullish and Blackbutt. Wandoo and Marri woodlands occur to the east with breakaways of Powder-bark Wandoo. The subregion also contains low *Banksia* woodland on extensive sand sheets (Williams and Mitchel 2001).

2.3 Geology

The geology of the study area and the wider Collie region has been described by Wild and Walker (1982). The study area lies within the Collie Basin on the Darling Plateau. Permian sedimentary rocks occur in north north-west trending depressions on the Darling Plateau and are completely covered by Tertiary sediments. The largest, the Collie Basin, contains 1,300 m of strata, whilst the smaller Wilga Basin contains 360 m of sediments. Both depressions contain similar sedimentary sequences and are believed to have resulted from glacial scouring into the Archaean basement rocks.

The Collie Basin is approximately 26 km long by 13 km wide and stretches south-east from Allanson (to the west of Collie). There are three sub-basins: Cardiff, Shotts and Muja. These sub-basins are comprised of the lower Permian unit, the Stockton Formation and the overlying Collie Coal Measures. The Stockton Formation rests on a glacially striated granite pavement, and consists of a basal tillite, which is overlain by sandstone, siltstone and mudstone. The Collie Coal Measures are composed of a conglomerate, sandstone, siltstone, shale and intercalated seams of sub-bituminous coal.

2.4 Flora and Vegetation

2.4.1 Beard (1981) Vegetation Associations

The study area occurs in the Menzies Sub-district of the Darling Botanical District, in the South-West Botanical Province (Beard 1981). The Menzies Sub-district (southern jarrah forest) covers a total area of 26,572 km^2, of which 18,715 km^2 (70 percent) originally supported jarrah and jarrah-marri forest (Beard 1981). The study area is dissected by the West Darling (northern extent) and Bridgetown (southern extent) Vegetation Systems as recognised by Beard (1981) (Figure 3). Within these systems, there is one vegetation association that intersects the study area:

- Vegetation Association 3 - Medium Forest; Jarrah-Marri.

When determining representation and reservation of remaining vegetation, Vegetation Association 3 was determined to be well represented at all levels (state-wide, bioregional [IBRA and IBRA sub-region], and local government authority), with more than 56% of the pre-European extent remaining. Vegetation Association 3 was also determined to be well reserved, with more than 15% of the current extent protected for conservation within the Southern Jarrah Forest sub-region.

2.4.2 Mattiske and Havel (1998) Vegetation Complexes

The pre-1750 distribution of vegetation complexes of the south-west forest region of Western Australia has been mapped at 1:50,000 scale by Mattiske and Havel (1998) as part of the biodiversity assessment for the comprehensive regional assessment for the south-west forest region. This database has been used to assess flora and vegetation values as part of the 1999 Regional Forest Agreement (RFA). Interrogation of this database confirmed there were three

vegetation complexes (as described and mapped by Mattiske and Havel 1998) intersecting the study area (Table 1, Figure 4).

Table 1 Vegetation complexes, as mapped by Mattiske and Havel (1998), represented within the study area.

Vegetation Complex	Vegetation Description
Collie Plain	
Cardiff	Uplands*:* Open Woodland of *Allocasuarina fraseriana - Banksia* species - *Xylomelum occidentale - Nuytsia floribunda* on sandy soils on valley slopes in the subhumid zone.
Collie	Uplands*:* Open Forest of *Eucalyptus marginata* subsp. *marginata - Corymbia calophylla - Allocasuarina fraseriana* on gravelly sandy upland soils in the subhumid zone.
Darling Plateau	
Yarragil 2	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.

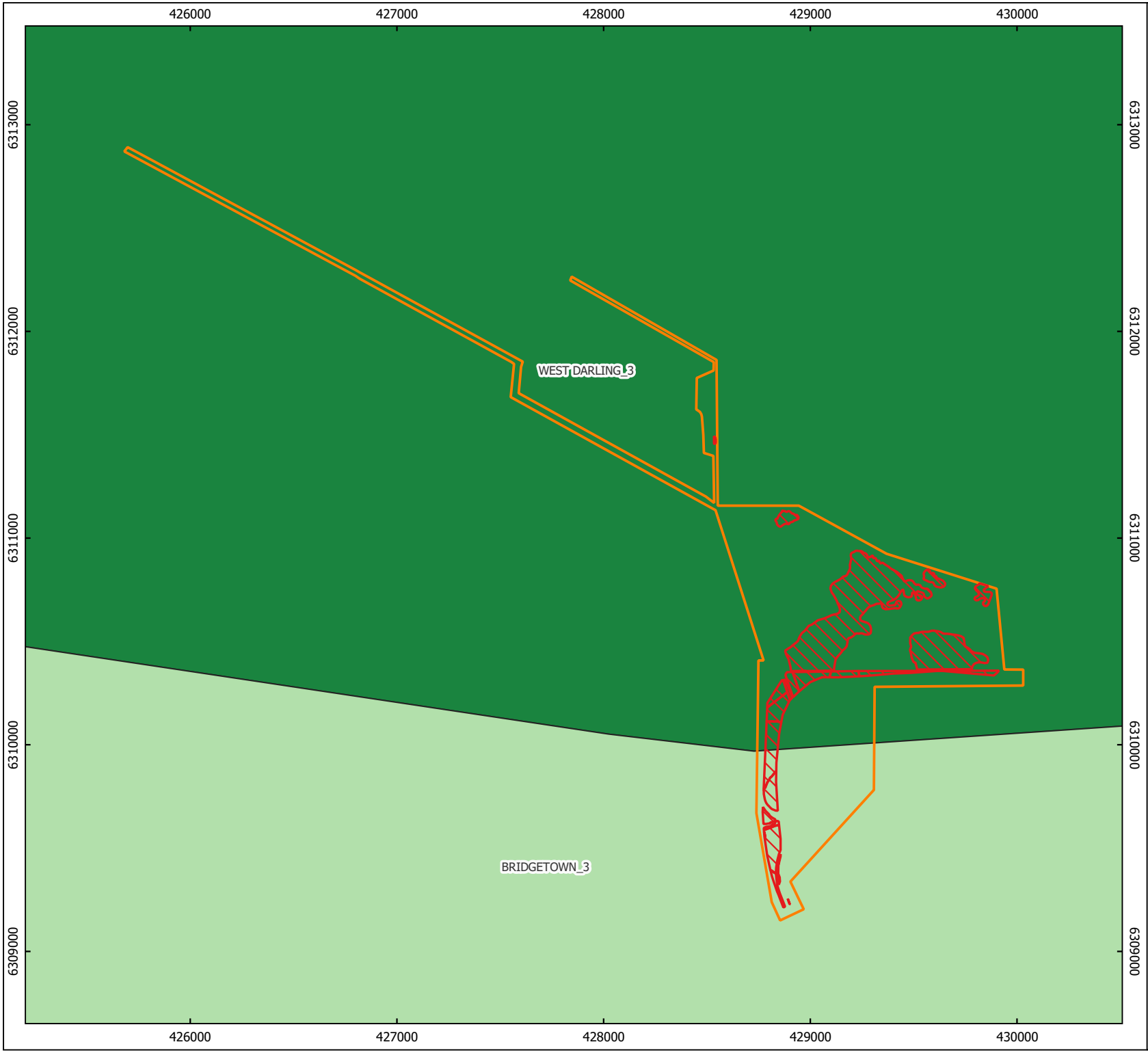

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Figure 3
Beard (1981) vegetation associations represented within the study area.

Legend

- Study Area
- Clearing Footprint

Vegetation Associations

- BRIDGETOWN_3
- WEST DARLING_3

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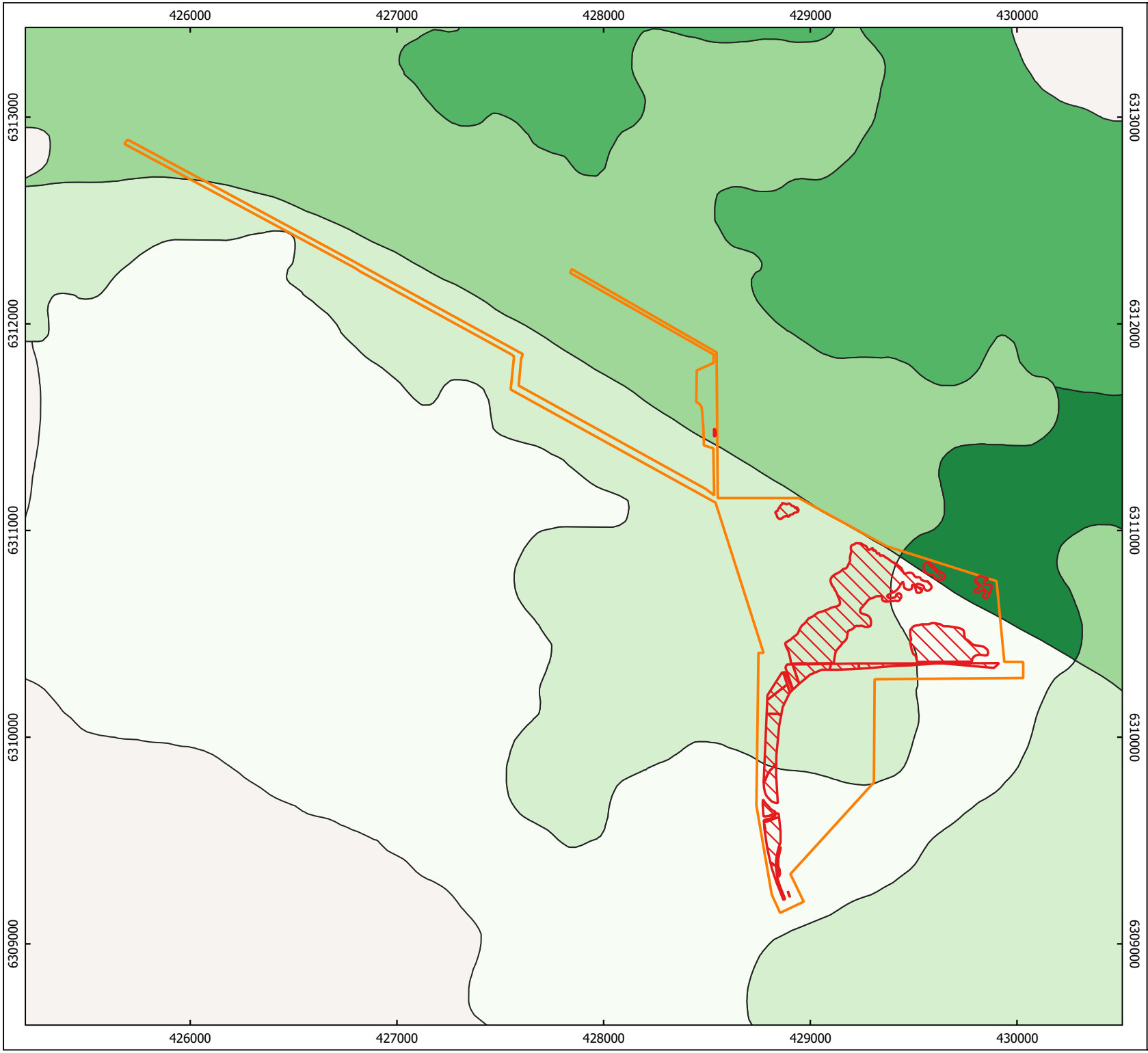

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Figure 4
Mattiske and Havel (1998) vegetation complexes represented within the study area.

Legend

- Study Area
- Clearing Footprint

Vegetation Complexes

- Cardiff
- Collie
- Dwellingup
- Murray 1
- Yarragil 2

0 250 500 750 m

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3.0 METHODOLOGY

3.1 Legislation and Guidance Statements

The basic fauna survey with targeted searches was carried out in a manner that was compliant with EPA requirements for the environmental surveying and reporting of vertebrate fauna in Western Australia:

- Statement of Environmental Principles, Factors and Objectives (EPA 2020a);
- Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020b); and
- Environmental Factor Guideline Terrestrial Fauna (EPA 2016).

Other guidelines relevant to the survey include:

- DEWHA (2010b) Survey Guidelines for Australia's Threatened Birds;
- Department of Agriculture, Water and Environment (DAWE 2022) Referral guidelines for three WA threatened black cockatoo species;
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022) Referral guidelines for three WA threatened black cockatoo species; and
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011a) Survey Guidelines for Australia's Threatened Mammals.

3.2 Desktop Assessment

3.2.1 Literature Review

A review of all relevant publicly available literature in close proximity to the study area was undertaken, including a search of the Department of Water and Environmental Regulation's Index of Biodiversity Surveys for Assessment (DWER 2024). Previous surveys were reviewed to provide context for the study area and to inform an assessment of habitat types potentially occurring within the study area.

While no previous vertebrate fauna surveys have been completed within the study area, surveys have occurred at nearby locations. Results from these and additional surveys around Collie are described in more detail in Section 4.1.1.

3.2.2 Database Searches

The desktop assessment included searches of several databases relating to significant fauna previously recorded within a 30 km radius of the study area. For this report the search was extended beyond the study area to place fauna values into a local and regional context. The following databases were searched:

- DBCA Threatened and Priority Fauna database search (10 km radial search);
- Commonwealth EPBC Act Protected Matters database (30 km radial search);
- DBCA Dandjoo Biodiversity Repository (30 km radial search);
- BirdLife Australia's Birdata dataset (30 km radial search); and

- Atlas of Living Australia database (30 km radial search).

The results from the above database searches and the literature review were compiled to provide a list of fauna species that could potentially occur within or surrounding the study area.

3.2.3 Assessment of Conservation Significance

The conservation significance of fauna and ecological communities are classified at a Commonwealth, State and Local level on the basis of various Acts and Agreements, including:

International Level:

- IUCN: The IUCN 'Red List' lists species at risk under nine categories (status codes) (Appendix 1); and
- International Conventions: Migratory taxa listed under the Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), and Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Commonwealth Level:

- EPBC Act: DCCEEW lists Threatened fauna, which are determined by the Threatened Species Scientific Committee according to criteria set out in the Act. The Act lists fauna that are considered to be of conservation significance under one of six categories (Appendix 1).

State Level:

- BC Act: At a State level, native fauna species are protected under the BC Act - Wildlife Conservation Notice. Species are assigned an additional level of conservation significance based on a limited number of known populations and the perceived threats to these locations (Appendix 1); and
- DBCA Priority list: DBCA produces a list of Priority species that have not been assigned statutory protection under the BC Act. Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added under Priorities 1, 2 or 3. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been removed from the threatened species list for other taxonomic reasons, are placed in Priority 4. These species require regular monitoring (see Appendix 1).

Local Level:

- Species may be considered of local conservation significance because of their patterns of distribution and abundance, including range extensions, restricted habitat requirements or occurring as a breeding colony.

3.2.4 Assessment of Likelihood of Occurrence in the Study Area

A list of conservation significant species occurring within a 30 km radius of the study area was compiled from the above database searches and literature review. The likelihood of each conservation significant species occurring within the study area was assessed based on habitat availability, the age and proximity and number of previous records, previous assessments and the regional occurrence of the species (Table 2). Habitat availability and suitability was assessed based on aerial imagery and previous knowledge of the survey area and surrounds. Results are described in Section 4.1.2.

Table 2 Ranking system used to assign the likelihood that a species would occur in the study area.

Rank	Criteria
Recorded	The species has been recorded in the study area.
Likely to occur	Suitable habitat exists within the study area and the species has been recorded within 5 km in the last 10 years.
Possible to occur	Suitable habitat exists within the study area and the species has been recorded within 10 km in the last 20 years.
Unlikely to occur	No suitable habitat occurs within the study area; and/or there are no previous records within a 10 km radius of the study area and/or previous records are >20 years old.

3.3 Survey Methodology

3.3.1 Timing and Personnel

The field survey was completed over four separate field trips that included Spring 2023, Summer 2024 and Winter 2024:

a) Principal Ecologist (Ms Jessica Waters) on the 11th and 12th of October 2023;
b) Principal Ecologist (Ms Jessica Waters) on the 8th of November 2023;
c) Ecologist (Dr Jerome Bull) on the 22nd of February 2024; and
d) Principal Ecologist (Ms Jessica Waters) and Ecologist (Dr Darren Brearley) between the 5th and 7th of August 2024.

3.3.2 Fauna Habitat Mapping

Habitat assessments were undertaken throughout the study area to document habitat characteristics and map the fauna habitat types. The fauna habitat mapping utilised high-resolution aerial photography of the study area at a scale of 1:10,000. Ground-truthing of the study area was completed during the survey with habitat characteristics recorded. Vegetation type mapping undertaken by Onshore Environmental during a previous flora and vegetation survey was utilised to further aid in characterising habitat mapping across the full extent of the study area (Onshore Environmental 2023). The suitability of habitat and presence of habitat features for species of conservation significance was noted as part of the habitat assessment.

3.3.3 Surveying of Study Area

The fauna survey employed a variety of systematic and opportunistic sampling techniques. Systematic sampling refers to data methodically collected over a fixed time period in a discrete habitat type, using an equal or standardised sampling effort. Opportunistic sampling includes data collected non-systematically within and outside fixed sampling sites. Sampling techniques included a combination of opportunistic searching, bird censusing, nocturnal surveying, and specialist equipment that included infra-red motion sensor cameras. The study area was ground truthed and assessed during four separate site visits to document habitat characteristics and record any observations of fauna species via primary or secondary evidence.

3.3.4 Targeted Fauna Searches

Targeted searches were undertaken for conservation significant fauna species throughout the study area, with a focus on naturally occurring habitats. The study area was traversed on foot to opportunistically record evidence of Threatened and Priority listed fauna and undertake closer examination of specific habitat features likely to support conservation significant fauna. The following parameters were recorded for all conservation significant fauna confirmed to occur from the study area:

- Co-ordinate location;
- Description of habitat in which the species was located; and
- Photograph of the species, evidence of species and/or habitat.

Further details of specific methods used to target conservation significant species are described below.

3.3.5 Motion Sensor Cameras

Camera traps enable the collection of valuable information about multiple species within any given community (Rosellini *et al.* 2008) and provide data that is more permanent and less disputable than data gathered by direct observation. They allow for the detection of species that are difficult to study due to their elusive and nocturnal habits (Mace *et al.* 2004) and are a recommended technique for mammals (DSEWPC 2011a).

A total of ten motion sensor cameras with infra-red illumination to 30 metres (Browning Spec Ops Elite HP5 model) were placed within areas that represented the most likely habitats of target conservation significant species (denser areas of forest, areas of deep leaf litter, potential denning sites, habitat trees with obvious hollows). Cameras were generally positioned with southerly aspect to avoid direct sun exposure onto the camera lens, facing the ground, and, where appropriate, directed towards fallen logs or rock piles (potential den or exploratory sites for species such as Chuditch). Camera locations were baited with universal bait (a mixture of sardines, fish oil, rolled oats and peanut paste) to attract animals. All ten cameras were deployed for a total duration of 28 nights (Table 3, Figure 5).

Table 3 Locations for camera traps situated throughout the study area.

Camera No.	Easting	Northing	Deployment Date	Retrieval Date
1	429290	6310260	11/10/2023	8/11/2023
2	429190	6310235	11/10/2023	8/11/2023
3	428868	6310011	11/10/2023	8/11/2023
4	428819	6309836	11/10/2023	8/11/2023
5	428956	6310264	11/10/2023	8/11/2023
6	429160	6309958	11/10/2023	8/11/2023
7	429229	6310772	11/10/2023	8/11/2023
8	428875	6309589	11/10/2023	8/11/2023
9	429042	6310476	11/10/2023	8/11/2023
10	429077	6309597	11/10/2023	8/11/2023

3.3.6 Targeted Western Ringtail Possum Surveys

Survey techniques employed to detect the presence of the Western Ringtail Possum followed those recommended within the Survey guidelines for Australia's threatened mammals (DSEWPC 2011a).

A diurnal inspection of the site was carried out between the 5th and 6th of August 2024, with the principal aim of recording the location of dreys or other potential daytime refuge sites (e.g. tree hollows) and direct observations, e.g., Western Ringtail Possum individuals. The diurnal search involved a series of close spaced grid traverses (50 m spacing) carried out on foot using a GPS for guidance and as a data recorder.

A nocturnal inspection was undertaken over two nights on the 5th and 6th of August 2024. The sampling procedure involved systematic searching by way of close spaced traverses on foot, using a head torch to detect individual Western Ringtail Possums (and other fauna) or their eye shine.

3.3.7 Assessment of Black Cockatoo Breeding Habitat

The DCCEEW provides guidelines for the study of actions that may result in impact to black cockatoos (for assessment under the EPBC Act). The survey and analysis reported here has been conducted with reference to the existing guidelines (DAWE 2022).

The suitability of habitat for breeding was assessed by recording known, suitable and potential nesting trees for black cockatoos within the study area. A ranking system developed by Onshore Environmental was utilised, with scores later converted to match categories as described within the EPBC Act referral guidelines for black cockatoos (DAWE 2022, Table 4). The field survey focused on identifying breeding habitat for black cockatoos assessed by targeting habitat trees that had a diameter at breast height (DBH) of 50 cm or greater (or 30 cm or greater for *Eucalyptus wandoo)*. Due to the large size of the study area all trees >50 cm were not identified and marked. The survey focused on identifying trees of a size and structure likely to support large hollows. Target tree species included Marri, Jarrah and any other *Corymbia* and *Eucalyptus* species of a suitable size. Large trees with the potential to contain hollows were marked using a handheld GPS. These trees were examined using binoculars to identify the presence of hollows and evidence of use by black cockatoos (e.g. chewing around hollow entrance, scarring and scratch marks on trunks and branches).

Where suitable or chewed hollows were identified, trees were further inspected using a drone where possible to further assess the suitability of hollows for nesting and to confirm signs of use. The following data was recorded:

- tree location;
- tree species;
- DBH; and
- Nest tree rank and corresponding category defined in the EPBC Act referral guidelines for black cockatoos (DAWE 2022, Table 4).

Additionally, in order to determine approximate densities of potential future breeding habitat (i.e. trees with a DBH ≥50 cm, or ≥30 cm for *Eucalyptus wandoo*), tree counts were conducted at randomly located points within the study area. Tree counts provide an indication of the current and future value of fauna habitats for use as black cockatoo breeding habitat. Tree

counts were conducted within a 0.25 hectare area and tree numbers within these areas were then extrapolated to provide an average density per hectare.

3.3.8 Assessment of Black Cockatoo Roosting

DAWE (2022) defines known roosting trees as a tree (generally the tallest), native or introduced known to be used for night roosting or which demonstrates evidence of roosting. Potential roosting trees are defined as tall trees of any species within close proximity to water sources. Night roosting habitat is defined as habitat that contains one or more known or potential roosting trees. Known roosting trees are typically situated close to important water sources within areas of high-quality foraging habitat.

The availability of night roosting habitat within the study area was assessed during the field survey. Any evidence of roosting was noted during the field survey (e.g. branch clippings, droppings or moulted feathers) as well as the presence of black cockatoos within the study area or nearby at dawn and dusk. Roost counts were conducted on three evenings during the winter 2024 assessment period. Two ecologists conducted counts within previously identified roosting areas as birds flew into the area on dusk. Early morning surveys confirmed that the birds remained in the area overnight.

Known night roosting habitat is recorded within databases managed by the DBCA, the Western Australian Museum and Birdlife Australia (Great Cocky Count). These records were accessed to determine if known sites occurred nearby to the study area and to assess regional context. Database searches were undertaken to determine known roosting locations within a 20 km radius of the study area (DBCA 2022).

Table 4 Ranking system used for the assessment of potential nest trees for black cockatoos.

Developed by Onshore Environmental		Referral guideline for 3 WA threatened black cockatoo species (DAWE 2022)	
Category	**Description**	**Category**	**Description**
Used	Black cockatoo breeding activity recorded	Known nesting trees	Trees (live or dead but still standing) which contains a hollow where black cockatoo breeding has been recorded or which demonstrates evidence of breeding (i.e. showing evidence of use through scratches, chew marks or feathers).
Chewed	Hollow of suitable size and orientation for use by black cockatoos and shows evidence of chew marks on edge of hollow or trunk indicating likely recent or historical usage.		
Suitable	Tree with a hollow of suitable size and orientation considered to be of sufficient depth for use by black cockatoos. However, there is no evidence of use.	Suitable nesting trees	Trees with suitable nesting hollows present, although no evidence of use. Note that any species of tree may develop suitable hollows for breeding.
		Suitable nest hollow	Any hollow with dimensions suitable for use for nesting by black cockatoos. Characteristics of hollows used by each species is available in the SPRAT database. Suitable nest hollows are only found in live trees with a DBH of at least 500 mm.
Potentially suitable	Tree contains a hollow that is potentially suitable for nesting i.e. diameter of 10 cm or greater. However, these hollows are considered unlikely to be used by black cockatoos as nesting sites for one or more of the following reasons: • small entrance (generally <20cm); • deemed unlikely to have a large internal space for nesting, or sufficient depth inside the hollow (i.e. less than 0.5 m); • evidence of use by other competitive species i.e. bees or other birds; • orientation of the hollow; • and/or the presence of branches or other obstructions. While these hollows are not currently high-quality nest sites they have the potential to become nest sites in the future and may support other species of conservation significance.	Potential nesting trees	Trees that have a suitable DBH to develop a nest hollow, but do not currently have hollows. Trees suitable to develop a nest hollow in the future are 300-500 mm DBH. Note that many species of eucalypt may develop suitable hollows for breeding.
Unsuitable	Tree contains hollows unsuitable for nesting due to hollow entrance diameter <10cm or hollow examined by drone and determined to be unsuitable for nesting. These hollows may be utilised by other species and have the potential to become black cockatoo nest sites in the longer term.		

3.3.9 Assessment of Black Cockatoo Foraging Habitat

Vegetation within the study area was assessed for foraging value. Black cockatoos forage widely in suitable vegetation in the southwest region and leave distinctive marks on dropped feeding material such as Marri fruit. Targeted searches were made for these signs throughout the study area. Results from the field survey were used to calculate foraging habitat scores using two different methodologies:

- the foraging quality scoring tool template recommended within the EPBC Act referral guidelines for black-cockatoos (DAWE 2022); and
- the foraging habitat score recently developed by the DCCEEW in consultation with species experts in Western Australia and used to calculate the value of an offset site.

Foraging Habitat Quality Score - EPBC Act referral guidelines for black cockatoos (DAWE 2022)

The foraging quality scoring tool has been developed to allow habitat quality to be quantified. The assessment of foraging habitat tool identifies habitat as high-quality foraging habitat (score of 5-10) or lower quality foraging habitat (score of 0-4). If the survey area contains native vegetation used for foraging at any time by one or more of the black cockatoo species, and is larger than one ha in size, it is considered at face value to be of very high quality, important for recovery and therefore as having a score of ten.

The scoring tool then considers the following five contextual factors that may lessen the quality of that habitat (Appendix 2):

- Foraging potential;
- Connectivity to other foraging areas;
- Proximity to breeding areas;
- Proximity to night roosting area; and
- Impacts from significant plant disease.

To provide a final habitat quality score points are subtracted (from the starting score of ten) for each of the contextual factors where the required evidence is not proven to occur at the site.

Offset Habitat Scoring System - DCCEEW in consultation with species experts in WA

The score used to calculate the value of an offset provides a numerical value that reflects the significance of vegetation as foraging habitat for each of the black cockatoo species, and was recently developed by the DCCEEW in consultation with species experts in Western Australia. The foraging value of the vegetation depends upon the type, percentage foliar cover and health of trees and/or vegetation condition, and can be influenced by the context of the site such as the availability of foraging habitat nearby. The scoring system has three components drawn from the DCCEEW offset calculator (DCCEEW 2020, see Appendix 3):

- A score between zero and seven relating to site condition;
- A score between zero and three relating to site context; and
- Species stocking rate which is related to confirmation of presence or absence at the site for each of the three species of black cockatoo.

Site condition is considered the key factor in determining the quality of habitat for the three black cockatoo species. Species stocking rate is considered only in terms of presence or

absence of the species and does not add to the total score. The species, or strong indicators of the species, must be present for an offset to be considered suitable.

3.3.10 Survey Constraints

The EPA Technical Guidance (EPA 2020b) list potential limitations that field surveys may encounter. Limitations associated with the targeted vertebrate fauna survey are addressed in Table 5.

Table 5 Relevance of limitations, as identified by EPA (2020b), to the vertebrate fauna survey.

Variable	Impact on Survey Outcomes
Availability of data and information	NOT A LIMITATION The desktop searches provided an extensive species list, background information and regional context for the study area. A number of fauna surveys have been completed in close proximity to the study area. No significant issues with the reliability or accuracy of the desktop searches or previous surveys were identified. However, it is acknowledged that there may be errors in the data presented from these sources. Where required species lists from previous surveys and database searches were reviewed and nomenclature and conservation significance were updated.
Experience levels	NOT A LIMITATION The personnel who executed the field survey work are practitioners suitably qualified in their respective fields; Ms Jessica Waters (Principal Ecologist >10 years' experience), Dr Darren Brearley (30 years' experience) and Dr Jerome Bull (25 years' experience). All three personnel have undertaken numerous surveys in close proximity to the study area and throughout the wider Jarrah Forest bioregion.
Scope (fauna groups sampled)	NOT A LIMITATION The study area supports a relatively small area of native vegetation and included four separate site visits in Spring 2023, Summer 2024 and Winter 2024. A range of specific sampling techniques were used to target conservation significant species identified as being likely to occur on the basis of previous records. Techniques employed included motion sensor camera traps, spotlighting, bird census, hollow assessment, and intensive ground truthing to confirm presence via primary or secondary evidence.
Timing, weather, and season	NOT A LIMITATION The study area included four separate site visits in Spring 2023, Summer 2024 and Winter 2024. The surveys occurred within periods recommended for target species, most noticeably breeding period (nesting) for black cockatoos.
Disturbance to site which may affect survey results	NOT A LIMITATION None of the disturbances within the study area were a constraint to the completeness of the survey.
Adequacy of the survey intensity and proportion of survey achieved	NOT A LIMITATION There were four separate site visits completed between October 2023 and August 2024 that included motion sensor camera traps, nocturnal spotlighting, ground truthing for primary and secondary evidence, and observation of black cockatoos including assessment of breeding habitat across the extent of the study area.
Remoteness and/or access	NOT A LIMITATION The entire study area was accessible by vehicle and on foot.

Variable	Impact on Survey Outcomes
Proportion of fauna identified, recorded or collected	NOT A LIMITATION The comprehensive database and literature review for a study area situated close to Collie and within a heavily developed mining (coal) and energy (three power stations) precinct where numerous previous surveys have been undertaken over a long period, provided a high level of confidence that potential conservation significant fauna had previously been identified. This allowed targeted surveys to undertaken to determine occurrence within the study area.
Problems with data and analysis, including sampling biases	NOT A LIMITATION There were no problems encountered with the collection or analysis of survey data.

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Figure 5
Location of camera traps in the study area.

Legend

- Clearing Footprint
- Study Area
- Camera Locations

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Datum: GDA 94
Projection: MGA Zone 50

Date: 21/08/2024
Status: Final
Figure: 5
Sheet Size: A4
File Name Reference: GS_Fig5_cameras.pdf
Drawn by: JW
Requested by: DB

4.0 RESULTS

4.1 Desktop Review

4.1.1 Previous Fauna Surveys

Onshore Environmental (2021a) completed a basic vertebrate survey within part of the Pit 2 study area in September 2020. A total of 43 vertebrate fauna species were recorded during the field survey, including one reptile, 34 birds and eight mammals. The total species list included three vertebrate fauna listed under the Western Australian BC Act and/or listed as Threatened fauna under the Commonwealth EPBC Act: Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) listed as Vulnerable, Carnaby's Black Cockatoo (*Zanda latirostris*) listed as Endangered, and Baudin's Black Cockatoo (*Zanda baudinii*) listed as Endangered. Additionally, there were two Priority 4 fauna species, as recognised by the DBCA, recorded from the study area: Quenda (*Isoodon fusciventer*) and Western Brush Wallaby (*Notamacropus irma*). Four fauna habitats were mapped within the study area; Jarrah/Marri Forest on hillslopes, Wandoo Woodland in drainage lines, *Melaleuca* drainage line and Wetland. None of these habitats were determined to be regionally or locally restricted.

A number of other surveys have been undertaken within the general area (Table 6). Onshore Environmental has recently completed both basic and detailed vertebrate fauna surveys at PCL's nearby Pit 7 project area (Onshore Environmental 2022, 2023b) and at PCL's Wilga tenements (Onshore Environmental 2020b, 2020c). The results from these previous surveys are presented in Table 6.

There have also been a number of black cockatoo tree habitat assessments undertaken around Collie. These surveys include:

- Woodman Environmental (2015) Black-Cockatoo Assessment, Muja Power Station;
- Harewood (2018a) Mungalup Road - Collie - Black Cockatoo Habitat Tree Survey;
- Harewood (2018b) CPS 8063/1 - Patstone Road – Slk 3.73 To 5.50 - Black Cockatoo Habitat Tree Survey;
- Harewood (2020) Concession Street - Mungalup - Slk 0.00 To 1.88 - Black Cockatoo Habitat Tree Survey; and
- Onshore Environmental (2023c) Wilga Exploration Tenements Black Cockatoo Habitat Assessment.

Chewed hollows were observed during a number of these surveys with a general consensus that black cockatoo breeding is likely to be occurring in the general area.

Table 6 Results from vertebrate fauna surveys previously completed within the vicinity of the study area.

Survey	Consultant	Field Survey Date	Conservation Significant Fauna Species Recorded
Collie Battery Energy Storage System Targeted Biological Survey	Biota	October 2022	Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) - Vulnerable under the EPBC Act and the BC Act Carnaby's Black Cockatoo (*Zanda latirostris*) - Endangered under the EPBC Act and the BC Act Baudin's Black Cockatoo (*Zanda baudinii*) - Endangered under the EPBC Act and the BC Act Chuditch *(Dasyurus geoffroii)* - Vulnerable under the EPBC Act and the BC Act Western False Pipistrelle *(Falsistrellus mackenziei)* - Priority 4 fauna by the DBCA
Wellington Myalup Water for Food Feasibility Study Flora and Fauna Survey	GHD	November 2016	None
Targeted Fauna Assessment at the Minninup Pool Project Development Investigation Area	Ecoedge	September 2018 - January 2019	Forest Red-tailed Black-Cockatoo - Vulnerable Western False Pipistrelle - Priority 4 Western Brush Wallaby - Priority 4 13 suitable nesting trees
Collie Solar Farm - Environmental Assessment Report	Matters of Environment	November - December	Baudin's Black Cockatoo - Endangered Forest Red-tailed Black-Cockatoo - Vulnerable 7 suitable nesting trees
Bowelling Curves Offset Options - Targeted Biological Survey	Biota	January - February 2016	Carnaby's Black Cockatoo – Endangered Forest Red-tailed Black-Cockatoo - Vulnerable 93 suitable nesting trees
Fauna Assessment - Collie-Lake King Road “Bowelling Curves” (SLK 64.5 – 71), Shire of West Arthur	Harewood	September - November 2014	Carnaby's Black Cockatoo – Endangered Forest Red-tailed Black-Cockatoo - Vulnerable 24 suitable nesting trees
Fauna Assessment of Collie Motorplex Proposed Clearing Areas Cardiff	Harewood	2013	Baudin's Black Cockatoo - Endangered Forest Red-tailed Black-Cockatoo - Vulnerable 25 suitable nesting trees

Survey	Consultant	Field Survey Date	Conservation Significant Fauna Species Recorded
Collie Urea Project - Level 1 Fauna Assessment	Harewood	June 2009	Carnaby's Black Cockatoo – Endangered Baudin's Black Cockatoo - Endangered Forest Red-tailed Black-Cockatoo - Vulnerable Chuditch - Vulnerable Western Brush Wallaby - Priority 4
Bluewaters Power Station Phase III & IV expansion - Inspection of trees in area south of the proposed pipeline route for black cockatoo nesting habitat	Strategen	January 2008	Baudin's Black Cockatoo - Endangered Forest Red-tailed Black-Cockatoo - Vulnerable 22 suitable nesting trees
Report for Collie Shotts Industrial Park - Spring Flora and Fauna and Wetland Assessment	GHD	October 2007	Baudin's Black Cockatoo - Endangered Western Brush Wallaby - Priority 4
Inspection of Trees on Bluewaters Farm (Coolangatta Industrial Estate) for Nesting by Black-Cockatoos	Bamford Consulting Ecologists	October 2005	Baudin's Black Cockatoo - Endangered Forest Red-tailed Black-Cockatoo - Vulnerable 25 suitable nesting trees
Wilga Exploration Tenements Black Cockatoo Habitat Assessment	Onshore Environmental		
Detailed Vertebrate Fauna Survey Pit 2	Onshore Environmental	September - October 2022 and March 2023	Forest Red-tailed Black-Cockatoo - Vulnerable Carnaby's Black Cockatoo - Endangered Baudin's Black Cockatoo - Endangered Chuditch - Vulnerable Brush-tailed Phascogale - Conservation Dependent Western False Pipistrelle - Priority 4 Western Brush Wallaby - DBCA Priority 4 Quenda - Priority 4

Survey	Consultant	Field Survey Date	Conservation Significant Fauna Species Recorded
Detailed Vertebrate Fauna Survey Pit 7 Study area	Onshore Environmental	November 2022 and March 2023	Forest Red-tailed Black-Cockatoo - Vulnerable Baudin's Black Cockatoo - Endangered Chuditch - Vulnerable Western Ringtail Possum *(Pseudocheirus occidentalis)* - Critically Endangered under the EPBC Act and the BC Act; Brush-tailed Phascogale - Conservation Dependent Quenda - Priority 4 Western False Pipistrelle - Priority 4 Western Brush Wallaby - Priority 4
Lot 4095 Bowelling-McAlinden Road, Bowelling Vegetation Mapping & Targeted Flora Survey and Fauna Assessment	Onshore Environmental	15-17 April 2020	Forest Red-tailed Black-Cockatoo - Vulnerable Carnaby's Black Cockatoo - Endangered
Level 2 Vertebrate Fauna Survey Wilga Tenements E70/4678 & E70/4868	Onshore Environmental	17-21 February 2020	Forest Red-tailed Black-Cockatoo - Vulnerable Carnaby's Black Cockatoo - Endangered Brush-tailed Phascogale - Conservation Dependent Western Brush Wallaby - Priority 4 Quenda - Priority 4
Level 2 Vertebrate Fauna Survey Wilga West Tenement M70 930	Onshore Environmental	16-21 March 2020	Forest Red-tailed Black-Cockatoo - Vulnerable Carnaby's Black Cockatoo - Endangered Chuditch - Vulnerable Brush-tailed Phascogale - Conservation Dependent Western Brush Wallaby - Priority 4
Targeted Fauna Assessment at the Minninup Pool Project Development Investigation Area, Prepared for the Shire of Collie	EcoEdge (2019)	September 2018 to January 2019.	Forest Red-tailed Black-Cockatoo - Vulnerable Western Brush Wallaby - Priority 4 Western False Pipistrelle - Priority 4
Fauna Assessment of Benjinup Project, Boyup Brook	Bamford Consulting Ecologists (2016)	9-12 June 2014, 2-10 December 2014, 2-5 June 2015, 29 September - 1 October 2015	Forest Red-tailed Black-Cockatoo - Vulnerable Carnaby's Black Cockatoo - Endangered Brush-tailed Phascogale - Conservation Dependent Chuditch - Vulnerable Western Brush Wallaby - Priority 4 Quenda - Priority 4

4.1.2 Database Searches

Threatened Fauna listed under the EPBC Act

A search of the EPBC Act Protected Matters database was undertaken for a 30 km buffer around the study area (DCCEEW 2023). The database search listed 21 Threatened vertebrate fauna species, or species habitat, that may occur in the study area:

Mammals:

- Woylie (*Bettongia penicillata*) listed as Endangered;
- Chuditch (*Dasyurus geoffroii*) listed as Vulnerable;
- Numbat (*Myrmecobius fasciatus*) listed as Endangered;
- Western Ringtail Possum (*Pseudocheirus occidentalis*) listed as Critically Endangered;
- Red-tailed Phascogale (*Phascogale calura*) listed as Vulnerable; and
- Quokka (*Setonix brachyurus*) listed as Vulnerable.

Birds:

- Australasian Bittern (*Botaurus poiciloptilus)* listed as Endangered;
- Australian Fairy Tern (*Sternula nereis nereis*) listed as Vulnerable;
- Australian Painted Snipe (*Rostratula australis)* listed as Endangered;
- Baudin's Black Cockatoo (*Zanda baudinii*) listed as Endangered;
- Carnaby's Cockatoo (*Zanda latirostris*) listed as Endangered;
- Curlew Sandpiper (*Calidris ferruginea*) listed as Critically Endangered;
- Eastern Curlew (*Numenius madagascariensis*) listed as Critically Endangered;
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) listed as Vulnerable;
- Greater Sand Plover (*Charadrius leschenaultii)* listed as Vulnerable;
- Grey Falcon (*Falco hypoleucos)* listed as Vulnerable;
- Malleefowl (*Leipoa ocellata*) listed as Vulnerable;
- Noisy Scrub-bird (*Atrichornis clamosus*) listed as Endangered; and
- Red Knot (*Calidris canutus)* listed as Endangered.

Fish:

- Balston's Pygmy Perch (*Nannatherina balstoni)* listed as Vulnerable; and
- Black-stripe Minnow (*Galaxiella nigrostriata*) listed as Endangered.

The database search also identified seven migratory bird species, or species habitat, that may occur in the study area:

- Fork-tailed Swift (*Apus pacificus);*
- Common Sandpiper (*Actitis hypoleucos);*
- Sharp-tailed Sandpiper (*Calidris acuminata);*
- Pectoral Sandpiper (*Calidris melanotos);*
- Common Greenshank (*Tringa nebularia);*
- Grey Wagtail (*Motacilla cinerea);* and
- Osprey (*Pandion haliaetus).*

Threatened Fauna listed under the BC Act

The Atlas of Living Australia and DBCA database searches (ALA 2023, DBCA 2023) identified seven species listed under the BC Act:

Mammals:

- Quokka (*Setonix brachyurus*) listed as Vulnerable; and
- Chuditch (*Dasyurus geoffroii*) listed as Vulnerable.

Birds:

- Peregrine Falcon (*Falco peregrinus*) listed as Other Specially Protected Fauna;
- Australasian Bittern (*Botaurus poiciloptilus*) listed as Endangered;
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) listed as Vulnerable;
- Baudin's Cockatoo (*Zanda baudinii*) listed as Endangered; and
- Carnaby's Cockatoo (*Zanda latirostris*) listed as Endangered.

Priority Fauna recognised by the DBCA

The Atlas of Living Australia and DBCA database searches (ALA 2023, DBCA 2023) identified eight Priority fauna species as potentially occurring:

Birds:

- Australian Little Bittern (*Ixobrychus dubius*) listed as Priority 4;
- Barking Owl (*Ninox connivens* (southwest subpopulation) listed as Priority 3; and
- Masked Owl (*Tyto novaehollandiae novaehollandiae*) listed as Priority 3.

Mammals:

- Water-rat (*Hydromys chrysogaster)* listed as Priority 4;
- Quenda (*Isoodon fusciventer*) listed as Priority 4; and
- Western Brush Wallaby (*Notamacropus irma*) listed as Priority 4.

Fish:

- Pouch Lamprey (*Geotria australis)* listed as Priority 3.

Reptiles:

- Darling Range South-west Ctenotus (*Ctenotus delli*) listed as Priority 4.

4.1.3 Potentially Occurring Significant Fauna

A total of 43 conservation significant species were identified during the desktop assessment, comprising 13 mammals, 26 birds, three fish and one reptile species. The database searches and literature review confirmed that none of these species had previously been recorded within the study area. Based on the known distribution (Figure 6) and habitat preference of the remaining species, eight species were determined as being “likely” to occur within the study area, and three species were determined as “possibly” occurring within the study area (Table 7):

Likely

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

- Western False Pipistrelle (*Falsistrellus mackenziei*) listed as Priority 4;
- Chuditch (*Dasyurus geoffroii*) listed as Vulnerable;
- Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) listed as Conservation Dependent;
- Quenda (*Isoodon fusciventer*) listed as Priority 4; and
- Western Brush Wallaby (*Notamacropus irma*) listed as Priority 4.

Possible

- Fork-tailed Swift *(Apus pacificus)* listed as Migratory;
- Western Ringtail Possum (*Pseudocheirus occidentalis*) listed as Critically Endangered; and
- Peregrine Falcon *(Falco peregrinus)* listed as Other Specially Protected Species.

The remaining 32 species were identified as “unlikely” to occur in the study area (Table 7).

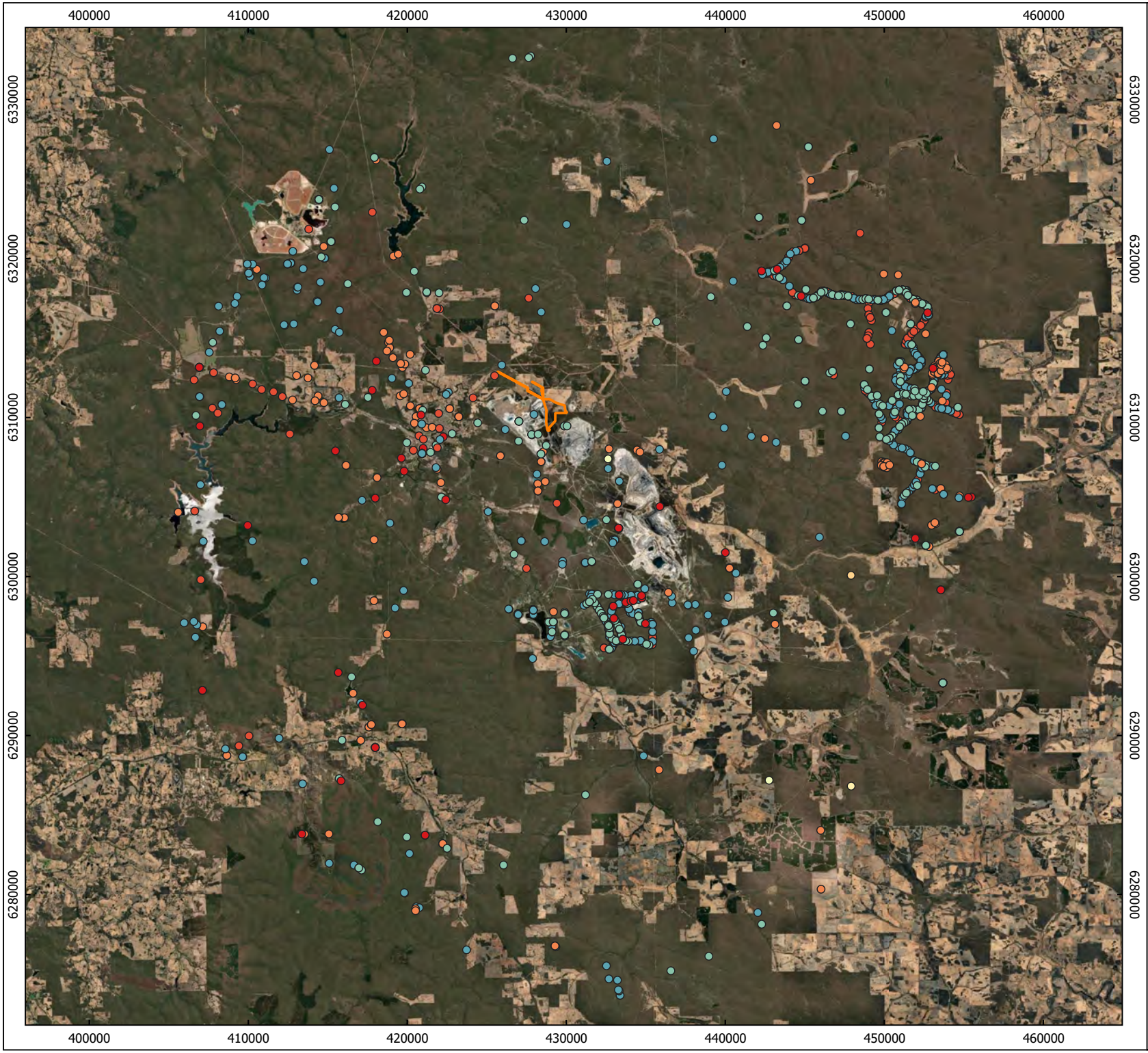

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Figure 6
Location of significant fauna from DBCA database searches

Legend

- Study Area

DBCA Database Search

- Conservation Dependant
- Critically Endangered
- Endangered
- Extinct
- Migratory
- Other significant
- Priority 2
- Priority 3
- Priority 4
- Vunlnerable

0 5 10 15 km

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Datum: GDA 94
Projection: MGA Zone 50

Date: 21/08/2024
Status: Final
Figure: 5
Sheet Size: A4
File Name Reference: GS_Fig6_DBCA.pdf
Drawn by: JW
Requested by: DB

Table 7 Conservation significant fauna species identified during the desktop assessment.

Scientific Name	Common Name	EPBC Act	BC Act	DBCA	Habitat Preference	Suitable Habitat Present	Likelihood in the study area	Rationale
BIRDS								
Actitis hypoleucos	Common Sandpiper	MI			Edge of sheltered waters, salt or fresh, estuaries, river pools, claypans, drying swamps (Johnstone and Storr 1998)	No	Unlikely	An uncommon migrant species but no suitable habitat present within the study area.
Apus pacificus	Fork-tailed Swift	MI			Entirely aerial species (Johnstone and Storr 1998)	Yes	Possible	Migratory, possibility that it may fly over study area.
Atrichornis clamosus	Noisy Scrub-bird, Tjimiluk	EN	EN		Dense, long-unburnt vegetation characterised as low forest (5-15 m high), scrub/thicket and (rarely) heath	No	Unlikely	Vegetation not dense enough to support this species. A translocated population occurs 50 km north. Nearest natural population is 250km south-east.
Botaurus poiciloptilus	Australasian Bittern	EN	EN		Reedbeds, and other vegetation in water such as cumbungi, lignum and sedges	No	Unlikely	Habitat unsuitable within study area. Suitable habitat exists along the Collie River 1-2 km to the north and east of the study area.
Calidris acuminata	Sharp-tailed Sandpiper	MI			Coastal and inland areas saline and fresh or brackish wetlands (Geering et al. 2007)	No	Unlikely	A migrant species and no suitable habitat present within the study area.
Calidris canutus	Red Knot	EN &MI	CR		Coastal habitats including intertidal mudflats, sandflats, beaches, estuaries, bays, inlets, lagoons and harbours	No	Unlikely	No suitable habitat.
Calidris ferruginea	Curlew Sandpiper	CR	CR		Intertidal mudflats and ephemeral and permanent lakes	No	Unlikely	A migrant species and no suitable habitat present within the study area.
Calidris melanotos	Pectoral Sandpiper	MI			Shallow fresh to saline wetlands	No	Unlikely	An uncommon migrant species and no suitable habitat present within the study area.
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo, Karrak	VU	VU		Eucalypt forests, areas of seeding Marri, Jarrah, Blackbutt, Karri and Sheoak (Johnstone and Storr 1998)	Yes	Likely	Previously recorded within 500m of the study area and at numerous locations in close proximity. Suitable habitat present.

Scientific Name	Common Name	EPBC Act	BC Act	DBCA	Habitat Preference	Suitable Habitat Present	Likelihood in the study area	Rationale
Zanda baudinii	Baudin's Black Cockatoo	EN	EN		Eucalypt forest, areas of Marri, Karri and Wandoo (Johnstone & Storr, 1998, Johnstone & Kirkby 2008)	Yes	Likely	Previously recorded 1.3km south of the study area suitable habitat present.
Zanda latirostris	Carnaby's Black Cockatoo	EN	EN		Eucalypt woodlands and forests and adjacent area of *Proteaceous* scrubs and heaths (Johnstone & Storr 1998)	Yes	Likely	Previously recorded 3.3km south of the study area suitable habitat present.
Charadrius leschenaultii	Greater Sand Plover	VU & MI	VU		Coastal or estuarine habitats including beaches, mudflats, sandbanks and lagoons	No	Unlikely	No suitable habitat.
Falco hypoleucos	Grey Falcon	VU	VU		Shrubland, grassland and wooded watercourses, wetlands	Yes	Unlikely	Protected matters search indicated species or species habitat may occur within the search area. No records from nearby.
Falco peregrinus	Peregrine Falcon			OS	Will utilise most habitats prefers coastal and inland cliffs or open woodlands near water, and also city buildings	Yes	Possible	Recorded 4km southeast of the study area. Potentially suitable habitat present, but not preferred.
Ixobrychus dubius	Australian Little Bittern			P4	Swamps, lakes and rivers with well vegetated margins	No	Unlikely	No suitable habitat.
Ixobrychus flavicollis australis (southwest subpop.)	Black Bittern			P2	Dense vegetation and trees at the edges of water bodies	No	Unlikely	No suitable habitat. Nearby record from 8km west of study area is historical (1937).
Leipoa ocellata	Malleefowl	VU	VU		Semi-arid mallee scrub on the fringes of the relatively fertile areas of southern Australia	No	Unlikely	No suitable habitat. No records from within a 30km radius of the study area.
Motacilla cinerea	Grey Wagtail	MI			Various habitats with open waterbodies (Johnstone & Storr 2004)	No	Unlikely	No suitable habitat. Protected matters search indicated species or species habitat may occur within the search area. No records from nearby.
Ninox connivens connivens	Barking Owl			P3	Open country with tree lined water courses, open woodlands and forest edges	Yes	Unlikely	No records within 30km radius of study area.
Numenius madagascariensis	Eastern Curlew	CR & MI	CR		Tidal mudflats, also reef flats, sandy beaches (Johnstone & Storr 1998)	No	Unlikely	No suitable habitat.

Scientific Name	Common Name	EPBC Act	BC Act	DBCA	Habitat Preference	Suitable Habitat Present	Likelihood in the study area	Rationale
Pandion haliaetus	Osprey	MI			Sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, and large river pools (Johnstone et al. 2013)	No	Unlikely	No suitable habitat.
Oxyura australis	Blue-billed Duck			P4	Well vegetated dams, lakes and swamps	No	Unlikely	No suitable habitat. No records within 30km radius of study area (DBCA 2023). Birddata search indicates has been recorded in the wider area. The date of the record is uncertain. Suitable habitat occurs nearby at the Collie River.
Rostratula australis	Australian Painted Snipe	EN	EN		Shallow inland wetlands, either freshwater or brackish	No	Unlikely	No suitable habitat.
Sternula nereis nereis	Australian Fairy Tern	VU	VU		Sheltered sandy beaches, spits and banks above the high tide line and below vegetation	No	Unlikely	No suitable habitat.
Tringa nebularia	Common Greenshank	MI			Intertidal mudflats and ephemeral and permanent lakes	No	Unlikely	No suitable habitat.
Tyto novaehollandiae novaehollandiae	Masked Owl			P3	Forests, woodlands, timbered waterways and open country	Yes	Unlikely	No DBCA database records within the 30km search radius.
FISH								
Galaxiella nigrostriata	Black-stripe Minnow	EN	EN		Ephemeral wetlands of the south-west (Bray and Gomon 2020)	No	Unlikely	No suitable habitat.
Geotria australis	Pouch Lamprey			P3	Rivers and streams, estuaries and coastal waters	No	Unlikely	Nearby record from 8km west of study area is historical (1915).
Nannatherina balstoni	Balston's Pygmy Perch	VU	VU		Coastal peat flats, rivers	No	Unlikely	No suitable habitat within the study area.
MAMMALS								
Bettongia penicillata ogilbyi	Woylie	EN	CR		Woodlands and adjacent heaths with a dense understorey of shrubs (Woinarski et al. 2014)	No	Unlikely	Historical record from 1999 approximately 6km northwest of the study area (DBCA 2023). Understorey vegetation within study area not dense enough to support viable population (predation).

Scientific Name	Common Name	EPBC Act	BC Act	DBCA	Habitat Preference	Suitable Habitat Present	Likelihood in the study area	Rationale
Dasyurus geoffroii	Chuditch, Western Quoll	VU	VU		Jarrah forest, in moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest particularly in riparian vegetation (Orell & Morris 1994)	Yes	Likely	Previous records within a 4km radius of the study area (DBCA 2023) and suitable habitat present.
Falsistrellus mackenziei	Western False Pipistrelle			P4	Wet sclerophyll forests of Karri, Jarrah and Tuart eucalypts	Yes	Likely	One record approximately 8km west of the study area (DBCA 2023). Suitable habitat present.
Hydromys chrysogaster	Water-rat			P4	Permanent bodies of fresh or brackish water, subalpine streams to lakes and farm dams (Van Dyck & Strahan 2008)	No	Unlikely	No suitable habitat. Nearest record 5km west of the study area (DBCA 2023).
Isoodon fusciventer	Quenda			P4	Jarrah forest and swamp habitats, preferring dense vegetation around wetland fringes and heathland (Cooper 1998, Woinarski et al. 2014).	Yes	Likely	Previous record within 650m of the study area (DBCA 2023) with suitable habitat present.
Macrotis lagotis	Bilby	VU	VU		Mixture of woodland including Jarrah, Marri and Wandoo in the south-west (Abbott 2001).	Yes	Unlikely	Two records within 6.8km and 5km to the southeast and west respectively, both historical; 1910 and 1971 (DBCA 2023). No longer present in the southwest of WA.
Myrmecobius fasciatus	Numbat	EN	EN		Eucalypt forests and woodland, notably wandoo and jarrah woodland (Van Dyck & Strahan 2008)	Yes	Unlikely	Three records from 7km west and 6.5km southeast of the study area, all historical; 1966-1984 (DBCA 2023). Habitat present but unlikely to occur.
Notamacropus eugenii derbianus	Tammar Wallaby			P4	Dense, low vegetation for daytime shelter and open grassy areas for feeding. This species inhabits coastal scrub, heath, dry sclerophyll forest and thickets in mallee and woodland (Maxwell et al. 1996)	Yes	Unlikely	Not previously recorded within a 30km radius of the study area (DBCA 2023).
Notamacropus irma	Western Brush Wallaby			P4	Wide-range of habitats including low Banksia woodlands, Jarrah/Marri woodlands and moist Melaleuca lowlands, favours open, grassy areas (Wann & Bell 1997, Woinarski et al. 2014)	Yes	Likely	Previously recorded within 2km of the study area (DBCA 2023) and suitable habitat present.

Scientific Name	Common Name	EPBC Act	BC Act	DBCA	Habitat Preference	Suitable Habitat Present	Likelihood in the study area	Rationale
Phascogale calura	Red-tailed Phascogale	VU	CD		Wandoo-rock sheoak uplands, and lowland habitat with riverine fringing vegetation of swamp sheoak, York Gum and Wandoo (Short et al. 2011)	No	Unlikely	No records within a 50km radius of the study area (DBCA 2023). Habitat unsuitable.
Phascogale tapoatafa wambenger	Brush-tailed Phascogale		CD		Dry sclerophyll forests and open woodlands that contain hollow-bearing trees with a sparse ground cover (Woinarski *et al.* 2014).	Yes	Likely	Numerous recent records in close proximity (DBCA 2023). Good habitat within study area.
Pseudocheirus occidentalis	Western Ringtail Possum	CR	CR		Coastal *Agonis flexuosa* forest or eucalypt woodland or forest with a mid-story of *Agonis flexuosa* (DPaW 2017, Jones *et al.* 1994). Additionally, inland forest areas that have been unlogged and unburnt for long periods (Wayne et al. 2006).	Yes	Possible	Occurs adjacent to the western end of the access road (although no disturbance at this point) and extends into the urban centre of Collie; records are relatively recent. Habitat within study area possibly suitable although prefers denser understorey within inland forested locations.
Setonix brachyurus	Quokka	VU	VU		Habitat varies, but prefer *Acacia* and *Melaleuca* thickets. Associated with *Taxandria linearifolia* in Jarrah Forest (de Tores 2008).	No	Unlikely	Three records around Collie are historical (1899-1930) and suitable habitat with dense ground cover is absent.
REPTILES								
Ctenotus delli	Darling Range South-west Ctenotus			P4	Coastal heaths characterised by Banksia or Mallee woodlands with pale sand plains.	No	Unlikely	Two records in the Collie area from 2000 but unsuitable habitat within the study area.

4.2 Fauna Habitats

4.2.1 Fauna Habitat Types

There were three naturally occurring habitat types recorded within the study area: Jarrah-Sheoak Forest (Table 8), parkland cleared Jarrah Forest (Table 9), and *Melaleuca* Scrub (Table 10). There were an additional two disturbed habitats: paddocks (cleared farmland supporting annual pasture, Table 11) and infrastructure corridors (roads, firebreaks, powerline, Table 12).

Native vegetation within the southern sector of the study area where the rail spur line is proposed, i.e. state forest, was dominated by Jarrah (*Eucalyptus marginata*) and Sheoak (*Allocasuarina fraseriana*) Forest on lateritic hill crests and slopes (Table 8, Figure 7). Soil depth increased on lower slopes to the south with localised zones including the associate sub-canopy species Candlestick Banksia (*Banksia attenuata)* and Moonah (*Melaleuca preissiana*). The spur line has been strategically positioned along the western fringe of the existing state forest vegetation to prevent fragmentation of the larger block. The spur line abuts a haul road at the Griffin Coal Mine, occurs within the area of reduced vegetation condition (related to impacts from the adjacent haul road), sits adjacent to the existing cleared corridor supporting a kVA transmission line, i.e. in the narrow strip of vegetation between the haul road and kVA transmission line, and represents the most direct route to the existing rail loop. The August 2024 field survey confirmed the presence of Phytophthora dieback within the footprint of the proposed rail spur line as indicated by the absence of susceptible plant species that occur further east, and visual evidence of decline and death within the few remaining indicator species including *Banksia attenuata, Persoonia longifolia* and *Xanthorrhoea preissii.*

The parkland cleared fauna habitat comprised Jarrah-Marri *(Corymbia calophylla)* Forest with all understorey strata removed through grazing by domestic stock (Table 9, Figure 7). While this contributed to a vegetation condition rating of degraded, the forest canopy retains foraging and roosting value for black cockatoos. The parkland cleared habitat occurred on privately owned land adjacent to the access road in the northern sector of the study area and on farmland (paddock) where the recycling mill will be constructed.

A localised area of *Melaleuca* Scrub (0.25 ha) was restricted to one point along the water pipeline corridor within a cleared powerline corridor (Table 10, Figure 7). The vegetation represents post-clearing native regeneration within a natural drainage zone. Vegetation condition was rated as good. There will be direction drilling undertaken to install the water pipeline beneath the *Melaleuca* Scrub remnant negating any requirement for clearing.

The two disturbed habitats included paddocks (cleared farmland supporting annual pasture) and infrastructure corridors (roads, firebreaks, powerline) (Table 11, Figure 7). Paddocks occur on privately owned farmland and support managed annual pasture utilised to conduct dryland grazing of cattle. The recycling mill will be constructed predominantly on the paddock habitat. The infrastructure corridors intersecting the study area include a mix of roads, rail (loop), firebreaks and kVA transmission lines (Table 12, Figure 7). Native vegetation has been cleared along most of the corridors (completely degraded condition rating). Natural regeneration has occurred along sections of the kVA transmission with reduced species richness and a significantly altered vegetation structure (degraded vegetation condition rating).

Table 8 Description of the Jarrah-Sheoak Forest fauna habitat within the study area.

Name	**Description**	
Jarrah-Sheoak Forest	Jarrah-Sheoak Forest on hillslopes	
Landform	Hillslopes and lower slopes	
Area (ha)	6.15ha within clearing footprint	
Vegetation Description	Forest of Eucalyptus marginata subsp. marginata and Allocasuarina fraseriana over Open Scrub (to Scrub) of Xylomelum occidentale, Persoonia longifolia and Xanthorrhoea preissii over Low Heath C of Hibbertia hypericoides and Dasypogon bromeliifolius	
% Ground Cover	Rock	<2%
	Leaf Litter	>70%
	Logs	2-10%
	Vegetation	10-30%
Rocks	Type	Laterite
	Size	<5 cm
Soil	Type	Sand
	Colour	Grey
Habitat Features Habitat includes areas with many logs and log piles, dense leaf litter, larger trees occur within this habitat providing some hollows.	Slope	Low
	Water	None
	Woody Debris	Moderate
	Peeling Bark	Minor
	Rock Crevices	Minor
	Burrowing Suitability	High
	Tree Hollows (<10cm)	Present
	Tree Hollows (>10cm)	Occasional
Condition	Condition	Degraded to Very Good
	Disturbances	Logging, frequent fire, roads/access tracks, mining infrastructure/rail and powerline corridors, adjacent coal mine haul road, siltation from haul road, rubbish, weeds, rabbits.
	Fire Age	Moderate (3-6 years) to Old (>6 years)

Table 9 Description of the Jarrah-Marri Forest fauna habitat within the study area.

Name	**Description**	
Parkland Cleared	Parkland Cleared Jarrah-Marri Forest on hill crests and upper hill slopes	
Landform	Hill crests and upper hill slopes	
Area (ha)	18.52 ha within the clearing footprint	
Vegetation Description	Forest of Eucalyptus marginata subsp. marginata (Allocasuarina fraseriana) over parkland cleared ground cover on brown sandy loam on hill crests	
% Ground Cover	Rock	30-70% (lateritic outcropping)
	Leaf Litter	2-10%
	Logs	2-10%
	Vegetation	<2% (understorey), 30-70% (canopy)
Rocks	Type	Laterite
	Size	<30cm
Soil	Type	Sandy loam (gravelly)
	Colour	Brown
Habitat Features Habitat contains Wandoo with small hollows, areas of dense understory cover including low shrubs and has minor pools of water in winter	Slope	Low
	Water	None
	Woody Debris	Minor
	Peeling Bark	Minor
	Rock Crevices	Moderate
	Burrowing Suitability	Low
	Tree Hollows (<10cm)	Present
	Tree Hollows (>10cm)	Present
Condition	Condition	Degraded
	Disturbances	Fire, logging, grazing by domestic stock, weeds from adjacent farmland, feral animals
	Fire Age	Old

Table 10 Description of *Melaleuca* Scrub habitat within the study area.

Name	**Description**	
Melaleuca Scrub	*Melaleuca* Scrub on minor drainage line	
Landform	Minor drainage line	
Area (ha)	Not within clearing footprint	
Vegetation Description	Scrub of *Hakea prostrata* and *Melaleuca incana* subsp. *tenella* over Low Scrub A of *Melaleuca incana* subsp. *tenella* and *Astartea scoparia* over Open Low Scrub B of *Xanthorrhoea preissii* over Dwarf Scrub D of *Hypocalymma angustifolium* and *Acacia stenoptera* over Open Low Sedges of *Cyathochaeta avenacea* and *Desmocladus asper*	
% Ground Cover	Rock	<2%
	Leaf Litter	30-70%
	Logs	<2%
	Vegetation	70-100% (all strata)
Rocks	Type	Laterite
	Size	<10 cm
Soil	Type	Silty clay loam
	Colour	Grey
Habitat Features Dense sedges and shrubs provide refuge. Small seasonal puddles of water along drainage line.	Slope	Low
	Water	Yes (seasonally wet)
	Woody Debris	Minor
	Peeling Bark	Minor
	Rock Crevices	None
	Burrowing Suitability	Low
	Tree Hollows (<10cm)	None
	Tree Hollows (>10cm)	None
Condition	Condition	Good
	Disturbances	Vegetation previously cleared for construction of kVA transmission line and service track.
	Fire Age	Old

Table 11 Description of Paddock habitat within the study area.

Name	**Description**	
Paddock	Paddock (cleared farmland supporting annual pasture)	
Landform	Lateritic hill crest and hill slopes	
Area (ha)	2.6 ha within clearing footprint	
Vegetation Description	No native vegetation (introduced annual pasture with common introduced weed species)	
% Ground Cover	Rock	<2%
	Leaf Litter	0%
	Logs	0%
	Vegetation	0%
Rocks	Type	Laterite
	Size	<2 cm
Soil	Type	Sandy loam
	Colour	Grey / brown
Habitat Features Areas of dense low ground cover.	Slope	Low
	Water	Two farm dams excavated
	Woody Debris	None
	Peeling Bark	None
	Rock Crevices	None
	Burrowing Suitability	Low
	Tree Hollows (<10cm)	None
	Tree Hollows (>10cm)	None
Condition	Condition	Completely Degraded
	Disturbances	Cleared of native vegetation, farms dams, application of fertiliser, grazing by cattle
	Fire Age	Old

Table 12 Description of Infrastructure Corridor habitat within the study area.

Name	**Description**	
Infrastructure Corridors	Infrastructure Corridors (roads, rail, firebreaks, powerline)	
Landform	Lateritic hill crest and hill slopes	
Area (ha)	2.3 ha within clearing footprint	
Vegetation Description	Typically cleared on native vegetation, noting that natural regeneration was evident at localised areas along the kVA powerline corridors (altered vegetation structure and reduced species richness)	
% Ground Cover	Rock	2-10%
	Leaf Litter	<2%
	Logs	<2%
	Vegetation	Variable from 0% to 30%
Rocks	Type	Laterite
	Size	<5 cm
Soil	Type	Sandy loam
	Colour	Grey / brown
Habitat Features Areas of dense low ground cover.	Slope	Low
	Water	None
	Woody Debris	Low
	Peeling Bark	None
	Rock Crevices	None
	Burrowing Suitability	Low
	Tree Hollows (<10cm)	None
	Tree Hollows (>10cm)	None
Condition	Condition	Completely Degraded to Degraded
	Disturbances	Cleared of native vegetation
	Fire Age	Old

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Figure 7
Fauna Habitats within the study area

Legend

- Study Area

Habitat Types

- Disturbed (Foraging Score 3)
- Jarrah-Sheoak Forest (Foraging Score 9)
- Paddock (Foraging Score 3)
- Parkland Cleared Jarrah-Marri (Foraging Score 9)
- Road (Foraging Score 3)

0 250 500 m

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Datum: GDA 94
Projection: MGA Zone 50
Date: 21/08/2024
Status: Final
Figure: 7
Sheet Size: A4
File Name Reference: GS_Fig7_habitats.pdf
Drawn by: JW
Requested by: DB

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Figure 7
Fauna Habitats within the study area

Legend

- Study Area

Habitat Types

- Disturbed (Foraging Score 3)
- Jarrah-Sheoak Forest (Foraging Score 9)
- Melaleuca Scrub (Foraging Score)
- Paddock (Foraging Score 3)
- Parkland Cleared Jarrah-Marri (Foraging Score 9)

0 250 500 m

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Datum: GDA 94
Projection: MGA Zone 50

Date: 21/08/2024
Status: Final
Figure: 7
Sheet Size: A4
File Name Reference: GS_Fig7_habitats.pdf
Drawn by: JW
Requested by: DB

4.3 Targeted Fauna Searches

4.3.1 Motion Sensor Cameras

The ten motion sensor cameras deployed over 28 nights recorded a total of 96 fauna observations from 16 fauna species across three species groups (Table 13, Appendix 4). The total fauna included three introduced species (feral animals): Cow *(Bos taurus),* Rabbit *(Oryctolagus cuniculus)* and Red Fox *(Vulpes vulpes).*

Table 13 Summary of fauna recorded during camera trap survey.

Species Group	Taxon Name	Common Name	Status
Birds	*Corvus coronoides*	Australian Raven	
BIrds	*Gymnorhina tibicen*	Australian Magpie	
Birds	*Phaps chalcoptera*	Common Bronzewing	
Mammals	*Antechinus flavipes leucogaster*	Mardoo	
Mammals	Bat sp. indet	Bat	
Mammals	*Bos taurus*	Cow	*
Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
Mammals	*Macropus irma*	Western Brush Wallaby	P4
Mammals	*Oryctolagus cuniculus*	Rabbit	*
Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	CD
Mammals	*Tachyglossus aculeatus*	Short-beaked Echidna	
Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
Mammals	*Vulpes vulpes*	Red Fox	*
Reptiles	*Egernia napoleonis*	South-western Crevice Skink	
Reptiles	*Tiliqua rugosa*	Bobtail	
Reptiles	*Varanus rosenbergi*	Heath Monitor	

None of the vertebrate fauna species recorded from the camera traps were listed under the Commonwealth EPBC Act. Two species listed under the Western Australian BC Act were recorded on 17 separate occasions from five of the ten cameras (Figure 8, Appendix 5).

Brush-tailed Phascogale *(Phascogale tapoatafa wambenger)* is listed as Conservation Dependant under the BC Act. The present distribution is believed to have been reduced to approximately 50% of its former range with the current distribution extending west of a line from Perth to Albany. It occurs at low densities in the northern Jarrah forest and at highest densities in the Perup/Kingston area, Collie River valley, and near Margaret River and Busselton. Records are less common from wetter forests. The Brush-tailed Phascogale has been observed in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover. It relies on tree hollows as nest sites. The home range for a female is estimated at between 20 ha and 70 ha, whilst that for males is estimated as twice that of females. In addition, they tend to utilise a large number (approximately 20) of different nest sites throughout their range (Soderquist and Rhind 2008). The Brush-tailed Phascogale was recorded on 14 occasions from four camera traps within the study area (Figure 8).

Western Brush Wallaby *(Notamacropus irma)* is listed as Priority 4 fauna by the DBCA and known to inhabit a wide-range of habitats including low *Banksia* woodlands, Jarrah/Marri woodlands and moist *Melaleuca* lowlands, favouring open, grassy areas (Wann and Bell 1997, Woinarski *et al.* 2014). It was recorded on three occasions from three of the ten camera traps within the study area (Figure 8). This species was also opportunistically observed on one occasion within the study area.

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Figure 8
Location of significant fauna within the study area

Legend

- Study Area
- Clearing Footprint

Observations

- Brush-tailed Phascogale
- Western Brush Wallaby

0 250 500 m

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Datum: GDA 94
Projection: MGA Zone 50
Date: 21/08/2024
Status: Final
Figure: 8
Sheet Size: A4
File Name Reference: GS_Fig8_sig_fauna.pdf
Drawn by: JW
Requested by: DB

4.3.2 Grid Traverses and Spotlighting

A diurnal inspection of the study area conducted along a series of grid traverses carried out on foot using a handheld GPS for guidance did not record any evidence of conservation significant fauna, such as tracks, nests (dreys) in trees, scratches on tree trunks or scats on the ground below trees with hollows or dreys. The nocturnal survey conducted via spotlighting with head torches also failed to detect Western Ringtail Possum (*Pseudocheirus occidentalis)* or their eye shine.

4.4 Presence of Black Cockatoos

4.4.1 Carnaby's Black Cockatoo

Carnaby's Black Cockatoo is one of two white-tailed black cockatoos listed as Endangered under the EPBC Act and BC Act. This species occurs in south-western Western Australia extending from Kalbarri to Cape Arid and inland to the Wheatbelt. Breeding habitat for the species generally occurs within the Wheatbelt region in hollows provided by smooth barked *Eucalyptus* species such as Wandoo and Salmon Gum (Saunders 1982). More recently there has been an expansion in the breeding range of Carnaby's Black Cockatoo to the west and south with breeding recorded from the Darling Scarp and as far south as Capel (Johnstone and Kirby 2019).

No evidence of this species was recorded from the study area across the four site visits completed in October and November 2023 and February and August 2024. However there are a number of records from the surrounding areas and they are considered likely to utilise the study area for foraging occasionally.

4.4.2 Baudin's and Forest Red-tailed Black Cockatoo

Baudin's Black Cockatoo and Forest Red-tailed Black Cockatoo (FRTBC) occur in the forested areas of the south-west with a generalised distribution between Perth to Albany and inland to Kojonup. Baudin's Black Cockatoo is listed as Endangered while the Forest Red-tailed Black Cockatoo is listed as Vulnerable under both the EPBC Act and BC Act. Both species have a diet comprising mainly seeds of Marri, with Baudin's Black Cockatoo also consuming seeds from Proteaceous species. Forest Red-tailed Black Cockatoos also consume Jarrah seeds and a range of other plant species that hold seeds in woody capsules. Habitat within the study area was suitable for foraging for both species. The study area is within the currently known breeding range for both species (DAWE 2022). Nests are known to occur within large hollows of mature trees, predominantly Marri, with Jarrah, Wandoo and other *Eucalyptus* species also utilised (Saunders 1974, Johnstone *et. al.* 2013). Baudin's Black Cockatoo breed between August and December (Johnstone *et. al.* 2011). The timing of breeding for the Forest Red-tailed Black Cockatoo is less defined with breeding having been recorded in all months with peaks in winter to autumn and spring (Johnstone and Kirby 2019).

Forest Red-tailed Black Cockatoos were observed directly or identified from calls on eleven occasions from within the study area during the four site visits, with an additional three observations made from state forest adjacent to (outside) the study area (Figure 9). Additionally, foraging evidence on Marri nuts was observed at 41 locations within the study area (Figure 9). Roosting evidence including droppings, feathers and branch clippings was recorded at one location within the parkland cleared Jarrah-Marri Forest habitat (Figure 9). Pre-dawn and dusk monitoring undertaken in August 2024 confirmed at least three small

family groups of Forest Red-tailed Black Cockatoos (total of 16 birds) returning to roost overnight at the location. The individual trees used for roosting were identified during the survey (Figure 9). However, it is noted that different trees were utilised across the three nights of monitoring and the trees utilised for roosting were not particularly tall (or taller than the surrounding stand). Roosting trees were situated on a hill crest along the perimeter of the remnant overlooking cleared farmland and the dam and were sheltered from the prevailing wind.

Baudin's Black Cockatoos were observed on two occasions (total of 82 birds) in October 2023 from the central sector of the study area, with a third observation (two birds) made from state forest vegetation outside the water pipeline corridor in February 2024 (Figure 9). Foraging evidence from Baudin's Black Cockatoo was also recorded at seven locations within the study area (Figure 9).

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Figure 9
Black-cockatoo records within the study area

Legend

- Study Area
- Clearing Footprint

Foraging Evidence

- Baudins's Cockatoo
- Forest Red-tailed Black Cockatoo

Observations

- Baudins's Cockatoo
- Forest Red-tailed Black Cockatoo
- Roosting Evidence

0 250 500 m

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Datum: GDA 94
Projection: MGA Zone 50
Date: 06/03/202421/08/2024
Status: Final
Figure: 9
Sheet Size: A4
File Name Reference: GS_Fig9_BC.pdf
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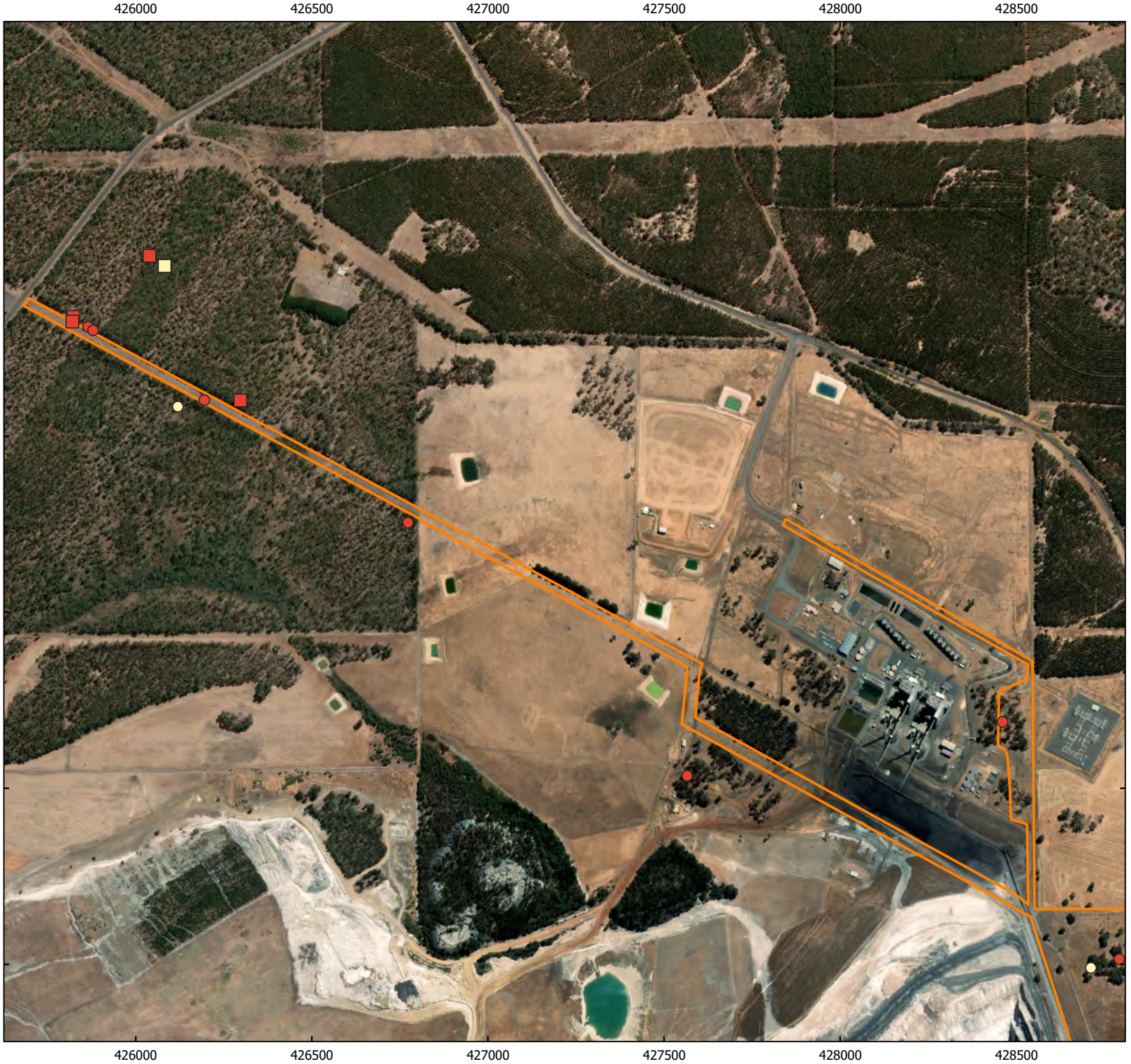
Requested by: DB



GREEN STEEL WA

Figure 9
Black-cockatoo records within the study area

Legend

Study Area

Foraging Evidence

- Baudins's Cockatoo
- Forest Red-tailed Black Cockatoo

Observations

- Baudins's Cockatoo
- Forest Red-tailed Black Cockatoo

0 250 500 m

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Status: Final
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4.5 Breeding Habitat Assessment

4.5.1 Habitat Tree Assessment

A total of 30 trees with the potential to represent known, suitable or potential nesting trees were identified from within the boundary of the study area during the field survey (Appendix 6, Figure 10). These trees were further assessed for suitability as nesting hollows for black cockatoos as per criteria outlined in Table 4. Three trees within the study area were classified as *suitable nesting trees*, defined as supporting a hollow of suitable size and orientation considered to be of sufficient depth for use by black cockatoos (but with no conclusive evidence of being used). Two trees containing suitable hollows were situated within the disturbance footprint (Figure 10). The remaining 27 trees were categorised as *potential nesting trees* (classified as potentially suitable or unsuitable). These trees supported hollows that were currently too small or of unsuitable orientation or depth to be used by black cockatoos for nesting, but with potential to become nest sites in the future.

Habitat trees occurring within native vegetation remnants bordering the access road corridor and within a 50 m buffer from the centreline of the water pipeline corridor (i.e. outside of the study area) were also assessed in February 2024. A total of 70 trees with the potential to represent known, suitable or potential nesting trees were recorded, including three *suitable nesting trees* and 67 *potential nesting trees* (Appendix 7, Figure 10).

4.5.2 Tree Density Assessments

The density of potential nesting trees (i.e. DBH >50 cm or >30 cm for *Eucalyptus wandoo*) were recorded from 13 quarter hectare plots distributed throughout the study area. The density of potential nesting trees averaged 9.3 trees per ha within Jarrah-Sheoak Forest habitat, and 4.0 trees per ha within the parkland cleared Jarrah-Marri Forest habitat. There were no potential nesting trees recorded from the *Melaleuca* Scrub habitat within the study area.

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Figure 10
Location of habitat trees within the study area

Legend

- Study Area
- Clearing Footprint

Habitat Trees

- Suitable nesting tree
- Potential nesting tree

0 250 500 m

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Datum: GDA 94
Projection: MGA Zone 50
Date: 21/08//2024
Status: Final
Figure: 10
Sheet Size: A4
File Name Reference: GS_Fig10_trees.pdf
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Requested by: DB

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Figure 10
Location of habitat trees within the study area

Legend

- Study Area
- Clearing Footprint

Habitat Trees

- Suitable nesting tree
- Potential nesting tree

0 250 500 m

1:15,000

Datum: GDA 94
Projection: MGA Zone 50

Date: 21/08/2024
Status: Final
Figure: 10
Sheet Size: A4
File Name Reference: GS_Fig10_trees.pdf
Drawn by: JW
Requested by: DB

4.6 Foraging and Roosting Habitat

4.6.1 Foraging Habitat Score (DAWE 2022)

Based on the foraging quality scoring tool (DAWE 2022, Appendix 2) the study area was given a score of ten for Forest Red-tailed Black Cockatoos and Baudin's Black Cockatoos, and a score of eight for Carnaby's Black Cockatoos (Table 14). Hence, the study area represents high quality foraging habitat for all three species of black cockatoo. Evidence of Forest Red-tailed Black Cockatoos and Baudin's Black Cockatoos feeding on Marri and Jarrah nuts was observed during the field survey. No evidence of foraging by Carnaby's Black Cockatoos was observed, resulting in a lower foraging score for this species (Table 14).

The study area was predominantly comprised of native Jarrah-Sheoak Forest with a range of other suitable foraging species that hold woody fruits also present including Marri (*Corymbia calophylla*) and *Banksia* species. Factors which may impact on the initial foraging score assigned to the study area including the presence of foraging evidence, availability of adequate foraging habitat in close proximity, proximity to breeding and roosting sites and the presence of disease are discussed below. No points were deducted based on the context of the site.

The availability and connectivity of nearby foraging habitat is important for successful breeding of black cockatoos (Saunders 1977, 1986). Approximately 68% (35,376.27 ha) of the land area within a 12 km radius of the study area comprised native vegetation (DPIRD 2017) (Figure 11). The vast majority of this native vegetation is likely to be Jarrah-Marri Forest and therefore represents suitable foraging habitat for black cockatoos. The study area was situated immediately adjacent to significant continuous areas of suitable foraging habitat present within the wider state forest. Based on the proximity and connectivity of significant foraging resources, no points were deducted for connectivity.

Database searches indicate that there are two known Carnaby's Black Cockatoo roost sites within a 12 km radius of the study area (DBCA 2022). The nearest documented roost site is situated to the north of the Collie townsite approximately 6 km west of the study area (Figure 11). Additionally, parkland cleared Jarrah Forest vegetation adjacent to the two farm dams within the study area provides roosting habitat, with evidence of roosting recorded from four locations during the surveys (Figure 9). Both Baudin's Black Cockatoo and Forest Red-tailed Black Cockatoo were observed in this habitat in the late afternoon and early morning. During the Winter 2024 field survey small family groups of Forest Red-tailed Black Cockatoos were confirmed as roosting within this area.

Baudin's Black Cockatoo and Carnaby's Black Cockatoo are known to breed within a 50 km radius of the study area (DAWE 2022) and chewed hollows have been observed approximately 3 km east south-east of the study area (Onshore Environmental 2023b). Additionally, there are large areas of suitable breeding habitat for all species within a 12 km radius. Based on this data, no points were deducted for proximity to roosting or breeding sites.

While dieback was present within the study area, no severe dieback or Marri canker disease was observed during the field survey, and no points were deducted for impacts resulting from significant plant disease.

Table 14 Scoring tool for determining quality of black cockatoo foraging habitat.

Score	Baudin's Cockatoo	Carnaby's Black Cockatoo	Forest Red-tail Black Cockatoo
Initial Score	10	10	10
Foraging evidence **Subtract 2** from your score if there is no evidence of feeding debris on your site.	0	-2	0
Connectivity **Subtract 2** from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	0	0	0
Proximity to breeding **Subtract 2** if you have evidence to conclude that your site is more than 12 km from breeding habitat	0	0	0
Proximity to roosting **Subtract 1** if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	0	0	0
Impact from significant plant disease **Subtract 1** if your site has disease present (e.g. *Phytophthora* spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	0	0	0
Final Score	**10**	**8**	**10**

4.6.2 Offset Habitat Scoring

The foraging habitat scoring system for black cockatoos developed by DCCEEW to calculate the value of an offset site (Appendix 3) was also applied to the three naturally occurring fauna habitats occurring within the study area, along with paddocks and infrastructure corridors (combined).

The two native fauna habitat types supporting high foraging value Jarrah-Sheoak-Marri forest were scored as a six for the site condition component (out of a possible total score of seven) (Table 15). The localised habitat type associated with a minor drainage line along the water pipeline corridor (no disturbance proposed) provided low foraging value and had been historically disturbed, reflected by the lower site condition score of two (Table 15). The remaining areas where native vegetation had been cleared were given site condition scores of one (for paddocks, due to presence of *Erodium botrys)* and zero (for infrastructure corridors) respectively (Table 15).

The 12 km buffer for regional foraging habitat is based upon the maximum distance from a nest that breeding birds are likely to travel (DEC 2012). Approximately 68% (35,376.27 ha) of the land area within a 12 km radius of the study area comprises native vegetation (DPIRD 2017) (Figure 11). The vast majority of this native vegetation is likely to comprise Jarrah-Marri Forest of moderate to high foraging value. Therefore, a score of three (out of a possible score of three) was adopted for all three species for site context (Table 15).

In order to confirm presence of black cockatoos within an area the scoring tool requires that the species is seen or reported regularly (intervals of every few days or weeks for at least

several months of the year) and/or there is abundant foraging evidence, e.g. chewed nuts that can be identified as this species. The Forest Red-tailed Black Cockatoo was confirmed to be common within the study area, directly observed at 26 locations with foraging evidence recorded at a further 41 locations. A total of 16 birds were also confirmed to be roosting within the study area in August 2024. Based on the current survey effort and knowledge of the study area the regular presence of the Red-tailed Black Cockatoo was confirmed within the study area.

Baudin's Black Cockatoos were observed as 84 birds on three occasions in October 2023 and February 2024, supported by foraging evidence at seven locations within the study area. Based on the current survey effort and knowledge of the study area the regular presence of Baudin's Black Cockatoo was confirmed within the study area.

There was no evidence of Carnaby's Black Cockatoo recorded from the study across the four site visits completed in October and November 2023 and February and August 2024. Based on the current survey effort and knowledge of the study area, the regular presence of Carnaby's Black Cockatoo was not confirmed within the study area and they are likely to utilise the study area for foraging occasionally.

Table 15 Foraging values within the clearing footprint based upon vegetation characteristics, context and species density.

SITE CONDITION								
Indicator	Score	Foraging Value	Reasoning	Impact (ha) Jarrah-Sheoak	Impact (ha) Parkland Cleared Jarrah-Marri	Impact (ha) *Melaleuca* Scrub	Impact (ha) Paddocks	Impact (ha) Infrastructure Corridors
Vegetation condition & structure. Habitat features.	7	Very High						
	6	High	Marri-Jarrah forest vegetation types with >40% projected foliage cover. Low percentage (<10%) of tree deaths.	6.15	18.51			
	5	Moderate to High						
	4	Moderate						
	3	Low to Moderate						
	2	Low	Marri-Jarrah forest providing <5% projected foliage cover. Scattered food plants.			0.00		
	1	Negligible to Low	Scattered food plants but projected foliage cover of these is <2%, e.g., paddocks.				2.57	
	0	None						1.78
			Sub-Total	6	6	2	1	0
SITE CONTEXT								
Proximity of the site in relation to other habitat	3	<12km of other foraging resources with site condition of at least 3, or 6km of known breeding habitat		6.15	18.51	0.00	2.57	1.78
	2	<15km of other foraging resources with site condition of at least 4, or 12 km of known breeding habitat						
	1	15-20km of other foraging resources with site condition of at least 5, or <15km of known breeding habitat						
	0	>20km from other foraging resources, or >15km of known breeding habitat						
			Sub-Total	3	3	3	3	3
			FINAL TOTAL	9	9	5	4	3

	Indicator	Species Stocking Rate	Carnaby's	Baudin's	FRTBC
Confirm presence/ absence of species	Yes	Species is seen or reported regularly and/or there is abundant foraging evidence, e.g. chewed nuts can be identified as this species. Regularly is when the species is seen at intervals of every few days or weeks for at least several months of the year.		X	X
	No	Species is recorded or reported very infrequently and there is little or no foraging evidence.	X		

ONSHORE ENVIRONMENTAL

GREEN STEEL WA

Figure 11
Black Cockatoo foraging areas and roosting sites within 12km of the study area.

Legend

- Study Area
- Clearing Footprint
- Roosting Sites (1km Buffer)
- Native Vegetation Extent
  35,376.27 ha (DPIRD 2017)
- 12km buffer

0 2 4 6 km

1:150,000

Datum: GDA 94
Projection: MGA Zone 50

Date: 21/08/2024
Status: Final
Figure: 11
Sheet Size: A4
File Name Reference: GS_Fig11_foraging.pdf
Drawn by: JW
Requested by: DB

4.7 Fauna of Conservation Significance

4.7.1 Threatened Fauna listed under the EPBC Act and BC Act

Two of the three species of black cockatoo were recorded from the study area and are listed under the EPBC Act and the BC Act (Figure 9). A third conservation significant species was recorded and is listed under the BC Act (Figure 8):

- Forest Red-tailed Black Cockatoo listed as Vulnerable under the EPBC Act and BC Act;
- Baudin's Cockatoo listed as Endangered under the EPBC Act and BC Act; and
- Brush-tailed Phascogale listed as Conservation Dependant under the BC Act.

4.7.2 Priority Fauna recognised by the DBCA

One Priority 4 fauna species, as recognised by the DBCA, was recorded from the study area: Western Brush Wallaby (Figure 8).

4.7.3 Threatened and Priority Fauna Potentially Occurring

Eight species of conservation significance were identified from the desktop searches as likely to occur within the study area. Four of the eight species were recorded within the study area during the four site visits completed in October and November 2023 and February and August 2024. The remaining four species were determined from the desktop assessment as likely to occur but were not recorded from the study area; Carnaby's Black Cockatoo, Chuditch, Western False Pipistrelle and Quenda. These species are discussed in more detail below, along with the Western Ringtail Possum which was determined as possibly occurring within the study area from the desktop assessment.

Carnaby's Black Cockatoo

Carnaby's Black Cockatoo occur between Kalbarri in the north and Esperance in the south-east (Storr and Johnstone 1998, DPAW 2013) occupying a more inland distribution compared to the other two species of black cockatoo and occurring mainly in areas with rainfall between 300-750 mm (Saunders 1974). Decline in the numbers of breeding attempts in the Wheatbelt and the disappearance of breeding populations due to significant clearing for agriculture are well documented (Saunders 1990, Saunders and Ingram 1987, Saunders and Ingram 1998). As a result of this clearing, the range of Carnaby's Black Cockatoo has contracted towards the south-west (Saunders *et al.* 1985) with a shift in breeding range onto the Swan Coastal Plain and within the Jarrah Forest (Johnstone and Kirkby 2019). Carnaby's Black Cockatoo is a highly mobile species that undertakes migration movements for breeding and foraging. The general movement pattern of this species is seasonal, with birds moving from breeding grounds in the inland regions of the south-west to more coastal areas of the west and south coast in the non-breeding season between January to July (Saunders 1980, Berry 2008, Johnstone and Kirkby 2010). Carnaby's Black Cockatoo forages on a wide range of native and non-native species and across more variable habitat than the other two black cockatoo species (Lee *et al.* 2013). This species has developed a high reliance on pine plantations as a foraging resource and for roosting (Perry 1948, Saunders 1974b, Valentine and Stock 2008, Stock *et al.* 2013, Rycken *et al.* 2019, Weerheim 2008, Johnstone and Kirkby 2010). Long term breeding studies for Carnaby's Black Cockatoo have been undertaken by Denis Saunders between 1968 to 1996 and by Rick Dawson and Denis Saunders from 2009 to 2016,

providing detailed information on the breeding biology (Saunders and Dawson 2017). Carnaby's Black Cockatoo nests predominantly in smooth-barked eucalypts in the Wheatbelt including Salmon Gum, Wandoo, Gimlet, Marri, Swamp Yate and Powderbark Wandoo (Saunders 1979, Saunders *et al.* 2014). Nesting has also been documented in *Eucalyptus camaldulensis* at Kalbarri (Bourne *et al*. 2024), as well as York Gum (*Eucalyptus loxophleba*), Flooded Gum (*Eucalyptus rudis*) and Tuart *(Eucalyptus gomphocephala*) (Johnstone and Kirkby 2019). Hollows used for nesting were large (mean depth of 1 m) and between 5-7 m high (Saunders 1979).

Carnaby's Black Cockatoo was not recorded within the study area during the four site visits undertaken across four different months throughout the year; October and November 2023 and February and August 2024. The annual rainfall for Collie (925.7mm) is higher than the typical range (300-750 mm) specified by Saunders (1974), and favoured breeding habitat does not occur within the study area (i.e. smooth-barked species such as *Eucalyptus wandoo*). Carnaby's Black Cockatoo is noted as being a highly mobile species and while previous records have occurred in the Collie region, the study area is unlikely to represent critical habitat for the species. While it is considered likely that Carnaby's Black Cockatoo may occasionally occur within the study area, based on the current survey there is no evidence that birds spent extended periods within the study area.

Chuditch

The Chuditch inhabits Jarrah forest in moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest particularly in riparian vegetation (Orell and Morris 1994). The parkland cleared habitat and paddocks (farmland) through central and northern sectors of the study area were not suitable habitat for Chuditch owing to absence of understorey vegetation and potential den sites. Habitat within the proposed rail corridor in the southern sector of the study area was marginally suitable for this species, noting that remnant vegetation in state forest situated east of the kVA powerline was more suitable due to higher foliage cover provided by the understorey strata. The proposed rail corridor was situated between the kVA powerline and haul road associated with Griffin Coal's coal mining operations, and intersected the haul road and existing rail loop at the southern extent of the corridor. The fragmentation of the proposed rail corridor combined with reduced vegetation condition resulting from edge effects (siltation from the haul road, dieback, weeds, reduced native species diversity and relatively open understorey structure) reduced the likelihood that Chuditch would utilise the corridor. It is considered unlikely that Chuditch occur within the proposed disturbance footprint.

Western False Pipistrelle

The Western False Pipistrelle is listed as a Priority 4 fauna species by the DBCA and is confined to south-west of Western Australia. This species of bat occurs in high forest and coastal woodlands. Most records are from Karri forests, but they have also been recorded in wetter stands of Jarrah and Tuart woodlands on the Swan Coastal Plain (Menkhorst and Knight 2001). It roosts in small colonies in tree hollows and forages at canopy level and in the cathedral-like spaces between trees. This species may utilise tree hollows within the study area including habitat trees identified as potentially suitable for Black Cockatoos (Figure 10).

Quenda

The Quenda (or Southern Brown Bandicoot) is listed as a Priority 4 fauna species by the DBCA. It has a wide but patchy distribution in the south-west of Western Australia, extending

from Cervantes in the north to Esperance in the south and inland as far as Hyden. The species inhabits dense scrubby, often swampy, vegetation with dense cover up to one metre high. It 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.

Quenda were not recorded on baited motion sensor cameras established throughout the study area over approximately one month in October 2023. Additionally, there was no evidence of their distinctive conical-shaped diggings or scats. This species has been frequently recorded from surrounding study areas and is likely to be present at low densities within the Jarrah-Sheoak habitat. However, reduced habitat condition from fragmentation, siltation and loss of vegetation structure within the proposed disturbance footprint has significantly reduced the likelihood of this species occurring.

Western Ringtail Possum *(Pseudocheirus occidentalis)*

The Western Ringtail Possum *(Pseudocheirus occidentalis)* is listed as Critically Endangered under the EPBC Act and BC Act. It is a small arboreal marsupial endemic to south-western Australia. It is folivorous (leaf eating herbivore) and characterised by a slender tail up to 40 cm long with a white tip (Wayne *et al.* 2005, Jones 1995). The home range of the Western Ringtail Possum is reported on average to be less than five hectares (Jones 2001) and less than two hectares in Peppermint dominated habitat (Jones *et al.* 1994).

The majority of Western Ringtail Possum records are from residential areas in the Collie townsite. Habitat within the proposed disturbance areas was not determined to be suitable due to openness of the understorey strata and associated high level of predation from feral animals such as Red Fox and Cat. A small area of marginally suitable habitat occurs within the *Melaleuca* Scrub habitat, however this area is not within the proposed disturbance area. Targeted searches of the study area did not record any evidence of scats, dreys or scratching of tree trunks, and animals were not captured on baited motion sensor cameras.

5.0 SUMMARY

The targeted fauna survey included establishment of infra-red motion sensor cameras, intensive ground truthing of the entire study area to record primary and secondary evidence of fauna activity, nocturnal spotlighting, and assessment of black cockatoos including breeding, roosting and foraging activity. There were four site visits completed in October 2023, November 2023, February 2024 and August 2024.

There were three naturally occurring habitat types recorded within the study area: Jarrah-Sheoak Forest, parkland cleared Jarrah-Marri Forest, and *Melaleuca* Scrub. The Jarrah-Sheoak Forest habitat occurred along the western edge of state forest in the southern sector where the rail spur line will connect the project area to the existing rail loop. The parkland cleared Jarrah-Marri Forest occurs on private farmland where the recycling mill will be constructed. The *Melaleuca* Scrub occurs as a small remnant along the previously cleared transmission line in the north-west sector and will not be disturbed by the proposal. There were an additional two disturbed habitats: paddocks (cleared farmland supporting annual pasture) and infrastructure corridors (roads, firebreaks, powerline).

Two of the three species of black cockatoo were recorded from the study area, both listed under the EPBC Act and the BC Act:

- Forest Red-tailed Black Cockatoo listed as Vulnerable under the EPBC Act and BC Act; and
- Baudin's Cockatoo listed as Endangered under the EPBC Act and BC Act.

One fauna species recorded from the study area was listed under the BC Act:

- Brush-tailed Phascogale listed as Conservation Dependant under the BC Act.

One fauna species recorded from the study area was recognised as conservation significant by the DBCA:

- Western Brush Wallaby listed as Priority 4.

Despite intensive survey effort there was no evidence of three other fauna species determined from the desktop assessment as being likely to occur within the study area: Chuditch (listed as Vulnerable under the EPBC Act and the BC Act), Western False Pipistrelle and Quenda (listed as Priority 4 by the DBCA). Similarly, the Western Ringtail Possum (listed as Critically Endangered under the EPBC Act and BC Act) which was determined as possibly occurring within the study area was not recorded despite intensive ground truthing and spotlighting and habitat is considered largely unsuitable for this species.

6.0 STUDY TEAM

The vertebrate fauna survey was planned, co-ordinated and executed by the following personnel:

Onshore Environmental Consultants P/L
ABN 41 095 837 120
PO Box 227
YALLINGUP WA 6282
Phone: 0427 339 842
Email: info@onshoreenvironmental.com.au

Project Staff

Dr Darren Brearley	PhD	Project Manager
Ms Jessica Waters	BSc	Principal Ecologist and GIS/Mapping
Dr Jerome Bull	PhD	Principal Botanist

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APPENDIX 1

Conservation codes for species and communities of conservation significance

Categories used under the EPBC Act		
Status	Code	Description
Critically Endangered	Cr	Taxa considered to be facing an extremely high risk of extinction in the wild in the immediate future
Endangered	En	Taxa considered to be facing a very high risk of extinction in the wild in the near future
Vulnerable	Vu	Taxa considered to be facing a high risk of extinction in the wild in the medium-term future
Migratory	Mi	Species that migrate to, over and within Australia and its external territories

Conservation Codes used under the BC Act		
Status	Code	Description
Critically Endangered	CR	Taxa rare or likely to become extinct, as critically endangered taxa
Endangered	EN	Taxa rare or likely to become extinct, as endangered taxa
Vulnerable	VU	Taxa rare or likely to become extinct, as vulnerable taxa
Presumed Extinct	EX	Taxa presumed to be extinct
Migratory	IA	Birds subject to international agreements relating to the protection of migratory birds
Conservation Dependent	CD	Taxa of special conservation need, being species dependent on ongoing conservation intervention
Special Protection	OS	Taxa in need of special protection

IUCN Red List Categories		
Status	Code	Description
Extinct	EX	There is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	The taxon is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range.
Critically Endangered	CR	When the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered	EN	When the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable	VU	When the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened	NT	When it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern	LC	When it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are often included in this category.
Data Deficient	DD	When there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.
Not Evaluated	NE	When it is has not yet been evaluated against the criteria.

Priority Flora and Fauna Under the BC Act		
Status	Code	Description
Priority 1: Poorly-known Species	P1	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.
Priority 2: Poorly-known Species	P2	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.
Priority 3: Poorly-known Species	P3	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.
Priority 4: Rare, Near Threatened and other species in need of monitoring	P4	(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.

Definitions, Categories and Criteria for Threatened and Priority Ecological Communities General Definitions	
Ecological Community	A naturally occurring biological assemblage that occurs in a particular type of habitat. Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.
Threatened Ecological Community (TEC)	A threatened ecological community (TEC) is one which is found to fit into one of the following categories; “presumed totally destroyed”, “critically endangered”, “endangered” or “vulnerable”. Possible threatened ecological communities that do not meet survey criteria are added to DEC’s Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.
Assemblage	An assemblage is a defined group of biological entities.
Habitat	Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (e.g. substrate and topography), and the biotic factors.
Occurrence	A discrete example of an ecological community, separated from other examples of the same community by more than 20 meters of a different ecological community, an artificial surface or a totally destroyed community. By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.
Adequately Surveyed	An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts.
Community structure	The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage (e.g. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, e.g. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B) All occurrences recorded within the last 50 years have since been destroyed
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B) Current distribution is limited, and one or more of the following apply (I, ii, iii) i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii) there are few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities	
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in an area and/or was originally of limited distribution and is in danger of significant modification throughout it range or severe modification or destruction over most of its range in the near future An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A) Geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B) Current distribution is limited, and one or more of the following apply (I, ii, iii) i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii) There are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) There may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

Definitions and Criteria for Priority Ecological Communities	
Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.	
Priority 1 Poorly-known ecological communities	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2 Poorly-known ecological communities	Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority 3 Poorly-known ecological communities	i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat or habitat destruction or degradation ii) communities known forma few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system bit are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stick, and inappropriate fire regimes Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them
Priority 4 Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring	a) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. c) Ecological communities that have been removed from the list of threatened communities during the past five years
Priority 5 Conservation Dependent ecological communities	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result int eh community becoming threatened within five years

APPENDIX 2

Foraging Quality Scoring Tool (DAWE 2022)

Starting score		Baudin's Cockatoo	Carnaby's Cockatoo	Forest Red-tailed Black-Cockatoo
10		**Start at a score of 10** if your site is native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly Marri, within the range of the species, including along roadsides and parkland cleared areas. Can include planted vegetation. **This tool only applies to sites equal to or larger than 1 hectare in size.**	**Start at a score of 10** if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. and *Grevillea* spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. **This tool only applies to sites equal to or larger than 1 hectare in size.**	**Start at a score of 10** if your site is Jarrah or Marri woodland and/or forest, or if it is on the edge of Karri forest, or if Wandoo and Blackbutt occur on the site, within the range of the subspecies, including along roadsides and parkland cleared areas. **This tool only applies to sites equal to or larger than 1 hectare in size.**
Attribute	Sub-tractions	Context adjustor (attributes reducing functionality of foraging habitat)		
Foraging potential	**-2**	**Subtract 2** from your score if there is no evidence of feeding debris on your site.	**Subtract 2** from your score if there is no evidence of feeding debris on your site.	**Subtract 2** from your score if there is no evidence of feeding debris on your site.
Connectivity	**-2**	**Subtract 2** from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	**Subtract 2** from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	**Subtract 2** from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.
Proximity to breeding	**-2**	**Subtract 2** if you have evidence to conclude that your site is more than 12 km from breeding habitat	**Subtract 2** if you have evidence to conclude that your site is more than 12 km from breeding habitat.	**Subtract 2** if you have evidence to conclude that your site is more than 12 km from breeding habitat.
Proximity to roosting	**-1**	**Subtract 1** if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	**Subtract 1** if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	**Subtract 1** if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.
Impact from significant plant disease	**-1**	**Subtract 1** if your site has disease present (e.g. *Phytophthora* spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	**Subtract 1** if your site has disease present (e.g. *Phytophthora* spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	**Subtract 1** if your site has disease present (e.g. *Phytophthora* spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.
Total score		*Enter score*	*Enter score*	*Enter score*
Appraisal		To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.		

APPENDIX 3

Habitat Scoring System for WA Black Cockatoo Foraging Habitat

Habitat Scoring System for WA black cockatoo foraging habitat

This habitat scoring system describes elements indicative of suitable foraging habitat[1] for the three WA black cockatoo species (Carnaby's Black Cockatoo, Baudin's Black Cockatoo and the Forest Red-tailed Black Cockatoo) in WA. Its use must be supported by survey information and reporting, undertaken by suitably qualified and experienced ecologists.

Appropriate scores will best fit a description. Where all components of the 'detail' column description are not met, this must be specified, and justification provided for that score to be accepted by the Department.

For an offset site to be considered by the Department, the offset site must have a start score of 1 for each indicator (e.g., there must be a species stocking rate score of at least 1).

Indicator	Score	Detail	Impact site	Offset start quality	Without offset	With offset
Site Condition						
	Foraging value	Details				
Vegetation condition and structure. Habitat features	**7**	Very High	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland (>30% projected foliage cover), banksia and eucalypt woodlands with >50% projected foliage cover. Low percentage (< 5%) of tree deaths[2].				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest and woodlands with >50% projected foliage cover. Low percentage (< 5%) of tree deaths.				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands, with >50% projected foliage cover. Low percentage (< 5%) of tree deaths.				
	6	High	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland (>25% projected foliage cover), banksia and eucalypt woodlands with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest and woodlands with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands, with >40% projected foliage cover. Low percentage (< 10%) of tree deaths.				

[1] In some cases, an impact or offset site may contain or require both foraging and breeding habitat for one or more black cockatoos. Breeding habitat is species of trees 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 species of trees, suitable DBH is 500 mm. For salmon gum and wandoo, suitable DBH is 300 mm.

[2] No tree deaths indicate robustness of habitat, unlikely for the habitat to decline in the medium-term. Tree deaths may be owing to disease, water stress, fire, etc.

Vegetation condition and structure. Habitat features	**5**	Moderate to high	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland (>20% projected foliage cover), banksia and eucalypt woodlands with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands, with 30-40% projected foliage cover; OR > 60% projected foliage cover but veg. condition reduced due to tree deaths (up to 20%).				
	4	Moderate	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland, banksia or eucalypt woodlands with 20-30% projected foliage cover. Moderate percentage of tree deaths (30-40%).				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 20-30% projected foliage cover; OR Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to tree deaths (up to 30-40%).				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with: 20-30% projected foliage cover; OR 40-60% projected foliage cover but veg. condition reduced due to tree deaths (up to 30-40%).				
	3	Low to moderate	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland, banksia or eucalypt woodlands with 10-20% projected foliage cover.				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 5-20% projected foliage cover.				
			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 5-20% projected foliage cover.				
	2	Low	Carnaby's Black Cockatoo				
			Native kwongan heath and shrubland, banksia and eucalypt woodlands with <10% projected foliage cover; OR Paddocks and/or urban areas with scattered foraging trees such as banksias, marri.				
			Baudin's Black Cockatoo				
			Marri-Jarrah Forest or woodlands with 1-5% projected foliage cover; OR Paddocks and/or urban areas with scattered foraging trees such as banksia, hakea, dryandra.				

Vegetation condition and structure. Habitat features			Forest Red-tailed Black Cockatoo				
			Marri-Jarrah-Karri Forest, other eucalypt woodlands, or allocasuarina woodlands with 1-5% projected foliage cover; OR Paddocks and/or urban areas with scattered food plants such as Cape Lilac, *Eucalyptus caesia* and *E. erythrocorys*.				
	1	Negligible to low	All species				
			Scattered specimens of known food plants but projected foliage cover of these is <2%. May include: paddocks or urban areas with scattered foraging trees.				
	0	None	All species				
			No Proteaceae, eucalypts or other potential sources of food. May include bare ground or developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).				
			Totals				

Site Context								
Proximity of the site in relation to other habitat.	**3**	Site is within 6km of known breeding site.	or	Site is within 12km of other foraging resources with site condition of at least 3.				
	2	Site is within 12km of known breeding site.	or	Site is within 15km of other foraging resources with site condition of at least 4.				
	1	Site is within 15km of known breeding site.	or	Site is between 15km and 20km of other foraging resources with site condition of at least 5.				
	0	Site is further than 15km from known breeding site.	or	Site is further than 20km from other foraging resources.				
				Totals				

Final Totals				

Indicator		**Species Stocking Rate**[3]	**Impact Site**			**Offset Site**		
			CBC	**BBC**	**FRT**	**CBC**	**BBC**	**FRT**
Confirm presence/ absence of species.	**Yes**	Species is seen or reported regularly and/or there is abundant foraging evidence, e.g. chewed nuts can be identified as this species. Regularly is when the species is seen at intervals of every few days or weeks for at least several months of the year.						
	No	Species is recorded or reported very infrequently and there is little or no foraging evidence.						

[3] Species stocking rate is indicated by yes or no to confirm if any of the species is frequently present or not. If yes, the presence must be for the species being impacted by the proposal, not for a species that will not be impacted.

Legend	
	If the site scores between 0-2 (low to no value) for site condition, 0 for the site context score, or is **No** for species stocking rate, it is extremely unlikely to be considered as suitable habitat. This would not be appropriate to use as an offset site.

The metrics used to determine Site Condition, Site Context, and Species Stocking Rate were developed by the Department of Climate Change, Energy, the Environment, and Water in consultation with species experts in WA.

A standard habitat quality scoring system for a species allocates scores out of 3 for both site condition and site context, and out of 4 for species stocking rate. However, as black cockatoos are very mobile, this HQS uses a score out of 7 for site condition and a score out of 3 for site context. Site condition is considered the key factor in determining the quality of habitat for these black cockatoo species. Species stocking rate is considered only in terms of presence or absence of the species and does not add to the total score. Note that the species, or strong indicators of the species, must be present, consistent with the presence/usage description above, for an offset to be considered suitable.

APPENDIX 4

Vertebrate fauna recorded from ten camera traps within the study area

Waypoint	Zone	Easting	Northing	Species Group	Taxon Name	Common Name	WA Con Stat
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 22	50H	429190	6310235	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 30	50H	429077	6309597	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 30	50H	429077	6309597	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 30	50H	429077	6309597	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 30	50H	429077	6309597	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 26	50H	429160	6309958	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 26	50H	429160	6309958	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 26	50H	429160	6309958	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 26	50H	429160	6309958	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 26	50H	429160	6309958	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 21	50H	429290	6310260	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 21	50H	429290	6310260	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 25	50H	428956	6310264	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 23	50H	428868	6310011	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 23	50H	428868	6310011	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 23	50H	428868	6310011	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 27	50H	429229	6310772	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 27	50H	429229	6310772	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 28	50H	428875	6309589	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 29	50H	429042	6310476	Mammals	*Antechinus flavipes leucogaster*	Mardoo	
ONS 24	50H	428819	6309836	Mammals	*Antechinus flavipes leucogaster*	Mardoo	

Waypoint	Zone	Easting	Northing	Species Group	Taxon Name	Common Name	WA Con Stat
ONS 26	50H	429160	6309958	Mammals	*Bat sp. indet*	Bat	
ONS 27	50H	429229	6310772	Mammals	*Bos taurus*	Cow	
ONS 29	50H	429042	6310476	Mammals	*Bos taurus*	Cow	
ONS 30	50H	429077	6309597	Birds	*Corvus coronoides*	Australian Raven	
ONS 26	50H	429160	6309958	Birds	*Corvus coronoides*	Australian Raven	
ONS 25	50H	428956	6310264	Birds	*Corvus coronoides*	Australian Raven	
ONS 23	50H	428868	6310011	Birds	*Corvus coronoides*	Australian Raven	
ONS 29	50H	429042	6310476	Birds	*Corvus coronoides*	Australian Raven	
ONS 26	50H	429160	6309958	Reptiles	*Egernia napoleonis*	South-western Crevice Skink	
ONS 29	50H	429042	6310476	BIrds	*Gymnorhina tibicen*	Australian Magpie	
ONS 22	50H	429190	6310235	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 22	50H	429190	6310235	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 30	50H	429077	6309597	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 30	50H	429077	6309597	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 26	50H	429160	6309958	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 26	50H	429160	6309958	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 26	50H	429160	6309958	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 26	50H	429160	6309958	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 25	50H	428956	6310264	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 23	50H	428868	6310011	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 23	50H	428868	6310011	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 27	50H	429229	6310772	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 28	50H	428875	6309589	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 29	50H	429042	6310476	Mammals	*Macropus fuliginosus*	Western Grey Kangaroo	
ONS 26	50H	429160	6309958	Mammals	*Macropus irma*	Western Brush Wallaby	Priority 4
ONS 21	50H	429290	6310260	Mammals	*Macropus irma*	Western Brush Wallaby	Priority 4
ONS 25	50H	428956	6310264	Mammals	*Macropus irma*	Western Brush Wallaby	Priority 4
ONS 25	50H	428956	6310264	Mammals	*Oryctolagus cuniculus*	Rabbit	
ONS 27	50H	429229	6310772	Birds	*Phaps chalcoptera*	Common Bronzewing	
ONS 22	50H	429190	6310235	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent

Waypoint	Zone	Easting	Northing	Species Group	Taxon Name	Common Name	WA Con Stat
ONS 30	50H	429077	6309597	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 30	50H	429077	6309597	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 30	50H	429077	6309597	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 30	50H	429077	6309597	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 26	50H	429160	6309958	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 26	50H	429160	6309958	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 26	50H	429160	6309958	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 26	50H	429160	6309958	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 26	50H	429160	6309958	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 25	50H	428956	6310264	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 25	50H	428956	6310264	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 25	50H	428956	6310264	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 25	50H	428956	6310264	Mammals	*Phascogale tapoatafa wambenger*	Brush-tailed Phascogale	Conservation Dependent
ONS 21	50H	429290	6310260	Mammals	*Tachyglossus aculeatus*	Short-beaked Echidna	
ONS 23	50H	428868	6310011	Mammals	*Tachyglossus aculeatus*	Short-beaked Echidna	
ONS 28	50H	428875	6309589	Mammals	*Tachyglossus aculeatus*	Short-beaked Echidna	
ONS 28	50H	428875	6309589	Reptiles	*Tiliqua rugosa*	Bobtail	
ONS 28	50H	428875	6309589	Reptiles	*Tiliqua rugosa*	Bobtail	
ONS 22	50H	429190	6310235	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 22	50H	429190	6310235	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 26	50H	429160	6309958	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 21	50H	429290	6310260	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 21	50H	429290	6310260	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 27	50H	429229	6310772	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 28	50H	428875	6309589	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 29	50H	429042	6310476	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 24	50H	428819	6309836	Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	
ONS 26	50H	429160	6309958	Reptiles	*Varanus rosenbergi*	Heath Monitor	
ONS 29	50H	429042	6310476	Reptiles	*Varanus rosenbergi*	Heath Monitor	
ONS 22	50H	429190	6310235	Mammals	*Vulpes vulpes*	Red Fox	

Waypoint	Zone	Easting	Northing	Species Group	Taxon Name	Common Name	WA Con Stat
ONS 30	50H	429077	6309597	Mammals	*Vulpes vulpes*	Red Fox	
ONS 30	50H	429077	6309597	Mammals	*Vulpes vulpes*	Red Fox	
ONS 23	50H	428868	6310011	Mammals	*Vulpes vulpes*	Red Fox	
ONS 27	50H	429229	6310772	Mammals	*Vulpes vulpes*	Red Fox	
ONS 28	50H	428875	6309589	Mammals	*Vulpes vulpes*	Red Fox	
ONS 24	50H	428819	6309836	Mammals	*Vulpes vulpes*	Red Fox	

APPENDIX 5

Photographic representation of conservation significant fauna species recorded from the study area

Brush-tailed Phascogale (Conservation Dependent)

Western Brush Wallaby (Priority 4)

APPENDIX 6

Details of habitat trees recorded from within the study area

Habitat trees recorded within the boundary of the study area

Waypoint	Easting	Northing	Onshore Nest Rank	Category (DAWE 2022)	Tree Species
GST- 1	429215	6310188	Suitable	Suitable nest hollow	Marri
Hollow1	429431	6310773	Suitable	Suitable nest hollow	Marri
Hollow2	429267	6310877	Suitable	Suitable nest hollow	Marri
GST- 2	428823	6309953	Potentially suitable	Potential nesting tree	Jarrah
GST- 3	429135	6310009	Potentially suitable	Potential nesting tree	Jarrah
GST- 4	429001	6309550	Potentially suitable	Potential nesting tree	Jarrah
GST- 5	428991	6309530	Potentially suitable	Potential nesting tree	Jarrah
GST- 6	429053	6310487	Potentially suitable	Potential nesting tree	Dead
GST- 7	429076	6310479	Potentially suitable	Potential nesting tree	Jarrah
GST- 8	429237	6310333	Potentially suitable	Potential nesting tree	Marri
GST- 9	429324	6309851	Potentially suitable	Potential nesting tree	Dead
GST- 10	428811	6309786	Potentially suitable	Potential nesting tree	Jarrah
GST- 11	429037	6309778	Potentially suitable	Potential nesting tree	Dead
GST- 12	428908	6309934	Unsuitable	Potential nesting tree	Dead
GST- 13	428884	6310000	Unsuitable	Potential nesting tree	Jarrah
GST- 14	428852	6310110	Unsuitable	Potential nesting tree	Jarrah
GST- 15	428884	6310163	Potentially suitable	Potential nesting tree	Dead
GST- 16	429351	6310793	Potentially suitable	Potential nesting tree	Jarrah
GST- 17	429347	6310793	Potentially suitable	Potential nesting tree	Dead
GST- 18	429428	6310769	Potentially suitable	Potential nesting tree	Marri
GST- 19	429522	6310478	Potentially suitable	Potential nesting tree	Jarrah
WP7030	428543	6311465	Potentially suitable	Potential nesting tree	Marri
7018	428457	6311640	Unsuitable	Potential nesting trees	Marri
7016	428462	6311688	Unsuitable	Potential nesting trees	Marri
7011	428474	6311742	Unsuitable	Potential nesting trees	Marri
7017	428477	6311647	Unsuitable	Potential nesting trees	Marri
7027	428487	6311481	Unsuitable	Potential nesting trees	Marri
7024	428494	6311518	Unsuitable	Potential nesting trees	Marri
7028	428496	6311466	Unsuitable	Potential nesting trees	Marri
7010	428512	6311743	Unsuitable	Potential nesting trees	Marri
7031	428523	6311450	Potentially suitable	Potential nesting trees	Marri
7032	428534	6311622	Unsuitable	Potential nesting trees	Marri

APPENDIX 7

Details of habitat trees recorded from outside the boundary of the water pipeline corridor and access road corridor (buffer) in the northern sector of the study area

Habitat trees recorded outside the boundary of the water pipeline corridor and access road corridor

Waypoint	Easting	Northing	Onshore Nest Rank	Category (DAWE 2022)	Tree Species
7035	425737	6312889	Unsuitable	Potential nesting trees	Jarrah
7036	425767	6312876	Unsuitable	Potential nesting trees	Jarrah
7037	425823	6312838	Unsuitable	Potential nesting trees	Jarrah
7039	425979	6312664	Potentially suitable	Potential nesting trees	Marri
6962	426256	6312615	Unsuitable	Potential nesting trees	Jarrah
6961	426297	6312601	Potentially suitable	Potential nesting trees	Jarrah
6960	426313	6312590	Unsuitable	Potential nesting trees	Marri
6951	426431	6312442	Unsuitable	Potential nesting trees	Wandoo
6958	426497	6312492	Unsuitable	Potential nesting trees	Marri
6955	426557	6312445	Unsuitable	Potential nesting trees	Wandoo
6956	426564	6312443	Unsuitable	Potential nesting trees	Wandoo
6957	426588	6312433	Unsuitable	Potential nesting trees	Wandoo
6954	426773	6312253	Suitable	Suitable nest hollow	Marri
6967	427554	6311514	Unsuitable	Potential nesting trees	Marri
6966	427566	6311534	Unsuitable	Potential nesting trees	Marri
6968	427567	6311504	Unsuitable	Potential nesting trees	Jarrah
6965	427568	6311533	Unsuitable	Potential nesting trees	Jarrah
6969	427583	6311474	Unsuitable	Potential nesting trees	Marri
6969	427583	6311474	Unsuitable	Potential nesting trees	Jarrah
6970	427591	6311473	Unsuitable	Potential nesting trees	Jarrah
6982	427601	6311635	Unsuitable	Potential nesting trees	Marri
6981	427602	6311614	Unsuitable	Potential nesting trees	Jarrah
6975	427606	6311516	Unsuitable	Potential nesting trees	Jarrah
6971	427607	6311470	Unsuitable	Potential nesting trees	Marri
6976	427608	6311542	Potentially suitable	Potential nesting trees	Jarrah
6974	427612	6311486	Unsuitable	Potential nesting trees	Marri
6973	427613	6311482	Unsuitable	Potential nesting trees	Jarrah
6983	427614	6311731	Unsuitable	Potential nesting trees	Marri
7008	427614	6311822	Unsuitable	Potential nesting trees	Marri
6978	427620	6311552	Unsuitable	Potential nesting trees	Marri
6972	427621	6311465	Unsuitable	Potential nesting trees	Marri
6977	427621	6311545	Unsuitable	Potential nesting trees	Marri
6980	427628	6311559	Unsuitable	Potential nesting trees	Marri
6979	427640	6311549	Potentially suitable	Potential nesting trees	Marri
7006	427654	6311784	Unsuitable	Potential nesting trees	Marri
6984	427659	6311706	Unsuitable	Potential nesting trees	Jarrah
7007	427660	6311779	Suitable	Suitable nest hollow	Marri
7005	427666	6311760	Unsuitable	Potential nesting trees	Jarrah
7004	427679	6311757	Unsuitable	Potential nesting trees	Marri
7003	427700	6311722	Potentially suitable	Potential nesting trees	Jarrah
6985	427740	6311660	Unsuitable	Potential nesting trees	Jarrah
7002	427740	6311732	Unsuitable	Potential nesting trees	Jarrah
7001	427763	6311736	Unsuitable	Potential nesting trees	Marri
6986	427765	6311665	Unsuitable	Potential nesting trees	Jarrah
6987	427767	6311647	Unsuitable	Potential nesting trees	Jarrah
6988	427770	6311639	Unsuitable	Potential nesting trees	Marri
6999	427771	6311702	Potentially suitable	Potential nesting trees	Jarrah

Waypoint	Easting	Northing	Onshore Nest Rank	Category (DAWE 2022)	Tree Species
6989	427774	6311626	Unsuitable	Potential nesting trees	Jarrah
6998	427793	6311693	Unsuitable	Potential nesting trees	Marri
7000	427793	6311730	Unsuitable	Potential nesting trees	Marri
6997	427801	6311678	Potentially suitable	Potential nesting trees	Marri
6996	427831	6311673	Suitable	Suitable nest hollow	Marri
6990	427839	6311594	Unsuitable	Potential nesting trees	Marri
6995	427847	6311694	Unsuitable	Potential nesting trees	Marri
6994	427850	6311682	Unsuitable	Potential nesting trees	Marri
6991	427853	6311591	Potentially suitable	Potential nesting trees	Marri
6992	427855	6311619	Unsuitable	Potential nesting trees	Marri
6993	427868	6311676	Unsuitable	Potential nesting trees	Marri
7022	428398	6311639	Unsuitable	Potential nesting trees	Marri
7012	428403	6311741	Unsuitable	Potential nesting trees	Marri
7023	428414	6311668	Unsuitable	Potential nesting trees	Marri
7021	428428	6311628	Unsuitable	Potential nesting trees	Marri
7013	428434	6311692	Potentially suitable	Potential nesting trees	Marri
7020	428435	6311636	Unsuitable	Potential nesting trees	Marri
7019	428440	6311642	Unsuitable	Potential nesting trees	Marri
7015	428447	6311683	Unsuitable	Potential nesting trees	Marri
7014	428448	6311702	Unsuitable	Potential nesting trees	Marri
7026	428455	6311497	Unsuitable	Potential nesting trees	Marri
7029	428463	6311462	Unsuitable	Potential nesting trees	Marri
7025	428476	6311516	Unsuitable	Potential nesting trees	Marri