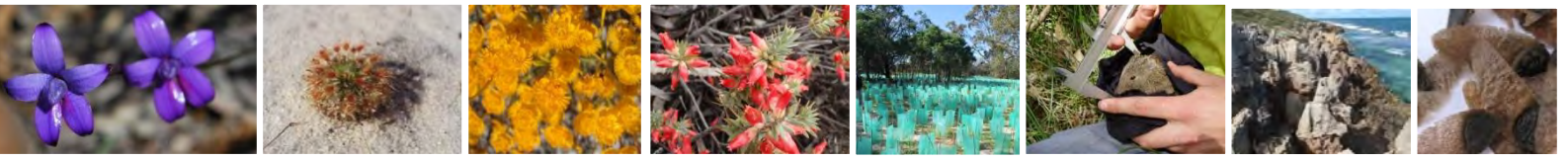
Mr Ivan Yujnovich

Detailed Fauna survey
Lot 123 Mortimer Road, Casuarina

May 2022

Natural Area Holdings Pty Ltd
233c Drumpellier Drive, Whiteman, WA, 6076
Ph: (08) 9209 2767
info@naturalarea.com.au
www.naturalarea.com.au



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Executive Summary

Natural Area Consulting Management Services (Natural Area) was contracted by Mr Ivan Yujnovich to undertake a detailed fauna survey within Lot 123 Mortimer Rd, Casuarina. The purpose of the survey was to

- gather data on the existing fauna species and assemblages present
- confirm the presence of any conservation significant species
- inform the environmental approvals process associated with the proposed development of the site.

The detailed fauna survey included the following activities:

- desktop searches of online databases including NatureMap (Department of Biodiversity, Conservation and Attractions) and Protected Matters Search Tool (Department of Agriculture, Water and the Environment)
- trapping over 10 consecutive days (9 nights) with trap-lines, Elliot traps and trail cameras set out for a total of:
    - 180 Elliot trap nights (20 Elliot traps)
    - 216 pitfall trap nights (8 trap-lines, 3 pitfalls per trap-line)
    - 144 funnel trap nights (8 trap-lines, 2 funnels per trap-line)
    - 54 trail camera trap nights (6 trail cameras)
- undertaking pitfall trapping and various active searching techniques to confirm the presence/absence of short range endemic (SRE) species
- night survey to observe any nocturnal species
- recording opportunistic sightings when traversing the site and opportunistic captures of fauna when undertaking activities including but not limited to raking leaf litter, checking under rocks/logs and sweeping vegetation with nets for invertebrates.

The fauna survey confirmed the presence of:

- six mammals including two Priority 4 species, namely the Southern Brown Bandicoot (*Isoodon fusciventer*) and the Western Brush Wallaby (*Macropus irma*), and two declared pest species, namely the Red Fox (*Vulpes vulpes*) and the European Rabbit (*Oryctolagus cuniculus*)
- sixteen birds (one Endangered, one Vulnerable, one introduced species)
- twelve reptiles (one Priority 3 species)
- one amphibian
- a total 83 invertebrates, with the native millipede (*Antichropus sp*.) listed as a potential short range endemic
- two threatened species (Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo), confirmed through visual sightings as well as evidence of foraging activities
- the *Lerista lineata,* a fossorial skink restricted to the Swan Coastal Plain and listed as a Priority 3 species, recorded during this survey through pitfall trapping.

The size and scale of proposed disturbance is relatively large considering the size of the Lot with the majority 37.2 ha of vegetation within the site proposed for clearing. This vegetation is habitat for threatened and priority fauna species and therefore clearing impact will be considered environmentally significant. Although approximately 7.82 ha of vegetation and CCW are proposed to be retained for conservation (refer to Figure 11, there are still a

number of residual impacts remaining for the site. This includes impacts to matters of nation environmental significance (MNES), including:

- The loss of 37.24 ha of Black Cockatoo foraging habitat
- The loss of 31 black cockatoo habitat trees, of which 22 have small hollows that can provide potential future hollows for black cockatoos and two that have potential nesting hollows that are of sufficient size to be utilised by black cockatoos currently.

Other non MNES impacts include:

- The loss of 37.357 ha of remnant flora in mostly excellent condition that provides habitat to the P4 listed Quenda and Western Brush Wallaby.

Contents

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was contracted by Mr Ivan Yujnovich to undertake a detailed fauna survey within Lot 123 Mortimer Road, Casuarina. The survey area consists mainly of remnant bushland and covers approximately 45 ha. It includes a Conservation Category Wetland and portions of two Resource Enhancement Wetlands. This survey was undertaken to gather data on fauna species, assemblages and habitats of the area to inform environmental approvals processes associated with the proposed development of the site. The area is proposed for urban development, with current development plans proposing to retain 7.82 ha for conservation purposes surrounding the conservation category wetland at the north of the Lot (Figure 11).

1.1 Background

Lot 123 Mortimer Road is a 45 ha vegetated lot within an area zoned urban development, with the change from rural to urban deferred through Amendment 1117/33 that was referred to the EPA in February 2006, at which time the EPA deferred their decision to formally assess the site. The site was later rezoned to urban in 2013, thus, as a legacy site in private ownership for more than 60 years, consideration of the environmental values on Lot 123 has not previously been considered by the EPA or any other state agency. The project was referred to the then Department of the Environment and Energy (now the Department of Agriculture, Water, and the Environment) in December 2018, with the proposed development being considered a controlled action. It was submitted to the Western Australian Planning Commission in October 2019, with the EPA determining in April 2020 that it should be formally assessed under Part IV of the *Environmental Protection Act 1986* (WA). In July 2020, it was determined that the assessment level for the proposal will be Assessment on Referral Information (ARI), with additional information to be provided. Outcomes of this survey are one of those additional information requirements.

1.2 Location

Lot 123 Mortimer Road is located approximately 32 km south of the Perth Central Business District (Figure 1), in the suburb of Casuarina within the City of Kwinana. The site is bounded by Mortimer Road to the south and existing development to the south, west and east. It is zoned Residential Development, as per the City of Kwinana Town Planning Scheme No. 2 (City of Kwinana, 2019) and Local Planning Policy 6 – Guidelines for Structure Planning in the Casuarina Cell (City of Kwinana, 2018). This zoning is consistent with the Metropolitan Regional Scheme, which indicates that Lot 123 is zoned Urban (Department of Planning, Lands, and Heritage, 2019).

1.3 Scope

Activities undertaken by Natural Area included:

- searching fauna databases to gather contextual site information and an indication of species that are likely to be present in the area
- setting out a range of cage, funnel, pitfall, Elliot traps, and motion activated trail cameras
- assessing the presence of short range endemic species using a variety of active searching methods
- determining the likelihood of rare, endangered, or migratory vertebrates
- recording opportunistic sightings and evidence of the presence of fauna while setting up and checking traps daily
- undertaking a dusk survey to check for evidence of nocturnal species

- reporting outcomes of the survey.

Figure 1:
Site Location
Lot 123 Mortimer Rd, Casuarina

2.0 Site Characteristics

The characteristics of a site have a strong bearing on the flora, vegetation, fauna, and ecological communities present. Key characteristics of Lot 123 are outlined in this section.

2.1 Regional Context

According to Interim Biogeographical Regionalisation of Australia (IBRA) descriptions, the suburb of Casuarina is located in the Perth Swan Coastal Plain 2 (SWA 2 – Swan Coastal Plain subregion). This area is described as a being a low-lying coastal plain with sands of colluvial and aeolian origin. The region is dominated by Banksia and/or Jarrah Woodland over sandy soils associated with the dune systems, with Paperbark (*Melaleuca*) in swampy/damp areas and Jarrah Woodland to the east where the Swan Coastal Plain rises (Mitchell, Williams & Desmond, 2002).

2.2 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters. According to the Bureau of Meteorology (Perth Airport, Station ID 009021, 2020):

- average rainfall is 762.1 mm pa, with the majority falling between May and August
- average maximum temperature ranges from 18.0 °C in winter to 32.0 °C in summer, with the highest recorded maximum being 46.7 °C
- average minimum temperatures range from 8.0 °C in winter to 17.5 °C in summer, with the lowest recorded minimum being -1.3 °C
- predominant wind directions include morning easterlies and south-westerly sea breezes during summer months, with an average wind speed of 16.5 km/h and gusts of more than 100 km/h.

2.3 Topography and Soils

Topography across the site ranges from 16 m AHD in the north to 38 m AHD in the south-east. Lot 123 is located on the Bassendean Dune System within the Swan Coastal Plain. This system is characterised by undulating land associated with sand dunes, interdunal swales and sandplains with pale, deep sand, semi-wet and wet soils (Department of Primary Industries and Regional Development, 2019). Two distinct soil types were identified using the Natural Resource Information Portal (NRInfo) and are described in Table 1 (Department of Primary Industries and Regional Development, 2020, Figure 2).

Table 1: Soil types and descriptions

Name	Symbol	Description
Bassendean B1 Phase	212Bs_B1	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m; Banksia dominant.
Bassendean B3 Phase	212Bs_B3	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with iron-organic hardpan 1-2 m or clay subsoils. Surface soils are dark grey sand or sandy loam.

Source: Department of Primary Industries and Regional Development, 2020

Figure 2:
Soil Types
Lot 123 Mortimer Rd, Casuarina

2.4 Vegetation Complex

The vegetation complex indicated by the Western Australian Local Government Association (WALGA) LGmap environmental planning tool (2020) as occurring within the site is the *Bassendean Complex – Central and South* (WALGA, 2020). The Complex comprises vegetation ranging from Jarrah, Sheoak and Banksia on sand dunes to low woodlands of *Melaleuca* species, and sedgelands on the low-lying depressions and swamps. It also includes transitional areas of Jarrah and Coastal Blackbutt in the vicinity of Perth.

Banksia attenuata, B. grandis and *B. menziesii* are common on upper slopes, with *B. menziesii* decreasing towards the southern limit of its range near Mandurah. *Banksia ilicifolia, B. littoralis* and *Melaleuca preissiana* are common in low-lying soils with higher moisture content, where Marri replaces Jarrah as the dominant species. Common shrub species include *Kunzea ericifolia*, *Hypocalymma angustifolium*, *Adenanthos obovatus* and *Verticordia* spp. (Heddle, Loneragan and Havel, 1980).

The pre-European extent of this vegetation complex remaining on the Swan Coastal Plain is 24,206.24 ha (27.7%) (WALGA, 2013); the remaining extent within the City of Kwinana local government area is 1,948.45 ha (41.65%) (WALGA 2010).

2.5 Hydrology

A designated Conservation Category Wetland occurs in the central northern portion of the site within the *Melaleuca preissiana* Woodland vegetation type. Similarly, designated Resource Enhancement Wetlands occur along the western boundary where the three southern portions of *Corymbia* and *Melaleuca* Woodland occur (Department of Biodiversity, Conservation and Attractions, 2018c; Map 3). Depth to ground water was measured using multiple bores across the site and ranges from 1.6 m in the Conservation Category Wetland to 13.5 m in the south-west corner of the site, with flow primarily to the west towards the Kwinana Freeway (Geo & Hydro Environmental Management 2020).

2.6 Bush Forever Sites

Lot 123 is located within 5 km of 13 Bush Forever sites, with the closest approximately 70 m to the north-east (Site 273):

- Bush Forever Site 67 – Parmelia Ave Bushland, Parmelia, 6.8 ha
- Bush Forever Site 68 – Jackson Road Bushland, 19.3 ha
- Bush Forever Site 70 – Duckpond Bushland, 8.8 ha
- Bush Forever Site 268 – Mandogalup Road Bushland, Mandogalup 99.62 ha
- Bush Forever Site 269 – The Spectacles, 349.7 ha (including lake)
- Bush Forever Site 270 – Sandy Lake and Adjacent Bushland, Anketell, 181.3 ha
- Bush Forever Site 272 – Sicklemore Road Bushland, Parmelia/Casuarina, 84.6 ha
- Bush Forever Site 273 – Casuarina Prison Bushland, Casuarina, 116.9 ha; this portion is 70 m to the north-east of the Lot and is connected by adjacent vegetated properties
- Bush Forever Site 347 – Wandi Nature Reserve and Anketell Road Bushland, Wandi/Oakford 558.41 ha
- Bush Forever Site 348 – Modong Nature Reserve and Adjacent Bushland, Oakford, 242.0 ha
- Bush Forever Site 349 – Leda and adjacent bushland, Leda, 959.8 ha
- Bush Forever Site 353 – Banksia Road Nature Reserve, Wellard, 32.3 ha

- Bush Forever Site 360 Mundijong and Watkins Road Bushland, Mundijong/Peel Estate 150.23 ha.

All except three sites 67, 68 and 360 contain some portion of the *Bassendean Complex – Central and South* vegetation complex that is located on Lot 123 (DPLH, 2017).

2.7 Black Cockatoo Habitat

There is potential for the three threatened black cockatoo species and their habitat to occur within the survey area including, the Carnaby's Cockatoo (*Calyptorhynchus latirostris*) listed as endangered under the *EPBC Act 1999* (Cwlth), the Forest Red-tailed Black Cockatoo *(Calyptorhynchus banksia naso*) and the Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) listed as vulnerable; all are listed as threatened under the *Biodiversity Conservation Act 2016* (WA). According to DBCA datasets (2022) the survey area is located within the following areas:

- Black Cockatoo Roosting Site – Buffered (DBCA-064) (DBCA, 2022a),
- Carnaby's Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region (DBCA-057) – it is an area requiring investigation (DBCA, 2022b)
- Carnaby's Cockatoo Confirmed Roost Sites (DBCA-050) (DBCA, 2022d) – it is within 6 km of a known roosting site
- Carnaby's Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054) (DBCA, 2022c) – not within 12 km of a known breeding site.

Forest Red-tailed Black Cockatoos were observed foraging within the site and signs of foraging by Carnaby's Cockatoos were observed during a basic fauna survey by Natural Area in 2018 (Natural Area, 2018).

3.0 Methodology

3.1 Desktop and Literature Review

The desktop survey included reviewing online databases to determine preliminary site characteristics, including:

- Department of Primary Industries and Regional Development NRInfo (2020) to determine soil types
- Department of Biodiversity, Conservation and Attractions (DBCA) NatureMap (DBCA 2020b) to indicate native and introduced fauna species that could potentially occur within the survey site (Appendix 1)
- Department of Agriculture, Water and the Environment (2022), Protected Matters Search Tool (PMST) to determine if any matters of national environmental significance were likely (Appendix 4)
- 10 km radius search the Atlas of Living Australia database (ALA, 2022)
- WALGA LGmap environmental planning tool to determine if Southern Brown Bandicoot (*Isoodon fusciventer*) habitat could occur or is confirmed to occur on site (WALGA 2020)
- Review of BirdLife Australia's Great Cocky Count Dataset to determine if Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso)* and Baudin's Cockatoo (*Calyptorhynchus baudinii*) habitat is present within the site (DBCA, 2022a-d)
- DBCA (2018) threatened and priority fauna database outcomes previously provided were reviewed.

3.1.1 Likelihood of Occurrence

Fauna Species

Fauna species found during the desktop survey as being previously recorded within 10 km of the site were assessed and ranked for their likelihood of occurrence within the survey site. Likelihood of occurrence analysis for vertebrate fauna:

- **Present** – species has been recorded within the survey site
- **Likely** – known to occur within close proximity of the site and species habitat is present
- **Possible** - species previously recorded within 10 km and suitable habitat occurs in survey area
- **Unlikely** – Suitable habitat for the species does not occur or suitable habitat is present but survey site is outside of the known distribution of the species.

Short Range Endemics

Short range endemics found during the desktop survey as being previously recorded within 10 km of the site were assessed and ranked for their likelihood of occurrence within the survey site, based on habitat present within the site.

- **Present** – species has been confirmed to occur within the survey site
- **High** – known to occur within close proximity of the site and species habitat is present
- **Moderate** - species previously recorded within 20 km and suitable habitat occurs in survey area
- **Low** – Species is known to occur within 50 km of the site but no habitat is present
- **Very Low** - no habitat exists for the species within the site and no records are known within 50 km, or it is outside the known distribution of a species with a well known range.

3.2 On-ground Methodology

Vertebrate fauna survey activities were undertaken in accordance with *EPA technical guidance* –

Technical Guidance Terrestrial vertebrate fauna surveys for environmental impact assessment (Environmental Protection Authority, 2020). The survey activities were carried out over a 10-day period from 05 to 14 October 2020 (nine trap nights), with trap locations shown in Figure 4. Works were conducted under DBCA Fauna Taking (Biological Assessment) Licence number BA27000327 (Appendix 5), by lead zoologist Sharon Hynes who has over seven years' experience undertaking fauna trapping surveys within Western Australia, particularly the Swan Coastal Plain. Sharon was assisted in the field by ecologist Kylie Sadgrove (3 years' experience) and Lachlan Crossley (field assistant). Short range endemic fauna surveys were undertaken in accordance with the *EPA Technical Guidance – Sampling of short range endemic fauna* (EPA 2016). The nocturnal survey was carried out on 04 November 2020.

Survey activities included:

- trapping over 10 consecutive days with trap-lines, Elliot traps and trail cameras for a total of (Figure 4):
    - 180 Elliot trap nights (20 Elliot traps)
    - 216 pitfall trap nights (8 trap-lines, 1 large and 2 small pitfalls per trap-line)
    - 144 funnel trap nights (8 trap-lines, 2 funnels per trap-line)
    - 54 trail camera trap nights (6 trail cameras)
- setting up 8 trap-lines (Figure 3) which includes pitfalls and funnel traps along a drift fence; trap-lines were installed across different habitat types to ensure a good representation of species (at least 1 per habitat type); vegetation was used to cover funnel traps and placed in pitfall buckets to provide protection from the elements
- setting up 20 Elliott traps in areas showing signs of animal activity, including the presence of conical and other diggings, scats, and tracks
- traps were baited with peanut butter and oats (universal bait) and set up under vegetation with shredded newspaper as bedding and covered with hessian to provide protection from the elements
- undertaking a dusk/night survey to observe nocturnal species and record bat calls using the Echo Meter Touch 2 Pro
- all trap and trap line locations were recorded using a hand-held GPS and marked with flagging tape
- checking traps within 3 hours of sunrise as per DBCA licence requirements, recording and releasing captured species back into the site
- active searching included searching under logs, hand raking through leaf litter and netting of flying insects
- static bird census were undertaken during trapping events with 5 minute census undertaken at each Trap line location over two days
- setting out six motion activated trail cameras in high-activity areas to capture images of evasive/ trap-shy animals
- walking the site to record opportunistic sightings or signs of birds and larger mammals, including calls, tracks, diggings, and scats
- recording opportunistic sightings and captures of invertebrates including sweeping vegetation with butterfly nets, with most invertebrates captured in pitfalls and funnel traps, pitfalls are the main capture method for short range endemics
- recording the outcomes of the trapping and observation activities.

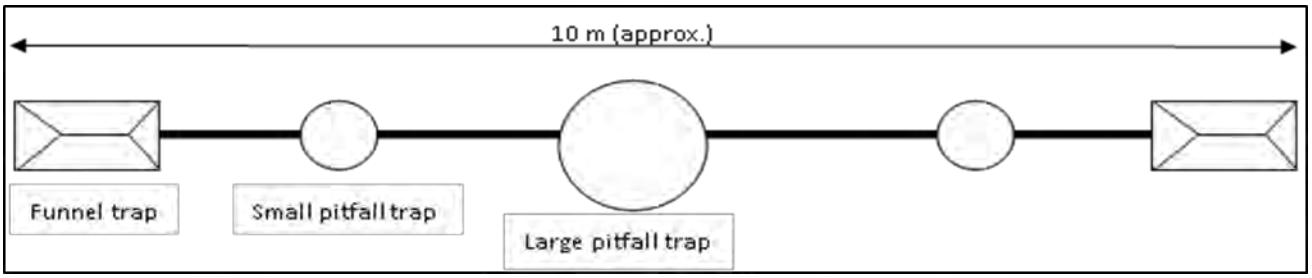

Figure 3: Typical trap-line setup including funnel and pitfall traps

3.3 Limitations

Several limitations associated with both desktop and on-site fauna surveys remain, including:

- database searches only provide an indication of what fauna species may be present, with on ground surveys required to confirm those present
- different databases are reliant on information submitted via various reporting mechanisms, therefore all records of a particular species within a specified area may not be complete
- information on species provided on some databases include out-of-date species names, meaning that names need to be checked for currency
- some fauna species are highly mobile and may utilise the site transiently as part of their range; as a result, they may not be present on site at the time of the survey
- certain fauna species are trap shy or difficult to trap, and may not be captured/observed even though they are present on site
- weather conditions during the trapping period may impact outcomes, with few animals generally caught in cooler weather conditions.

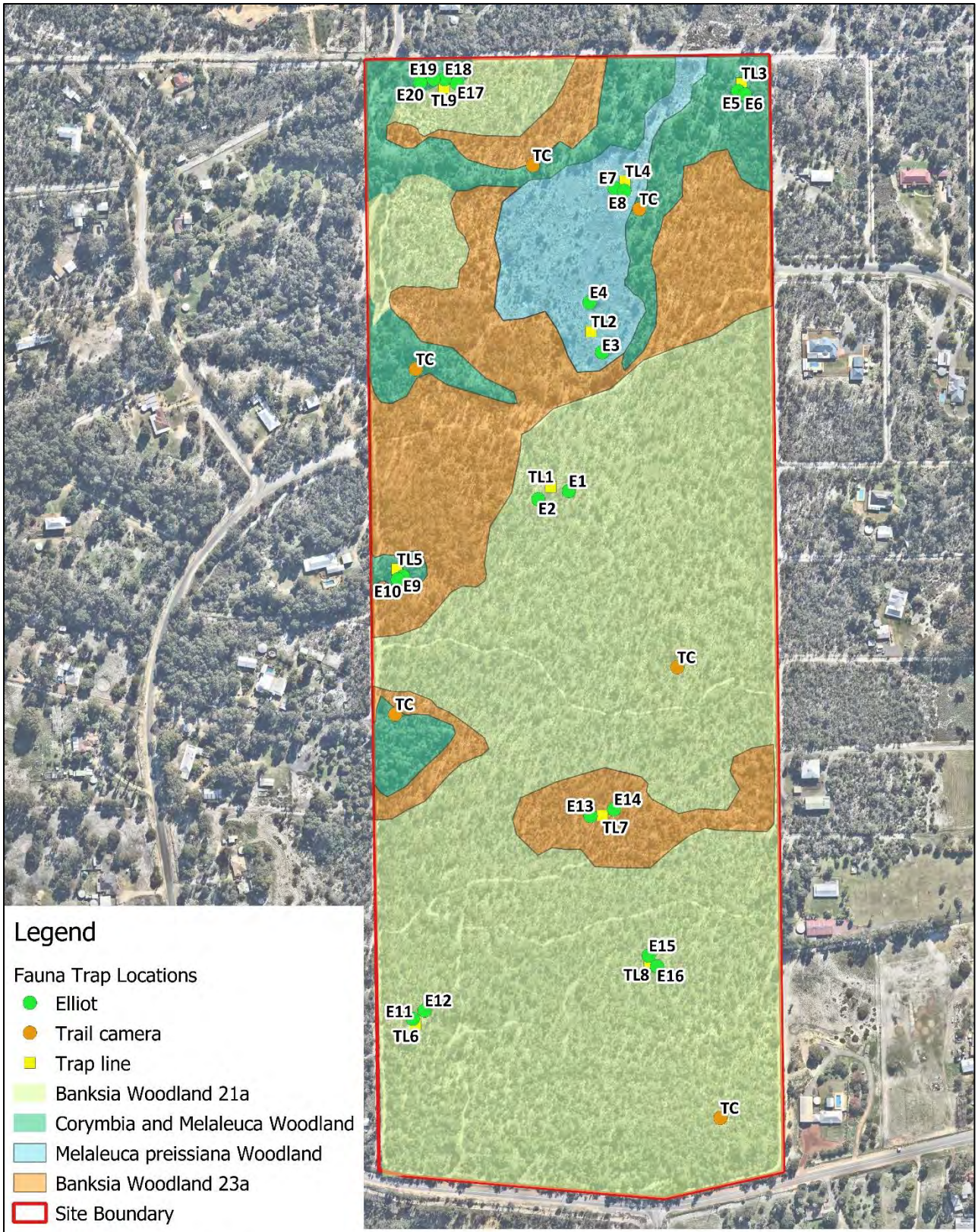

Figure 4:
Fauna Trap Locations
Lot 123 Mortimer Rd, Casuarina

4.0 Results

4.1 Fauna Desktop Survey

4.1.1 Fauna Species

A review of the DBCA NatureMap Report (2020) using a 5 km buffer around the site indicated the potential for 143 bird, 14 mammal, 33 reptile, seven amphibian, and 40 invertebrate fauna species (Appendix 1).

4.1.2 Conservation Significant Species

As a result of the desktop survey of online literature and databases listed in Section 3.1 a total of 42 conservation significance may occur within the survey area (Appendix 3). These species are listed as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999 (Cwlth) and/or as threatened or priority species under the *Biodiversity Conservation Act* 2016 (WA). A description of conservation codes is provided in Appendix 4. Of these species listed by the desktop search as potentially occurring in the area, the habitat was considered suitable 10 of these species, with five known to be present in the site (highlighted green) (Table 2).

Opportunistic fauna observations recorded by Natural Area in September 2018 confirmed the presence of two Priority 4 species in the survey site. The Western Brush Wallaby (*Macropus Irma*) was observed at the edge of the *Corymbia Melaleuca* Woodland in the central western side of the site, while diggings of the Southern Brown Bandicoot (*Isoodon fusciventer*) were recorded at the north-east corner, adjacent to the Conservation Category Wetland (Natural Area, 2018).

Table 2: Conservation significant species that are possible to occur or are present in the site

Species Name	Common Name	Cons. Code	Nature Map	PMST	DBCA	ALA	Likelihood
Invertebrates							
Idiosoma sigillatum	Swan Coastal Plain Shield-Backed Trapdoor Spider	P3	X				Possible, habitat suitable
Synemon gratiosa	Graceful Sun Moth	P4	X				Possible, habitat suitable
Mammals							
Isoodon fusciventer	Quenda, Southern Brown Bandicoot	P4	X		X	X	Present
Notamacropus Irma	Western Brush Wallaby	P4	X	X	X	X	Present
Phascogale tapoatafa wambenger	Wambenger Brush-tailed Phascogale	OS	X		X		Possible, habitat suitable

Species Name	Common Name	Cons. Code	Nature Map	PMST	DBCA	ALA	Likelihood
Reptiles							
Lerista lineata	Perth Slider	P3	X		X		Present
Neelaps calonotos	Black-striped Snake	P3	X		X		Possible, habitat suitable
Birds							
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	T, VU	X	X	X	X	Present, observed foraging on site
Calyptorhynchus baudinii	Baudin's Cockatoo	T, EN		X	X	X	Possible, foraging habitat suitable but tends to occur further south
Calyptorhynchus latirostris	Carnaby's Cockatoo	T, EN	X	X	X		Present, foraging signs within site

4.1.3 Short Range Endemic

The short rage endemic *Idiosoma sigillatum* that was considered possible to occur due to suitable habitat being present on site is considered to have a Moderate potential for occurrence within the site. This species is found in Banksia woodlands on sandy soils and uses Allocasuarina fraseriana needles to line its burrow (Mason et al., 2018). Therefore, the Banksia woodlands on site have a Moderate potential to provide habitat for this species. The 10 km search of ALA Database had records of this species within 20 km of the site. These records were historic records for the Swan Coastal Plain and much of its habitat has since been cleared for urban development. As this Lot is comprised of remnant vegetation in excellent condition it provides habitat suitable for this species.

5.0 Field Survey Results

This section provides the results of the detailed fauna survey, short range endemic targeted survey and the night stalk undertaken at Lot 123 Mortimer Road. Overall, six mammals, 16 birds, 12 reptiles, one amphibian, and 84 invertebrates were recorded during the survey activities. The fauna species list for Lot 123 is provided in Appendix 1.

5.1 Mammals

A total of six mammal species were recorded on site, of which four are native and two introduced species (Table 3). Trapping efforts yielded 12 separate captures of the Southern Brown Bandicoot (*Isoodon fusciventer*) with evidence of active recruitment in the form of individuals of varying ages and genders recorded. Bandicoot captures included four juvenile males, one juvenile female, six mature males and one mature female with two pouch young (Figure 5). The Southern Brown Bandicoot is listed as a Priority 4 species under the *Biodiversity Conservation Act 2016* (WA). Observations of the Common Brushtail Possum was recorded during the nocturnal survey on 12 November 2020, with three animals recorded, including a female with a juvenile on her back (Figure 5). No bats were recorded during the nocturnal survey although this was likely due to windy and overcast weather experienced at the time, and bats are likely to be present within the area.

The Western Brush Wallaby (*Macropus Irma*), listed as a Priority 4 species under the BC Act, was also observed on site. Two individuals were captured on motion activated trail camera in the CCW and in the south-east corner of the site (Figure 5), as well as indirect observations in the form of scats and diggings throughout the site noted whilst undertaking flora and fauna survey activities. This species was previously recorded in the central western side of Lot 123 during the flora, vegetation, and black cockatoo habitat carried out by Natural Area in 2018.

A combination of camera trapping, visual sightings as well as on-ground observable signs such as diggings, tracks and scats confirm the presence of the remaining species within the survey site (Table 3). The European Rabbit (*Oryctolagus cuniculus*) and the European Red Fox (*Vulpes vulpes*) are listed as category C3 declared pests under the *Biosecurity and Agriculture Management Act 2007* (WA), which requires control by the land manager to reduce abundance and spread of these species.

Table 3: Mammal species observed during the 2020 survey

Family	Species Name	Common Name	Comment
Peramelidae	*Isoodon fusciventer*	Southern Brown Bandicoot, Quenda	P4
Macropodidae	*Macropus fuliginosus melanops*	Western Grey Kangaroo	
Macropodidae	*Notamacropus irma*	Western Brush Wallaby	P4
Leporidae	**Oryctolagus cuniculus*	European Rabbit	C3 declared pest
Phalangeridae	*Trichosurus vulpecula hypoleucos*	Common Brushtail Possum	Two mature individuals and

			one juvenile recorded
Canidae	**Vulpes vulpes*	Red Fox	C3 declared pest

*Denotes introduced species

Southern Brown Bandicoot (*Isoodon fusciventer*) (P4)

Western Brush Wallaby *(Macropus Irma)* (P4)

Common Brushtail Possum (*Trichosurus vulpecula hypoleucos*) (mother and young)

Figure 5: Mammals recorded on site

5.2 Birds

Sixteen avian species were recorded during the fauna survey. Both Carnaby's Cockatoo (Endangered) and the Forest Red-tailed Black Cockatoo (Vulnerable) were recorded on site through visual sightings as well as evidence of foraging activities in the form of chewed Marri nuts (Table 4, Figure 6). Carnaby's Cockatoos were only observed flying over the site, whilst the Forest Red-tailed Black Cockatoo were observed over most days of the trapping event feeding on Marri nuts in the vicinity of the western boundary of the site and on adjacent properties, these observations were consistent with the locations where feeding evidence was recorded in 2018, with five locations primarily associated with the presence of Marri. The bird species that use this site are expected to be much higher than what was recorded, with many common bird species likely to be utilising the site at different times.

Regional significant birds recorded in the site including the Square-tailed Kite that is a wide ranging species with reduced populations on the Swan Coastal Plain (SCP), and the Scarlet Robin and Splendid Fairywren which are habitat specialist with reduced range on SCP (Government of Western Australia, 2000).

Table 4: Bird species observed during the 2020 survey

Family	Species	Common Name	Conservation Status
Alcedinidae	**Dacelo novaeguineae*	Laughing Kookaburra	Naturalised, exotic
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Cacatuidae	*Calyptorhynchus banksii naso*	Forest Red-tailed Black Cockatoo	T, VU
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	T, EN

Family	Species	Common Name	Conservation Status
Accipitridae	*Hamirostra isura*	Square-tailed Kite	Wide ranging species with reduced populations on the SCP
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	
Maluridae	*Malurus splendens*	Splendid Fairywren	Habitat specialist with reduced range on SCP
Pachycephalidae	*Pachycephala rufiventris*	Rufus Whistler	
Petroicidae	*Petroica boodang*	Scarlet Robin	Habitat specialist with reduced range on SCP
Petroicidae	*Petroica goodenovii*	Red-Capped Robin	
Meliphagidae	*Phylidonyris novaehollandiae longirostris*	New Holland Honeyeater	
Psittacidae	*Platycercus spurius*	Red-capped Parrot	
Psittacidae	*Platycercus zonarius*	Australian Ringneck	
Threskiornithidae	*Threskiornis moluccas*	Australian White Ibis	
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	

*Denotes introduced species

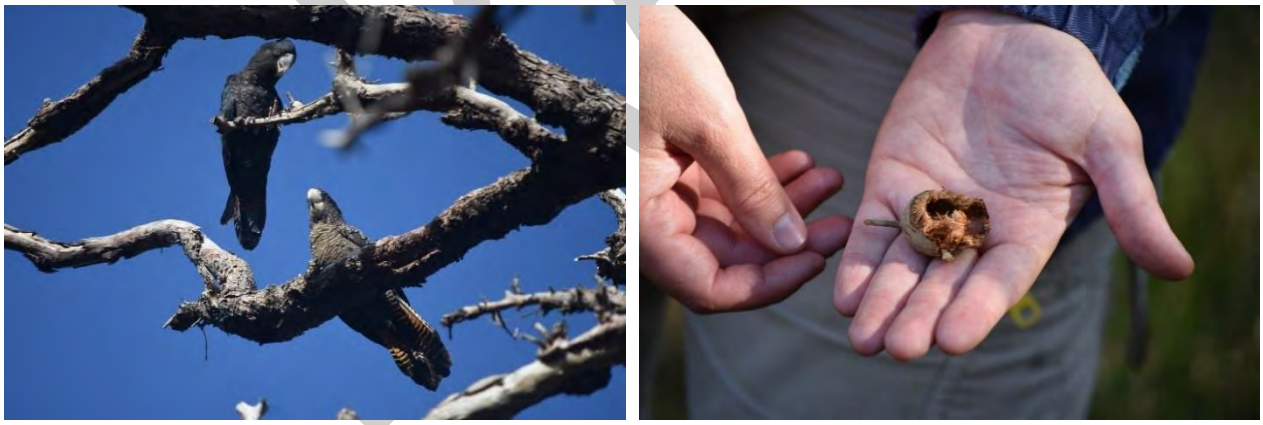

Figure 6: Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso)* and evidence on Marri nuts

5.3 Reptiles

A total of 12 reptile species across three families were recorded during the survey (Table 5). *Lerista lineata,* also commonly known as the Perth Slider, was recorded with one individual captured in a pitfall trap in TL2 (Figure 4 and 10) in the CCW. This species is currently listed as a Priority 3 species under the *Biodiversity Conservation Act 2016* (WA). The presence of *Lerista burtonis* indicates good populations of smaller skinks species recorded as this species almost feed solely on other skinks. It is likely that there are more species of common reptiles present than were capture in this survey.

Table 5: Reptile species observed during the 2020 survey

Family	Species Name	Common Name	Conservation Status
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink	
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink	
Scincidae	*Ctenotus australis*	Western Limestone Ctenotus	
Scincidae	*Ctenotus fallens*	West-coast Laterite Ctenotus	
Pygopodidae	*Delma grayii*	Side-barred Delma	
Scincidae	*Hemiergis quadrilineata*	Two-toed Earless Skink	
Scincidae	*Lerista elegans*	Elegant Slider	
Scincidae	*Lerista lineata*	Perth Slider	P3
Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard	
Scincidae	*Menetia greyii*	Common Dwarf Skink	
Elapidae	*Pseudonaja affinis affinis*	Dugite	
Scincidae	*Tiliqua rugosa rugosa*	Bobtail	

Perth Slider (*Lerista lineata*) (P3)

Burtons legless lizard (*Lialis burtonis*)

Figure 7: Reptiles recorded on site

5.4 Amphibians

Multiple captures (12) of the Moaning Frog (*Heleioporus eyrei*) were recorded through pitfall trapping during this survey, with captures widespread across the Lot in all trap lines except TL1 (Table 6). This species is capable of living a considerable distance from permanent water sources, so it was not unusual to find this species in the Banksia Woodland areas on site. Due to the drier nature of the site, it would be expected that the Banjo Frog would be present within the site. Species like Crinia however may prefer wetter sites where there is surface water present.

Moaning frog *(Heleioporus eyrei)*

Figure 8: Moaning frog recorded on site

Table 6: Amphibian species observed during the 2020 survey

Family	Species Name	Common Name	Conservation Status
Limnodynastidae	*Heleioporus eyrei*	Moaning Frog	

5.5 Invertebrates and Short Range Endemics

A total of 82 invertebrate species from 43 families were recorded, with forty being native species and three being introduced (Table 7). Species were identified using *A Field Guide to Insects in Australia* (Zborowski and Storey, 2010), the *Invertebrates* chapter in *Guide to the Wildlife of Perth and the South West* (Knowles and Whyte, 2014), and *Macroinvertebrate Herpetofauna of the Canning Catchment* (Knowles, 2012). Species were identified to family level, and where possible, to genus and species.

Table 7: Invertebrate species observed during the 2020 survey

Order	Family	Species	Common
Orthoptera	Acrididae	*Goniaea australasiae*	Gumleaf Grasshopper
Orthoptera	Acrididae	*Peakesia brunnea*	Grey Peakesia
Orthoptera	Acrididae	*Pycnostictus seriatus*	Common Bandwing
Orthoptera	Acrididae		Grasshopper
Araneae	Anamidae	*Proschermacha tepperi*	Orange-legged Banksia Mygale
Dermaptera	Anisolabididae		Earwig
Hymenoptera	Apidae	**Apis mellifera*	European Honey Bee
Araneae	Araneidae	*Argiope trifasciata*	Banded Orb Weaver
Araneae	Araneidae	*Austracantha minax*	Christmas Orb Jewel Spider
Araneae	Araneidae	*Eriophora biapicata*	Garden Orb Weaver
Araneae	Araneidae		Orb Spider
Diptera	Asilidae		Robber Fly
Blattodea	Blaberidae	*Laxta sp.*	Trilobite Cockroach

Order	Family	Species	Common
Blattodea	Blattidae	*Cutila nigra*	Black Bush Cockroach
Blattodea	Blattidae	*Zonioploca bicolor*	Spotted Desert Cockroach
Diptera	Bombyliidae	*Comptosia sp.*	Bee Fly 1
Diptera	Bombyliidae	*Villa sp.*	Bee Fly 2
Diptera	Calliphoridae	*Lucilia sericata*	Greenbottle Blowfly
Coleoptera	Carabidae	*Scaraphites silenus*	Ground Beetle
Coleoptera	Coccinelidae	*Coccinella transversalis*	Lady Bird
Odonata	Corduliidae	*Hemicordulia tau*	Tau Emerald
Araneae	Coriniidae	*Nyssus funereus*	Swift Spider
Hymenoptera	Crabronidae	*Bembix sp.*	Wasp
Coleoptera	Curculionidae	*Catasarcus spinipennis*	Spiny Weevil
Araneae	Desidae	*Badumna insignis*	Black House Spider
Coleoptera	Elateridae		Elabeetle
Hymenoptera	Evaniidae		Hatchet wasp
Hymenoptera	Formicidae	*Camponotus rudis*	Ant
Hymenoptera	Formicidae	*Camponotus sp.*	Ant 1
Hymenoptera	Formicidae	*Camponotus sp.*	Ant 2
Hymenoptera	Formicidae	*Camponotus terebens*	Ant 3
Hymenoptera	Formicidae	*Iridomyrmex sp.*	Meat Ant
Hymenoptera	Formicidae	*Myrmecia vindex*	Bull Ant
Hymenoptera	Formicidae	*Polyrhachis sp*	Ant 4
Hymenoptera	Formicidae	*Rhytidoponera metallica*	Green headed Ant
Hymenoptera	Formicidae	*Cerapachys ruficornis*	Ant 5
Hemiptera	Gelastocoridae	*Nerthra sp.*	Toad Bug
Julida	Julidae	**Ommatoiulus moreletii*	Portuguese Millipede
Zygentoma	Lepismatidae	*Acrotelsella sp.*	Silverfish
Zygentoma	Lepismatidae	*Acrotelsella sp.*	White striped Silverfish
Odonata	Libellulidae	*Diplacodes bipunctata*	Scarlet Percher
Araneae	Lycosidae	*Lycosa sp.*	Wolf Spider 1
Araneae	Lycosidae	*Lycosa sp.*	Wolf Spider 2
Coleoptera	Melolonthidae	*Colpochila sp.*	Scarab Beetle
Araneae	Miturgidae	*Argoctenus sp.*	Long-legged Sac Spider

Order	Family	Species	Common
Araneae	Miturgidae	*Cheriracanthium sp.*	Prowling Spider
Araneae	Miturgidae		Prowling Spider 1
Araneae	Miturgidae		Prowling Spider 2
Araneae	Miturgidae		Prowling Spider 3
Araneae	Miturgidae		Prowling Spider 4
Araneae	Miturgidae		Prowling Spider 5
Araneae	Miturgidae		Prowling Spider 6
Lepidoptera	Noctuidae	*Proteuxoa sp.*	Moth (larvae)
Polydesmida	Paradoxosomatidae	*Antichiropus sp.*	Native Millipede
Lepidoptera	Pieridae	*Delias aganippe*	Spotted Jezebel
Lepidoptera	Pieridae	*Pieris rapae*	Cabbage Moth
Araneae	Pisauridae		Pisauridae Spider
Araneae	Pisauridae		Pisauridae Spider 1
Araneae	Pisauridae		Pisauridae Spider 2
Hemiptera	Reduvidae		Reduvidae Spider
Araneae	Salticidae	*Helpis sp.*	Jumping spider
Araneae	Salticidae	*Maratus pavonis*	Common Peacock Spider
Araneae	Salticidae		Jumping Spider 1
Coleoptera	Scarabaeidae		Scarab Beetle
Coleoptera	Scarabaeidae		Oval Bug
Scolopendromorpha	Scolopendridae	*Ethmostigmus sp.*	Pale centipede
Scolopendromorpha	Scolopendridae	*Scolopendra sp.*	Blue-legged Centipede
Scolopendromorpha	Scolopendridae		Centipede
Scutigeromorpha	Scutigeridae	**Scutigera coleoptrata*	House Centipede
Araneae	Sparassidae	*Delena sp.*	Huntsman
Araneae	Sparassidae		Huntsman 1
Diptera	Syrphidae	*Simosyrphus grandicornis*	Hover Fly
Coleoptera	Tenebrionidae	*Adelium sp.*	Darkling Beetle
Coleoptera	Tenebrionidae	*Pterohelaeus sp.*	Piedish Beetle
Orthoptera	Tettigonidae		Green Cricket
Orthoptera	Tettigoniidae	*Tympanophora andreae*	Andrea's Balloon-winged Katydid (nymph)

Order	Family	Species	Common
Araneae	Theridiidae	*Achaearanea sp.*	Comb-Footed Spider
Araneae	Theridiidae	*Steatoda sp.*	Cupboard Spider
Araneae	Theridiidae		Spider
Araneae	Zodariidae	*Pentasteron sp.*	Ant Spider
Araneae	Zodariidae		Ant Spider 1
Lepidoptera	Zygaenidae	*Pollanisus sp.*	Forester moth

*Denotes introduced species

Orange-legged Banksia Mygale (*Proschermacha tepperi)*

Native Millipede (*Antichiropus* sp.)

Figure 9: Invertebrates recorded from pitfall trapping

5.5.1 Short Range Endemics

The Orange-legged Banksia Mygale was captured in a pitfall trap in trap line T1 after rain was experienced over the previous night. This species although it is a type of Mygalomorph trap door spider is not considered an SRE. Male trap door spiders are the usually observed when they leave their burrow during humid warm nights in spring and summer. The short range endemic species *Idiosoma sigillatum* was not found during active searches over the trapping period although it is still considered a Moderate potential for this species to occur as the Banksia Woodland habitat on site is suitable for this species.

The native millipede, *Antichiropus sp*. (Figures 9 and 10) was captured in a pitfall in trap line 3 north-east of the conservation category wetland (Figure 4) and is potentially a short range endemic species. According to the *Technical Guidance Sampling of short range endemic invertebrate fauna* (Environmental Protection Authority, 2016), all species within the *Antichiropus* genus except *Antichiropus variabilis*, which is known to inhabit the Jarrah Forests of the south west, including those on the Swan Coastal Plain and the Perth metropolitan area, are known to be short range endemics (SRE).

5.6 Fauna Habitat

Fauna habitat within Lot 123 is in good condition with vegetation and fauna habitat intact across most of the site with only minor disturbances in the form of sandy vehicle tracks and previous clearing associated with

old buildings and sheds in the southern portion of the lot. These disturbances do not inhibit fauna movement across the site, or its function as an ecological linkage to adjacent vegetated areas. The entire site contains good understorey vegetation for smaller mammals, reptiles and invertebrates and good quality canopy for arboreal mammals and birds. Four general habitat types are represented by the vegetation communities on site including (Figure 11):

- Tall Marri Woodland - tall woodland with dense understorey vegetation, particularly sedges which provide suitable habitat for the P4 Quenda and high value foraging and potential roosting habitat
- Low Banksia Woodland – low woodland with diverse understorey providing habitat to a wide array of fauna species and foraging and potential roosting and nesting habitat for black cockatoos
- Low Banksia Woodland with Allocasuarina – low woodland with diverse understorey and thicker middle storey including *Allocasuarina fraseriana* (Known habitat of the SRE Swan Coastal Plain Shield-Backed Trapdoor Spider) and Kunzea glabrescens, providing plenty of leaf litter for reptile frogs and invertebrates and high cover and habitat for mammals and bird species
- Open Melaleuca Woodland - Open Woodland over dense shrubland and sedgeland providing habitat for wetland dependent species.

5.6.1 Significant Invertebrates

Lot 123 also contained good quality microhabitats for invertebrates including the conservation significant species listed in Table 2. *Lomandra hermaphrodita,* a preferred habitat species for the Graceful Sun Moth is present throughout the Banksia Woodland. Deep leaf litter for the Swan Coastal Plain Shield-Backed Trapdoor Spider is present within Banksia Woodland, specifically SCP 23a as these areas contain more *Allocasuarina fraseriana* (Figure 11). This species of trapdoor spider are known to use the leaves around the entrance of their burrows (Mason *et al*., 2018). Although active searching including hand raking through leaf litter and pitfall trapping was undertaken, no records of any conservation significant invertebrates were recorded. However, due to the presence of suitable habitat, there is a Moderate likelihood that these species may be present but not detected due to their cryptic nature.

5.6.2 Black Cockatoo habitat

Habitat for threatened black cockatoos is present with the Banksia Woodlands and the Marri Woodlands on site. Preferred foraging species include the Marri, Banksia and Jarrah trees. Additionally, plant species from the Proteaceae family and grasses, which are found throughout the site may also provide foraging for black cockatoo. Foraging habitat value is very high across the site, with potential nesting and roosting trees also present. Forest Red-tailed Black Cockatoos were observed feeding on Marri within the site on multiple occasions and signs of foraging by Carnaby's Cockatoos was observed within the Banksia Woodland. Although, these sightings were older foraging evidence from previous years it is not unusual for Banksias to have seasons where cones are more prevalent as this depends on autumn rainfall when trees are flowering, meaning black cockatoos may feed in these areas in a rotational pattern (alternate years).

A black cockatoo foraging habitat scoring tool (Department of Environment and Energy, 2017) was applied to determine the quality of black cockatoo foraging habitat. This scoring tool assigns a habitat score between one and ten, with a score of ten representing the maximum possible score and very high quality of foraging habitat. Contextual adjustors (attributes that improve or reduce functionality of foraging habitat) such as tree species composition, availability of nesting hollows, distances from known breeding and roosting sites,

were considered and used to evaluate habitat quality. The scoring matrix was applied to the survey area, with habitat score of ten assigned to all three species (Table 8).

Table 8: Black Cockatoo foraging habitat scoring and justification (10-Very High Quality to 1-Low Quality)

Forest Red-tail Black Cockatoo foraging habitat		**Starting Score**
Lot 123 contained native Marri woodland as well as containing other eucalypt species. As such, starting score of 7 (high quality) is assigned.		7
Context adjustors: attributes improving/ reducing functionality of foraging habitat	Jarrah and Marri present showing recruitment	+3
	Contains trees with suitable nest hollows	+3
	Primarily contains Marri	+2
	Contains trees with potential to be used for breeding (DBH >500 mm)	+2
	No recorded breeding location within 12 km of site	-1
	Final Score	**>10 Very high quality**
Carnaby's Cockatoo foraging habitat		**Starting Score**
Lot 123 contains Banksia woodland with other proteaceous species present as well as native eucalypt woodland containing foraging species. As such, starting score of 7 (high quality) is assigned.		10
Context adjustors: attributes improving/ reducing functionality of foraging habitat	Is within the Swan Coastal Plain	+3
	Contains trees with suitable nest hollows	+3
	Contains trees with potential to be used for breeding (DBH >500 mm)	+2
	Is within 6 km of a confirmed roosting site	+1
	Final Score	**>10 Very high quality**
Baudin's Cockatoo foraging habitat		**Score**
Lot 123 contains native Marri woodland as well as containing other eucalypt and proteaceous species. As such, starting score of 7 (high quality) is assigned.		7
Context adjustors: attributes improving/ reducing functionality of foraging habitat	Contains trees with suitable nest hollows	+3
	Contain primarily Marri in certain areas	+2
	Contains trees with potential to be used for breeding (DBH >500 mm)	+2
	No recorded breeding location within 12 km of site	-1

	Final Score	**>10 Very high quality**

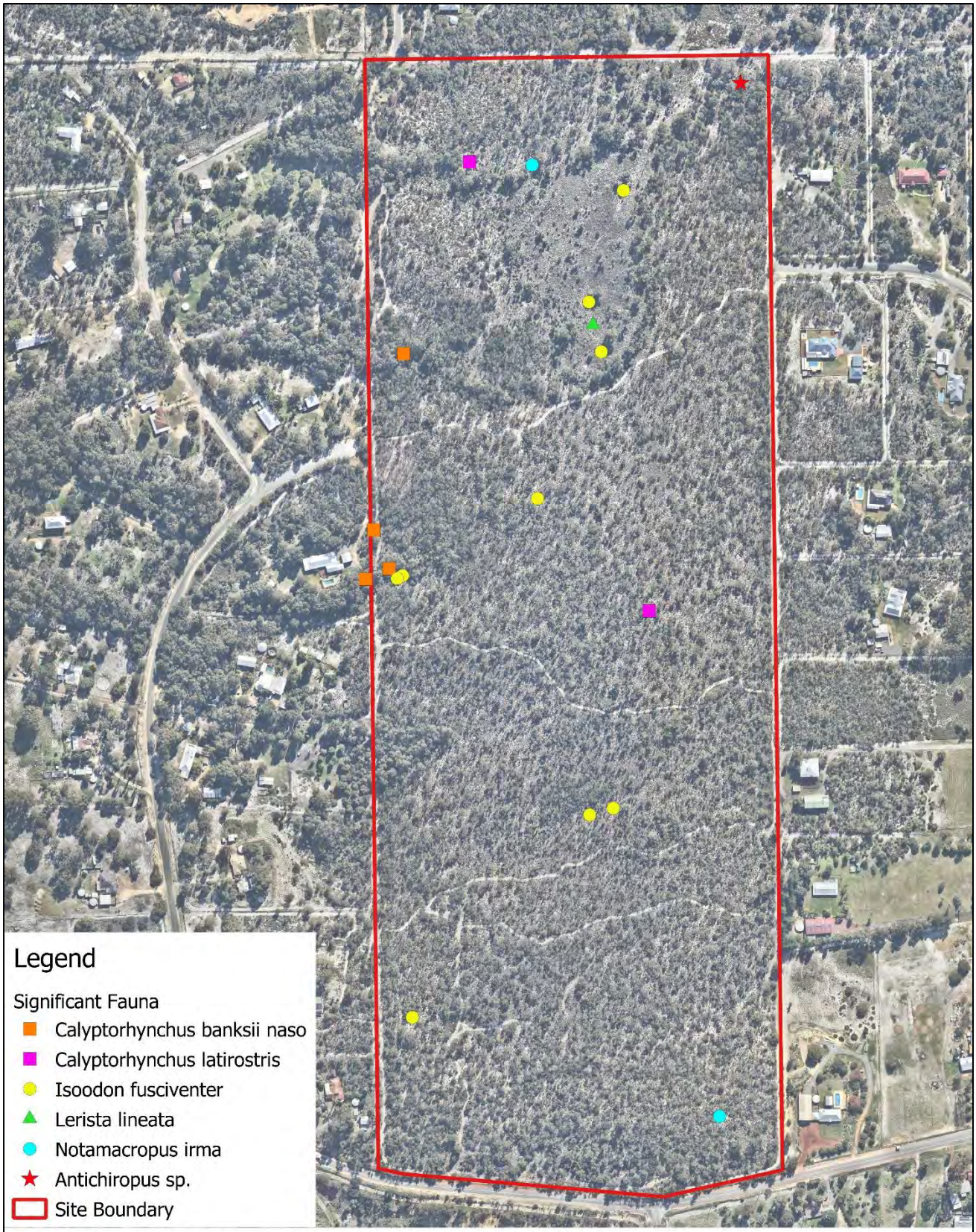

Figure 10:

Priority and Threatened Fauna Locations
Lot 123 Mortimer Rd, Casuarina

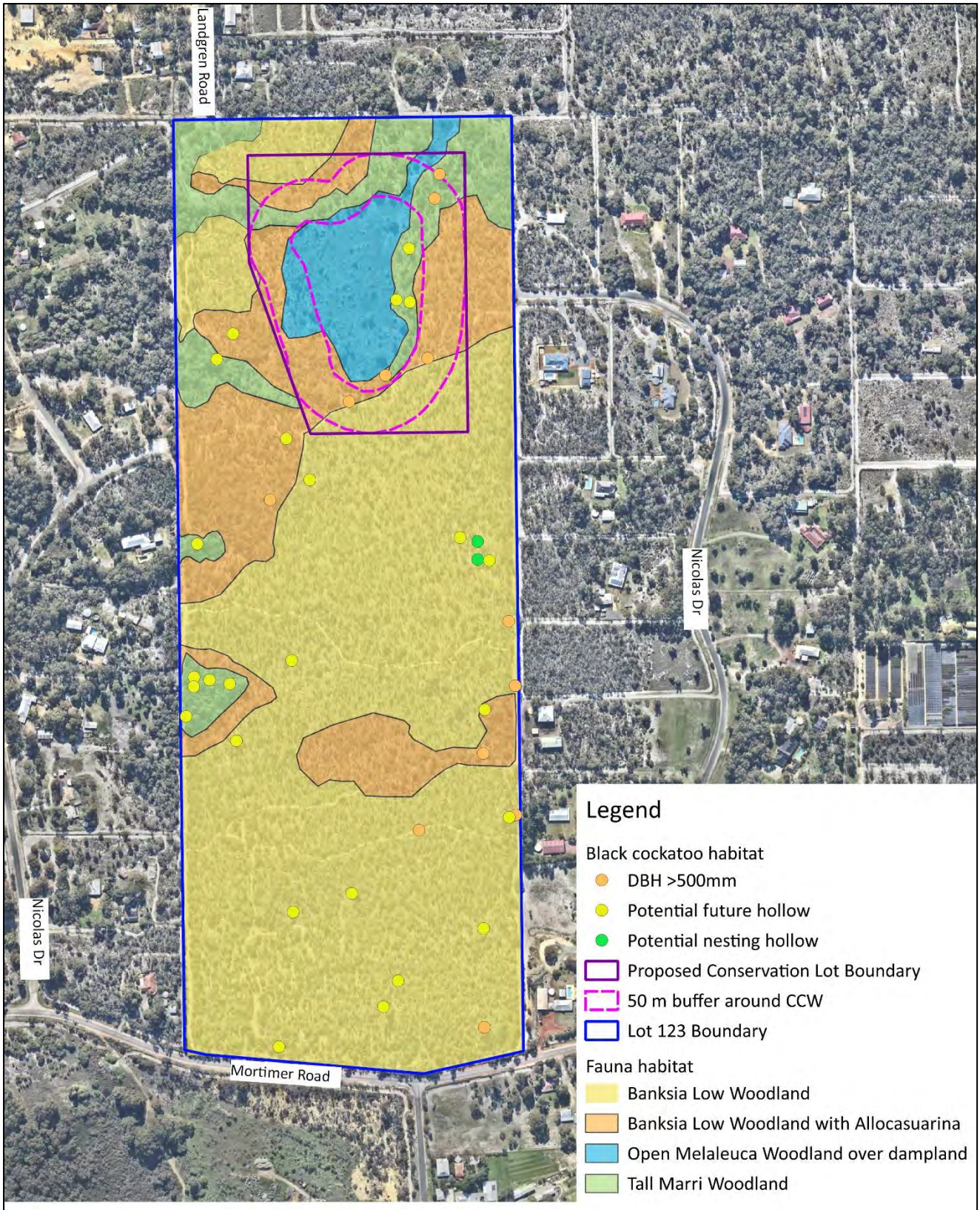

Figure 11:
Fauna Habitat Observations
Lot 123 Mortimer Rd, Casuarina

6.0 Implications of Results

6.1 Biodiversity Conservation Act 2016 (WA)

The *Biodiversity Conservation Act 2016* replaces the *Wildlife Conservation 1950* and provides for the ongoing protection of Western Australian flora, fauna and ecological communities, including those that are listed as threatened or priority species. Several of the environmental values present within Lot 123 relate to the presence of threatened and priority listed fauna, including the Carnaby's Cockatoo (*Calyptorhynchus latirostris*), the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), Southern Brown Bandicoot (*Isoodon fusciventer*), Western Brush Wallaby (*Macropus Irma)*, and the Perth Slider (*Lerista lineata*).

6.2 Introduced Fauna Species

The presence of European Rabbit (*Oryctolagus cuniculus*) within the site as indicated by scats, piles and diggings, poses a significant environmental risk to the site and surrounding areas. Rabbits are able to reproduce rapidly and compete with native animals for limited food resources and habitats. Rabbits are also known to cause appreciable land degradation and erosion by digging and forming extensive warrens. Under the *Biosecurity and Agriculture Management Act* 2007, landholders are required to control rabbits on their properties. While several methods are available to control rabbit populations, the close proximity to existing urban areas may limit the number of feasible approaches. Release of Rabbit Haemorrhagic Disease Virus (RHDV), warren fumigation and subsequent rabbit-proof fencing may be options that can be considered for conservation areas to be retained.

Scats and tracks from the European Red Fox *(Vulpes vulpes)* were also recorded on site during the survey. This indicates that this species utilises the site as part of its range and with it, places pressure on the local native species in the area through predation. There is strong evidence that foxes have caused the decline of many small to medium-sized species of Australian native mammals. Similar to the European Rabbit, the Red Fox is a declared pest in Western Australia and landowners are required to control their population. 1080 baiting is one of the more commonly used control methods, although its application should be evaluated against the site's close proximity and accessibility to urban population.

Three introduced invertebrate species including European Honeybee, Portuguese millipede, House Centipede were recorded, these are all common species found throughout the Swan Coastal Plain.

6.3 Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

The *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) provides for the protection of matters of national environmental significance (MNES), such as significant impacts to nationally listed endangered flora, fauna and/or ecological communities. Lot 123 includes Very high quality habitat for the endangered Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and the vulnerable Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*).

6.4 Fauna Species

The number of species recorded over the 10 day (9 trap nights) trapping event was plotted using a species accumulation curve (Figure 12). The specie accumulation curve was still rising although it the increase is slowing down, so although additional surveys may yield more species it is unlikely to be significant. If additional surveys are required they should target birds to increase the number of bird species recorded and a short range endemic survey should be undertaken by a qualified specialist.

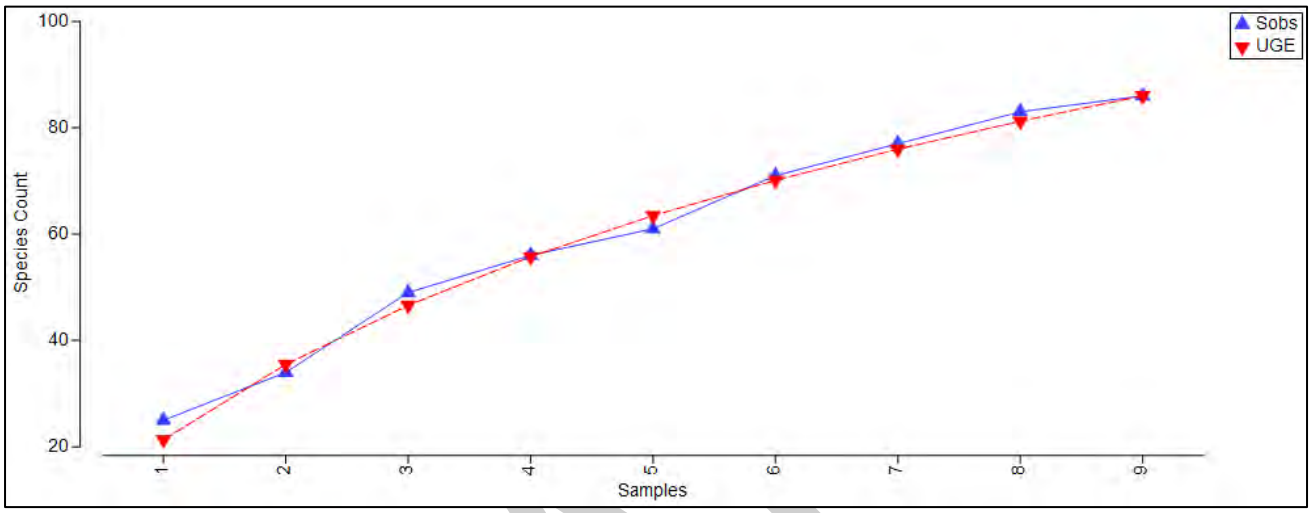

Figure 12: Species accumulation curve for trapping nights undertaken in Lot 123

6.4.1 Southern Brown Bandicoot (P4)

The Southern Brown Bandicoot, (*Isoodon fusciventer*), listed as Priority 4 species under the BC Act was recorded on site. Bandicoots are known to favour vegetation that is swampy and with dense vegetation cover. Lot 123 provides suitable habitat for bandicoots, in particularly the northern section where an open Woodland of *Melaleuca preissiana* over *Xanthorrhoea preissii* and *Astartea scoparia* shrubland with an understorey of mixed sedges and herbs occurs, with the wider site providing foraging habitat. Captures from Elliot trapping indicate a breeding population in the area as they include a range of individuals with differing sexual maturity as well as a female carrying pouched young. The bandicoot presence is likely to be a small permanent population, with the level of impact related to the amount of clearing that will take place on the site.

Although a relatively small mammal they can have home ranges of 2-7 ha for males and 1-3 ha for females, clearing of the Lot will reduce the carrying capacity for the wetland and sustainability of the remaining population (Department of Environment and Conservation, 2012). The trapping and relocation of bandicoots present to nearby conservation areas is a possible mitigation activity for the potential reduction in habitat if clearing proceeds.

6.4.2 Western Brush Wallaby (P4)

The Priority 4 listed Western Brush Wallaby (*Macropus irma*) was recorded within Lot 123. This species prefers open woodland, particularly favouring open, seasonal wetlands with low grasses and scrubby thickets, which are present within the site. It was previously recorded in the western side of the lot along the edge of the *Corymbia Melaleuca* Woodland during the 2018 Flora and Black Cockatoo habitat

assessment carried out by Natural Area (2018). During the 2020 survey, three individuals were recorded on trail cameras within the *Corymbia Melaleuca* Woodland, and it was also recorded closer to the northern section of the survey site. Numerous sightings of diggings and scats were observed across the entire site, indicating a healthy population.

It is likely that the Western Brush Wallaby utilises the site used as a part of the species home range in conjunction with Casuarina Prison Bushland – Bush Forever Site 273 to the north, with impacts due to clearing likely to significantly affect carrying capacity of this species in the local area.

6.4.3 Black Cockatoos

Both Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Forest Red-tailed Black Cockatoos (*Calyptorhynchus banksii naso*) (listed as Endangered and Vulnerable respectively under the BC Act and the EPBC Act) were sighted flying over Lot 123, with the latter species observed feeding on Marri nuts within the Corymbia Woodland along the western Lot boundary and adjacent properties (Figure 10). Black cockatoo feeding across the site was consistent with 2018 results with feeding evidence limited to a small number of locations on site, with Marri being the main food source utilised by Forest Red-tailed Black Cockatoos. While there was some evidence of recent feeding from Carnaby's Cockatoos, most indicators suggest that it had occurred in previous years as evidenced by colour change and weathering of the debris. No increase of feeding by Carnaby's cockatoo was noted on the ground but there is still food available there and bird may use the site on a rotation basis, when the Banksia fruiting it at its best post good autumn rains.

No observable evidence of Black Cockatoo nesting was noted whilst Natural Area was undertaking the survey in October 2020. The 2018 Flora and Black Cockatoo habitat assessment identified the presence of 39 habitat trees (diameter greater than 500 mm at breast height) that could be potential roosting trees, of which 27 trees contained with most smaller hollows that may provide nesting habitat in the future, two trees contained hollow that were large enough to provide habitat for black cockatoo nesting. Despite showing limited feeding evidence by black cockatoos, the site is considered to be Very High quality foraging habitat due to:

- the presence of a range of known black cockatoo food sources, including Marri and four species of Banksias and other Proteaceous species, with fruit presenting on all foraging species observed
- vegetation condition across most of the site being Excellent
- the site is located on the Swan Coastal Plain, which is known foraging habitat of the black cockatoos
- it is located within 1 km of confirmed roosting habitat for Black Cockatoos and 6 km of known roosting habitat of Carnaby's Cockatoo.

6.4.4 Reptiles

A single individual of the Priority 3 listed Perth Slider *(Lerista lineata)* was captured and recorded in the conservation category wetland (CCW) in the northern section of Lot 123. With the retention of the CCW and its buffer, impacts to this species are expected to be minimal. The presence of Burton's legless lizard (*Lialis burtonis*) is an indicator of a healthy skink population as this species feeds almost exclusively on smaller skinks.

6.4.5 Invertebrates and Short Range Endemics

SREs are terrestrial or freshwater invertebrates that have a relatively small distribution and often occupy small, fragmented, and discontinuous habitats (Harvey 2002), with their traits including:

- poor dispersal mechanisms
- confined to discontinuous or specialised habitats, such as rocky outcrops
- often have a seasonal activity pattern, such being more active during cooler, wetter periods
- have a low fecundity (reproductive) rate.

According to EPA technical guide - *Technical Guidance Sampling of short range endemic invertebrate fauna* (Environmental Protection Authority, 2016) there is a greater potential for SRE to be impacted by developments due to their restricted range compared to wider ranging species. Where identification of species recorded during 2020 was able to be carried out to species level, none that were listed as priority or endangered on the NatureMap report (DBCA, 2020), and no invertebrate species were listed on the PMST report (DAWE, 2020). While the identification of the *Antichiropus* millipede recorded in trap line 3 in the north-eastern portion of Lot 123 (Figure 10) was not confirmed with certainty and given there is an *Antichiropus* species typically located on the Swan Coastal Plain that is not a short range endemic found in a habitat within Lot 123 that cannot be described as discontinuous or specialised it may not be a short range endemic. However, all other species of *Antichiropus* are short range endemics and therefore cannot be ruled out with certainty. There is a Moderate likelihood of the vegetation types present to support these particular short range endemics.

Accordingly, the potential presence of SREs is inferred as being Moderate, noting that their presence cannot be ruled out with certainty due to their cryptic nature and typically low detection rates. The habitat for the Priority 3 Swan Coastal Plain Shield-Backed Trapdoor Spider is present within the Banksia Woodland particularly within floristic community 20a, adjacent to the wetlands and in dunes swales where *Allocasuarina fraseriana* is more prevalent. This species and *Antichiropus* cannot be ruled out as being present within the site and further targeted surveys by a SRE specialist may be required.

6.5 Fauna Habitat Impacts

Ecological linkages provide opportunity for increased genetic diversity of population through fauna movement between bushland areas. Impacts to ecological linkages across landscapes reduces fauna movement between bushland areas reducing population numbers and diversity over time. Reduced fauna movement may also impact seed dispersal for native flora species where animals act as vectors.

Fragmentation of habitat would impact fauna through the reduction of their home ranges, reduced resources, increased competition for resources and increase in potential for predation due to reduced vegetation cover and protection. Fragmentation of short range endemic species habitat is of particular concern with direct clearing of their habitat causing a direct loss of individuals of the populations, particularly for trap door spiders which stay in the same burrows for their entire lives which may be up to 40+ years (Mason *et al*., 2018).

Fragmentation increases edge effects and weed encroachment of bushland areas further impacting fauna habitat in the area. The rate of fires may increase in the area due to increased anthropogenic activity. Fires

would also have larger impacts in smaller areas due to reduced refuge and safe escape routes for fauna to flee from approaching fires, particularly large-scale fires.

Clearing of vegetation and urbanisation of the area may increase the predator pressure in the area by increasing the number of cats present in the local area and making access for predators such as foxes easier. There are 13 Bush Forever Sites within 5 km of Lot 123 and of these 10 have the same vegetation complex as the site. While native fauna may be displaced into nearby habitat with similar and suitable vegetation complex, competition for limited resources due to increased populations may have detrimental impacts on the environment if fauna populations exceed the carrying capacity of the area. Larger mammals like the Western Brush Wallaby and Western Grey Kangaroo also do not do well with physical translocation as they become to stressed.

5.4.1 Residual Impact of Development

The size and scale of proposed disturbance is relatively large considering the size of the Lot with the majority 37.2 ha of vegetation within the site proposed for clearing. This vegetation is habitat for threatened and priority fauna species and therefore clearing impact will be considered environmentally significant. Although approximately 7.82 ha of vegetation and CCW are proposed to be retained for conservation (refer to Figure 11, there are still a number of residual impacts remaining for the site. This includes impacts to matters of nation environmental significance (MNES), including:

- The loss of 37.24 ha of Black Cockatoo foraging habitat
- The loss of 31 black cockatoo habitat trees, of which 22 have small hollows that can provide potential future hollows for black cockatoos and two that have potential nesting hollows that are of sufficient size to be utilised by black cockatoos currently.

Other non MNES impacts include:

- The loss of 37.357 ha of remnant flora in mostly excellent condition that provides habitat to the P4 listed Quenda and Western Brush Wallaby.

7.0 References

Atlas of Living Australia (ALA). (2022). *Search and analyse portal -search by area* (20 km buffer). https://www.ala.org.au/.

Biodiversity Conservation Act 2016 (WA)

Biosecurity and Agriculture Management Act 2007 (WA)

Bureau of Meteorology. (2020). *Climate and weather statistics - Perth Airport, Station ID 009021*. Viewed December 2020 via http://www.bom.gov.au/climate/data/

Department of Agriculture, Water and the Environment. (2020a). *Categories of Threatened Species*. Retrieved December 2020 via www.environment.gov.au/biodiversity/threatened/species

Department of Agriculture, Water and the Environment. (2022). *Protected Matters Search Tool*. Retrieved May 2022 via https://pmst.awe.gov.au/#/map/(m:ex/group/e8f210c3-41f8-42b8-99c9-7ea5af3112ca)?lng=115.87293148040773&lat=-32.24603639435562&zoom=15&baseLayers=Imagery.

Department of Biodiversity, Conservation and Attractions. (2022a). *Black Cockatoo Roosting Sites - Buffered (DBCA-064),* viewed May 2022 via https://nationalmap.gov.au/

Department of Biodiversity, Conservation and Attractions. (2022b). *Carnaby's Cockatoo Areas requiring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region (DBCA-057)*, viewed May 2022 via https://nationalmap.gov.au/

Department of Biodiversity, Conservation and Attractions. (2022c). *Carnaby's Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)*, viewed May 2022 via https://nationalmap.gov.au/

Department of Biodiversity, Conservation and Attractions. (2022d). *Carnaby's Cockatoo Confirmed Roost Sites (DBCA-050) – it is within 6 km of a known roosting site*, viewed May 2022 via https://nationalmap.gov.au/

Department of Biodiversity, Conservation and Attractions. (2020a). *Conservation Codes*, viewed December 2020 via https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation%20code%20definitions.pdf

Department of Biodiversity, Conservation and Attractions. (2020b). *NatureMap* report. Retrieved December 2020 via http://naturemap.dpaw.wa.gov.au/default.aspx

Department of Environment and Conservation. (2012). Fauna Profiles – Isoodon obesulus (Shaw,

1797). Viewed December 2020 via https://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/quenda_2012.pdf.

Department of Primary Industries and Regional Development. (2020). *NRInfo for Western Australia: map application*, accessed December 2020 via https://www.agric.wa.gov.au/resource-assessment/nrinfo- western-australia

Department of Sustainability, Environment, Water, Population and Communities. (2012). *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris. Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii. Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksia naso,* accessed December 2020 via https://www.environment.gov.au/system/files/resources/895d4094-af63-4dd3-8dff-ad2b9b943312/files/referral-guidelines-wa-black-cockatoo.pdf

Environmental Protection Authority. (2012). *EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo, Baudin's cockatoo and Forest red-tailed black cockatoo,* accessed December 2020 via https://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral- guidelines-three-threatened-black-cockatoo-species-carnabys-cockatoo

Environmental Protection Authority. (2020). *Technical Guidance, Terrestrial vertebrate fauna surveys for environmental impact assessment,* EPA, Western Australia.

Environmental Protection Authority. (2016). *Technical Guidance, Sampling of short range endemic invertebrate fauna,* EPA, Western Australia.

Geo & Hydro Environmental Management. (2020). *Water Balance of Lot 123 Mortimer Rd, City of Kwinana*, unpublished report prepared for Natural Area Consulting Management Services.

Harvey, M. S. (2002). *Short-range endemism in the Australian fauna: some examples from non-marine environments*. Invertebrate Systematics 16: 555-570.

Heddle, E., Loneragan, O., and Havel, J. (1980). *Vegetation Complexes of the Darling System Western Australia.* In *Atlas of Natural Resources - Darling System, Western Australia* (pp. 37 - 72), Department of Conservation and Environment, Western Australia.

Knowles D. (2012). *Macroinvertebrate Herpetofauna of the Canning Catchment*, SERCUL Inc. Beckenham, Western Australia.

Knowles D. and Whyte G. (2014). *Invertebrates* (*Guide to the Wildlife of Perth and the South West*), Simon Nevill Publication, Perth, Western Australia.

Mason L. D., Bateman P. W. and Wardell-Johnson G. W. (2018). *The pitfalls of short-range endemism: high vulnerability to ecological and landscape traps.* Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5937473/.

Mitchell, Williams and Desmond. (2002). *Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion)*, accessed November 2020 via https://www.dpaw.wa.gov.au/images/documents/about/science/projects/waaudit/swan_coastal_plain02_p 606-623.pdf

Nevill S. J. (2013). *Birds of Western Australia Field Guide*. Simon Nevill Publications. Perth, Western Australia.

Nevill S. J. (2014). *Mammals* (*Guide to the Wildlife of Perth and the South West*). Simon Nevill Publications. Perth, Western Australia.

Natural Area Consulting Management Services. (2018). Lot 123 Mortimer Road Flora and Vegetation Survey and Black Cockatoo Habitat Assessment. Unpublished report prepared for Yujnovich, I.

Western Australian Local Government Association (WALGA). (2020). Environmental Planning Tool – Environmental Considerations. Retrieved November 2020 from: https://walga.asn.au/Subscription- Services/Environmental-Planning-Tool.aspx.

Wilson S. and Swan G. (2013). *A Complete Guide to Reptiles of Australia*. New Holland Publishers (Australia) Pty Ltd. Sydney, Australia.

Zborowski P. and Storey R. (2010). *A Field Guide to Insects in Australia*. New Holland Publishers (Australia) Pty Ltd. Sydney, Australia

Appendix 1: Fauna Species List

*Denotes introduced species

Family	Species Name	Common Name	Conservation Status
MAMMALS			
Peramelidae	*Isoodon fusciventer*	Southern Brown Bandicoot, Quenda	P4
Macropodidae	*Macropus fuliginosus melanops*	Western Grey Kangaroo	
Macropodidae	*Notamacropus irma*	Western Brush Wallaby	P4
Leporidae	**Oryctolagus cuniculus*	European Rabbit	C3 declared pest
Phalangeridae	*Trichosurus vulpecula hypoleucos*	Common Brushtail Possum	
Canidae	**Vulpes vulpes*	Red Fox	C3 declared pest
BIRDS			
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Cacatuidae	*Calyptorhynchus banksii naso*	Forest Red-tailed Black Cockatoo	VU
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	EN
Alcedinidae	**Dacelo novaeguineae*	Laughing Kookaburra	Naturalised, exotic
Accipitridae	*Hamirostra isura*	Square-tailed Kite	
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	
Maluridae	*Malurus splendens*	Splendid Fairywren	
Pachycephalidae	*Pachycephala rufiventris*	Rufus Whistler	
Petroicidae	*Petroica boondang*	Scarlet Robin	
Petroicidae	*Petroica goodenovii*	Red-Capped Robin	
Meliphagidae	*Phylidonyris novaehollandiae longirostris*	New Holland Honeyeater	
Psittacidae	*Platycercus zonarius*	Australian Ringneck	
Psittacidae	*Platycercus spurius*	Red-capped Parrot	
Threskiornithidae	*Threskiornis moluccus*	Australian White Ibis	
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	
REPTILES			
Scincidae	*Acritoscincus trilineatus*	Western Three-lined Skink	
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink	

Family	Species Name	Common Name	Conservation Status
Scincidae	*Ctenotus australis*	Western Limestone Ctenotus	
Scincidae	*Ctenotus fallens*	West-coast Laterite Ctenotus	
Pygopodidae	*Delma grayii*	Side-barred Delma	
Scincidae	*Hemiergis quadrilineata*	Two-toed Earless Skink	
Scincidae	*Lerista elegans*	Elegant Slider	
Scincidae	*Lerista lineata*	Perth Slider	P3
Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard	
Scincidae	*Menetia grayii*	Common Dwarf Skink	
Elapidae	*Pseudonaja affinis*	Dugite	
Scincidae	*Tiliqua rugosa rugosa*	Bobtail	
AMPHIBIANS			
Limnodynastidae	*Heleioporus eyrei*	Moaning frog	
INVERTEBRATES			
Paradoxosomatidae	*Antichiropus sp.*	Native Millipede	
Apidae	**Apis mellifera*	European Honey Bee	
Theridiidae	*Achaearanea sp.*	Comb-Footed Spider	
Lepismatidae	*Acrotelsella sp.*	Silverfish	
Lepismatidae	*Acrotelsella sp.*	White striped Silverfish	
Tenebrionidae	*Adelium sp.*	Darkling Beetle	
Araneidae	*Argiope trifasciata*	Banded Orb Weaver	
Miturgidae	*Argoctenus sp.*	Long-legged Sac Spider	
Araneidae	*Austracantha minax*	Christmas or Jewel Spider	
Desidae	*Badumna insignis*	Black House Spider	
Crabronidae	*Bembix sp.*	Wasp	
Formicidae	*Camponotus rudis*	Ant	
Formicidae	*Camponotus sp.*	Ant 1	
Formicidae	*Camponotus sp.*	Ant 2	
Formicidae	*Camponotus terebens*	Ant 3	
Curculionidae	*Catasarcus spinipennis*	Spiny weavil	
Formicidae	*Cerapachys ruficornis*	Ant 5	
Miturgidae	*Cheriracanthium sp.*	Prowling Spider	
Coccinelidae	*Coccinella transversalis*	Lady Bird	

Family	Species Name	Common Name	Conservation Status
Melolonthidae	*Colpochila sp.*	Scarab Beetle	
Bombyliidae	*Comptosia sp.*	Bee fly	
Blattidae	*Cutila nigra*	Black Bush Cockroach	
Sparassidae	*Delena sp.*	Huntsman	
Pieridae	*Delias aganippe*	Spotted Jezebel	
Libellulidae	*Diplacodes bipunctata*	Scarlet Percher	
Araneidae	*Eriophora biapicata*	Garden Orb Weaver	
Scolopendridae	*Ethmostigmus sp.*	Pale centipede	
Acrididae	*Goniaea australasiae*	Gumleaf Grasshopper	
Salticidae	*Helpis sp.*	Jumping spider	
Corduliidae	*Hemicordulia tau*	Tau Emerald	
Formicidae	*Iridomyrmex sp.*	Meat Ant	
Blaberidae	*Laxta sp.*	Trilobite cockroach	
Calliphoridae	*Lucilia sericata*	Greenbottle Blowfly	
Lycosidae	*Lycosa sp.*	Wolf Spider 1	
Lycosidae	*Lycosa sp.*	Wolf Spider 2	
Salticidae	*Maratus pavonis*	Common Peacock Spider	
Formicidae	*Myrmecia vindex*	Bull Ant	
Gelastocoridae	*Nerthra sp.*	Toad Bug	
Coriniidae	*Nyssus funereus*	Swift Spider	
Julidae	**Ommatoiulus moreletii*	Portugese Millipede	
Acrididae	*Peakesia brunnea*	Grey Peakesia	
Zodariidae	*Pentasteron sp.*	Ant Spider	
Pieridae	*Pieris rapae*	Cabbage Moth	
Zygaenidae	*Pollanisus sp.*	Forester moth	
Formicidae	*Polyrhachis sp*	Ant 4	
Anamidae	*Proschermacha tepperi*	Orange-legged Banksia Mygale	
Noctuidae	*Proteuxoa sp.*	Moth (larvae)	
Tenebrionidae	*Pterohelaeus sp.*	Piedish Beetle	
Acrididae	*Pycnostictus seriatus*	Common bandwing	
Formicidae	*Rhytidoponera metallica*	Green headed Ant	
Carabidae	*Scaraphites silenus*	Ground Beetle	

Family	Species Name	Common Name	Conservation Status
Scolopendridae	*Scolopendra sp.*	Blue-legged Centipede	
Scutigeridae	**Scutigera coleoptrata*	House Centipede	
Syrphidae	*Simosyrphus grandicornis*	Hover Fly	
Theridiidae	*Steatoda sp.*	Cupboard Spider	
Tettigoniidae	*Tympanophora andreae*	Balloonwing Tettihopper (nymph)	
Bombyliidae	*Villa sp.*	Bee fly	
Blattidae	*Zonioploca bicolor*	Spotted Desert Cockroach	
Acrididae		Grasshopper	
Anisolabididae		Earwig	
Araneidae		Orb Spider	
Araneidae		Orb Spider	
Asilidae		Robber Fly	
Elateridae		Elabeetle	
Evaniidae		Hatchet wasp	
Miturgidae		Prowling Spider 1	
Miturgidae		Prowling Spider 2	
Miturgidae		Prowling Spider 3	
Miturgidae		Prowling Spider 4	
Miturgidae		Prowling Spider 5	
Miturgidae		Prowling Spider 6	
Pisauridae		Pisauridae Spider	
Pisauridae		Pisauridae Spider 1	
Pisauridae		Pisauridae Spider 2	
Reduvidae		Reduvidae Spider	
Salticidae		Jumping spider 1	
Scarabaeidae		Scarab Beetle	
Scarabaeidae		Oval bug	
Scolopendridae		Centipede	
Sparassidae		Huntsman 1	
Tettigonidae		Green Cricket	
Theridiidae		Spider	
Zodariidae		Ant Spider 1	

Appendix 2: Conservation Significant Fauna Likelihood Analysis

The table below provides the combined online database lists of conservation significant fauna that has the potential to occur on site (20 km buffer), with species that are considered 'present' or 'possible' to occur on site highlighted green in the table.

List of conservation significant species resulting from NatureMap, PMST, DBCA and ALA review:

Species Name	Common Name	Cons. Code	Nature Map	PMST	DBCA	ALA	Likelihood
Invertebrates							
Idiosoma sigillatum	Swan Coastal Plain Shield-Backed Trapdoor Spider	P3	X				Possible habitat suitable
Leioproctus douglasiellus	A short tongued bee	T, CR		X			Unlikely habitat unsuitable
Neopasiphae simplicior	A native bee	T, CR		X			Unlikely habitat unsuitable
Synemon gratiosa	Graceful Sun Moth	P4	X				Possible habitat suitable
Westralunio carteri	Carter's Freshwater Mussel	T, VU		X			Unlikely habitat unsuitable
Mammals							
Bettongia penicillata ogilbyi	Brush-tailed Bettong, Woylie	T, CR		X			Unlikely outside of current distribution range
Dasyurus geoffroii	Chuditch, Western Quoll	T, VU	X	X	X		Unlikely outside of current distribution range
Isoodon fusciventer	Quenda, Southern Brown Bandicoot	P4	X		X		Present
Notamacropus Irma	Western Brush Wallaby	P4	X	X	X		Present

Species Name	Common Name	Cons. Code	Nature Map	PMST	DBCA	ALA	Likelihood
Phascogale tapoatafa wambenger	Wambenger Brush-tailed Phascogale	OS	X		X		Possible habitat suitable
Pseudocheirus occidentalis	Western Ringtail Possum	T, EN		X			Unlikely habitat unsuitable
Setonix brachyurus	Quokka	T, VU		X			Unlikely habitat unsuitable
Reptiles							
Lerista lineata	Perth Slider	P3	X		X		Present
Neelaps calonotos	Black-striped Snake	P3	X		X		Possible habitat suitable
Birds							
Actitis hypoleucos	Common Sandpiper	MI	X				Unlikely habitat unsuitable
Anous tenuirostris melanops	Australian Lesser Noddy	T, VU		X			Unlikely habitat unsuitable
Botaurus poiciloptilus	Australasian Bittern	T, EN		X		X	Unlikely habitat unsuitable
Calidris canutus	Red Knot	T,EN		X		X	Unlikely habitat unsuitable
Calidris ruficollis	Red-necked Stint	MI			X		Unlikely habitat unsuitable
Calidris ferruginea	Curlew Sandpiper	T,CR		X	X	X	Unlikely habitat unsuitable
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	T, VU	X	X	X	X	Present observed foraging on site
Calyptorhynchus baudinii	Baudin's Cockatoo	T, EN		X	X	X	Possible foraging habitat suitable but tends to occur further south

Species Name	Common Name	Cons. Code	Nature Map	PMST	DBCA	ALA	Likelihood
Calyptorhynchus latirostris	Carnaby's Cockatoo	T, EN	X	X	X		Present foraging signs within site
Charadrius leschenaultia	Great Sand Plover	T,VU		X		X	Unlikely habitat unsuitable
Diomedea amsterdamensis	Amsterdam Albatross	T, EN		X			Unlikely habitat unsuitable
Diomedea dabbenena	Tristan Albatross	T, EN		X			Unlikely habitat unsuitable
Diomedea epomorpha	Southern Royal Albatross	T, VU		X			Unlikely habitat unsuitable
Diomedea exulans	Wandering Albatross	T, VU		X		X	Unlikely habitat unsuitable
Diomedea sanfordi	Northern Royal Albatross	T, EN		X			Unlikely habitat unsuitable
Falco peregrinus	Peregrine Falcon	OS				X	
Leipoa ocellata	Malleefowl	T, VU		X			Unlikely habitat unsuitable
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	T, CR		X			Unlikely habitat unsuitable
Macronected gigateus	Southern Giant Petrel	T, EN		X		X	Unlikely habitat unsuitable
Macronected halli	Northern Giant Petrel	T, VU		X			Unlikely habitat unsuitable
Numenius madagascariensis	Eastern Curlew	T, CR		X		X	Unlikely habitat unsuitable
Oxyura australis	Blue-billed Duck	P4			X	X	Unlikely habitat unsuitable
Pachyptila tutur subantarctica	Fairy Prion (southern)	T, VU		X			Unlikely habitat unsuitable
Plegadis falcinellus	Glossy Ibis	MI			X		Unlikely habitat unsuitable
Rostraluta australis	Australian Painted Snipe	T, EN		X			Unlikely habitat unsuitable

Species Name	Common Name	Cons. Code	Nature Map	PMST	DBCA	ALA	Likelihood
Sternula nereis nereis	Australian Fairy Tern	T, VU		X			Unlikely habitat unsuitable
Thalassarche cateri	Indian Yellow-nosed Albatross	T, VU		X			Unlikely habitat unsuitable
Thalassarche cauta	Shy Albatross	T, EN		X			Unlikely habitat unsuitable
Thalassarche impavida	Campbell Albatross	T, VU		X			Unlikely habitat unsuitable
Thalassarche melanophris	Black-browed Albatross	T, VU		X			Unlikely habitat unsuitable
Thalassarche steadi	White-capped Albatross	T, VU		X			Unlikely habitat unsuitable
Tringa nebularia	Common Greenshank	MI			X		Unlikely habitat unsuitable
Tringa glareola	Wood Sandpiper	MI			X		Unlikely habitat unsuitable

Appendix 3: DBCA NatureMap Species Report

Appendix 4: Protected Matters Report

Appendix 5: Fauna Licence

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

FAUNA TAKING (BIOLOGICAL ASSESSMENT) LICENCE

Regulation 27, Biodiversity Conservation Regulations 2018

Licence Number: BA27000327

Licence Holder: Miss Sharon Louise Hynes
Natural Area Consulting Management Services
99C Lord Street
WHITEMAN WA 6068

Date of Issue: 02/10/2020

Date Valid From: 02/10/2020
Date of Expiry: 30/12/2020

LICENSED ACTIVITIES

Subject to the terms and conditions on this licence, the licence holder may –

1. Take or disturb fauna to determine fauna species including Short Range Endemic (SRE) invertebrates present within Lot 123 to ensure adequate protection of fauna is considered during any future development planning for the area as part of EPA referral process under section 38 of the Environment Protection Act 1986. Survey to be undertaken using remote sensing camera traps, ultrasonic bat detectors, hand collecting techniques, dry pitfall traps, funnel traps, Elliot traps, and one larger Aluminum box trap or Cage trap. Traps will be out for ten days and nine trap nights. A maximum of 20 funnels, 30 pitfalls, 20 Elliots and 10 large Aluminum box traps or cage traps and Traps tol be checked daily within 3 hours of sunrise and if temperatures exceed 30oC traps to be closed during the day and reopened in the late afternoon.. Fauna will be release at site of capture once identified or photographed for later identification.

LOCATIONS

1. Lot 123 Mortimer Road, Casuarina

AUTHORISED PERSONS

The following persons or persons of the specified class may assist in carrying out the licensed activities:

1. Kylie Joy Sadgrove
2. Taryn Roseanne Brebner
3. John Wei

CONDITIONS

1. Fauna must not be taken on CALM land, (as defined in the Conservation and Land Management Regulations 2002), unless authorised by a written notice of a lawful authority issued under regulations 4 and 8 of the Conservation and Land Management Regulations 2002.
2. If persons, other than the licence holder, are authorised to carry out/assist in carrying out the activities under the licence, the licence holder must ensure those persons have read and understand the licence terms and conditions.

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3. The written authorisation of the person in possession or occupation of the land accessed and upon which fauna is taken, as required under regulation 101(2) and referred to in "Additional information" below, must:
   a) state location details (including lot or location number, street/road, suburb and local government authority);
   b) state land owner or occupier name, and contact phone number;
   c) specify the time period that the authorisation is valid for;
   d) be signed and dated; and
   e) be attached to this licence at all times.
4. This licence, and any written authorisation or lawful authority which authorises the take of fauna on specified locations must be carried at all times while conducting licensed activities and be produced on demand by a wildlife officer.
5. If a species of fauna listed as a threatened species under Section 19 of the *Biodiversity Conservation Act 2016* is inadvertently captured, that species is to be released immediately at the point of capture. If the fauna is injured or deceased, the licence holder shall contact the DBCA Wildlife Licensing Section (wildlifelicensing@dbca.wa.gov.au) for advice on treatment or disposal. Details of any capture of threatened fauna must be included in the "Return of Fauna Taken."
6. The licence holder must not:
   a) release any fauna in any area where it does not naturally occur;
   b) transfer fauna to any other person or authority (other than the Western Australian Museum) unless approved in writing by the CEO; or
   c) dispose of the remains of fauna in any manner likely to interfere the natural or present day distribution of the species.
7. The licence holder must not take and remove more than ten specimens of any one protected species of fauna from any location less than 20km apart. Where exceptional circumstances make it necessary to take a larger number of specimens from a particular location in order to obtain adequate statistical data, the collector must proceed with circumspection and justify their actions to the Director General in advance.
8. All holotypes and syntypes and a half share of paratypes of species or subspecies permitted to be permanently taken under this licence must be donated to the Western Australian Museum. Duplicates (one pair in each case) of any species collected, which represents a significant extension of geographic range must be offered to the Western Australian Museum.
9. All specimens and material retained under the authority of this licence must be offered to the Western Australian Museum for loan, for inclusion in its collection, or on request be made available to other persons involved in relevant scientific studies.
10. The licence holder must create, compile and maintain records and information as required in a DBCA approved "Return of Fauna Taken" of all fauna taking activities as they occur.
11. A DBCA approved "Return of Fauna Taken" must be completed in full (including nil taking details) and submitted to DBCA Wildlife Licensing Section (wildlifelicensing@dbca.wa.gov.au) prior to the end of each annual period of the licence (from the valid from date) (refer to "Additional Information" section below).

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Danny Stefoni
LICENSING OFFICER
WILDLIFE PROTECTION BRANCH

Delegate of CEO

ADDITIONAL INFORMATION

1. It is an offence to take any species of fauna listed as a threatened species under Section 19 of the *Biodiversity Conservation Act 2016* unless the person is authorised under Section 40. The penalty ranges between $300 000 and $500 000; Section 150 Biodiversity Conservation Act 2016.
2. Regulation 82 empowers the CEO to add, substitute or delete a term or condition of a licence or to correct errors. Such power may be exercised on application of a licence holder or by the CEO's own initiative. If an amendment to a licence term or condition is required, please contact the CEO or the Licensing Section on wildlifelicensing@dbca.wa.gov.au in the first instance. The licence holder, if adversely affected by a condition imposed in this licence, may apply to the State Administrative Tribunal for review of the decision of the CEO to impose that condition on a licence: regulation 89(2) Biodiversity Conservation Regulations 2018.
3. A person must not contravene a condition of a licence. The penalty for an offence involving the contravention of a condition of a licence is a fine of $10 000: regulation 84 of the Biodiversity Conservation Regulations 2018.
4. It is an offence for persons authorised by this licence to enter land that is not in their possession or under their control without first having the *prior* written authorisation of the current owner or occupier of the land to:
   a) enter the land; and
   b) carry out the activity authorised by this licence.

   The penalty for this offence is a fine of $5 000: regulation 101(2) of the Biodiversity Conservation Regulations 2018.
5. The licence holder must be able to produce for inspection upon request any information or records required by regulation 85(2) of the Biodiversity Conservation Regulations 2018 Penalty $10 000. It is an offence to knowingly include false or misleading information or make statements in records: regulation 85(3) of the Biodiversity Conservation Regulations 2018 Penalty $10 000. It is an offence to include any information or make any statement in a return that the licence holder knows to be false or misleading in a material particular: regulation 86 (2) of the Biodiversity Conservation Regulations 2018 Penalty $10 000.
6. The approved DBCA "Return of Fauna Taken" data file can be downloaded from the DBCA webpage (https://www.dpaw.wa.gov.au/plants-and-animals/licences-and-authorities).
7. The issuing of a licence under the Biodiversity Conservation Regulations 2018 does not constitute an animal ethics approval or a licence to use animals for scientific purposes as required under the *Animal Welfare Act 2002*, Animal Welfare (Scientific Purposes) Regulations 2003. It is the responsibility of a licence applicant / licence holder to ensure that they comply with the requirements of all applicable legislation. Enquiries relating to the Animal Welfare Act licences and animal ethics approvals are to be

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directed to the Department of Primary Industries and Regional Development (https://www.agric.wa.gov.au/animalwelfare).

8. Threatened fauna can only be taken under a *Biodiversity Conservation Act 2016* Section 40 authorisation, Occurrences of threatened species must be reported to the CEO. For more information please see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals.
9. Any interaction involving Nationally Listed Threatened Fauna that may be invasive and/or harmful to the fauna may require approval from the Commonwealth Department of the Environment and Energy http://www.environment.gov.au/about-us/business-us/permits-assessments-licences. Interaction with such species is controlled by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and Environment Protection and Biodiversity Conservation Regulations 2000 as well as the *Biodiversity Conservation Act 2016* and Biodiversity Conservation Regulations 2018.

Appendix 6: Conservation Codes

Western Australia (*Biodiversity Conservation Act 2016*)

Conservation Code	Name	Description
T	Threatened	Flora or fauna that is rare or likely to become extinct, ranked according to their level of threat using IUCN Red List criteria (Schedules 1-3 of the Wildlife Conservation (Specially Protected Fauna) Notice or the Wildlife Conservation (Rare Flora) Notice)
CR	Critically endangered	Species considered to be facing an extremely high risk of extinction within the wild in the immediate future
EN	Endangered	Species considered to be facing a very high risk of extinction in the wild in the near future
VU	Vulnerable	Species considered to be facing a high risk of extinction in the wild in the medium-term future
EX	Extinct Species	Species where 'there is no reasonable doubt that the last member of the species has died (Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice or the Wildlife Conservation (Rare Flora) Notice)
EW	Extinct in the Wild	Species that are known to only survive in cultivation, in captivity, or as a naturalised population well outside its past range; and it has not been recorded in its known or expected habitat at appropriate seasons anywhere in its past range, despite surveys over a timeframe appropriate to its life cycle and form
MI	Migratory Species	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth (Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice)
CD	Conservation Dependent	Species of special conservation interest (conservation dependent fauna), being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened (Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice)
OS	Specially Protected	Fauna otherwise in need of special protection to ensure their conservation (Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice)
P	Priority Species	Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna

Conservation Code	Name	Description
		lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.
P1	Priority One	Poorly known species – Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either very small or on lands not managed for conservation, such as road verges, urban areas, farmland, active mineral lease and under threat of habitat destruction or degradation.
2	Priority Two	Poorly known species – Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, such as national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves and similar.
3	Priority Three	Poorly known species – Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat
4	Priority Four	Rare or near threatened and other species in need of monitoring.

(Source: Department of Biodiversity Conservation and Attractions, 2020)

Commonwealth (*Environment Protection and Biodiversity Conservation Act 1999*)

Category	Description
Critically Endangered	Species facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Species facing a very high risk of extinction in the wild in the near future
Vulnerable	Species facing a high risk of extinction in the wild in the medium term

(Source: Department of Agriculture, Water and the Environment, 2020a)