

NEERABUP INDUSTRIAL AREA - ENVIRONMENTAL ASSESSMENTS (FAUNA)

City of Wanneroo

ecoscape



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Neerabup Industrial Area - Environmental Assessments (Fauna)
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SUMMARY

The review of previous surveys and information relevant to the survey area determined that a significant amount of survey effort has been invested in the survey area and the surrounding landscapes, with respect to understanding the suite of fauna assemblages and habitats present. This has resulted in a well understood ecology for the survey area and therefore a comprehensive understanding of the threats and impacts to the biodiversity of the region.

It is Ecoscape's opinion that further fauna surveys are very unlikely to be required as the existing fauna assemblage of threatened and priority fauna species and the habitat values of the survey area are now well understood.

The basic fauna survey undertaken in October 2020 recorded the following:

- two fauna habitat types - Woodlands and Degraded Grasslands
- twenty eight species detected during the basic survey
- 226 previously recorded fauna species including 12 threatened and priority fauna species
- three conservation listed species were recorded during the field survey, Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), and Quenda (*Isoodon fusciventer*).

ACRONYMS AND ABBREVIATIONS

Table 1: Acronyms and abbreviations

Acronyms and abbreviations	
BC Act	Western Australian <i>Biodiversity Conservation Act 2016</i>
BoM	Bureau of Meteorology
C1, C2, C3	Declared Pest categories under the BAM Act
CD	Conservation Dependent (fauna; specially protected species under the Western Australian BC Act)
CR	Critically Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
DAWE	Commonwealth Department of Agriculture, Water and Environment (2020-)
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DBH	Diameter at Breast Height (1.3 m)
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
DWER	Western Australian Department of Water and Environmental Regulation
EN	Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
Ecoscape	Ecoscape (Australia) Pty Ltd
EP Act	Western Australian <i>Environmental Protection Act 1986</i>
EPA	Western Australian Environmental Protection Authority
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDA 94	Geographic Datum of Australia 1994
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare/hectares
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for Conservation of Nature
km	kilometre/kilometres
m	metre/metres
MGA	Map Grid of Australia
MI	Migratory species (fauna; specially protected species under the Western Australian BC Act)
MNES	Matters of National Environmental Significance
NIA	Neerabup Industrial Area
OS	Other specially protected species (fauna; specially protected species under the BC Act)
P; P1, P2, P3, P4, P5	Priority Flora and Fauna species rankings (P1-P4) or Priority Ecological Communities (P1-P5)
PMST	Protected Matters Search Tool (hosted by DAWE, used to search for MNES)
SoW	Scope of Works
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
subsp.	Subspecies (infrataxon)
S1	Schedule 1 Fauna species listed under the BC Act
T	Threatened Fauna species listing by DBCA
TEC	Threatened Ecological Community
VU	Vulnerable (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
WAM	Western Australian Museum

1 INTRODUCTION

1.1 BACKGROUND

The City of Wanneroo (the City) is proposing the development of Lot 9003 Mather Drive, Neerabup (the survey area) for industrial land development purposes. The project is expected to be undertaken in stages over the next 20 to 30 years and includes resource extraction, development of general industrial lots and longer term strategic employment.

In accordance with the City's approved action (EPBC 2007/3479; Clearing Permit CPS 6359), the City is required to revise both the Conservation Area Management Plan (CAMP) (AECOM 2016) and the Construction Environmental Management Plan (CEMP) (City of Wanneroo 2020). The City requested the following tasks to support the approval process:

- a review of the City's previous Basic and Targeted fauna reports from 2012/2013
- undertake a Basic Survey, including habitat assessment, photography and mapping and determine if a Detailed or Targeted Survey is required from the information contained within the 2012/2013 reports and the Basic Survey
- undertake a Detailed or Targeted Survey, including habitat assessment, photography, and mapping, if required.

1.2 SURVEY AREA

The City's project area, known as the 'survey area' in this report, is located within the Swan IBRA Bioregion and SWA02 subregion, approximately 30 km north from Perth (**Figure 1**). The survey area consists of Banksia, Tuart Marri, Coastal Blackbutt, and Jarrah woodlands interspersed by degraded cleared grasslands of Veldt grasses.

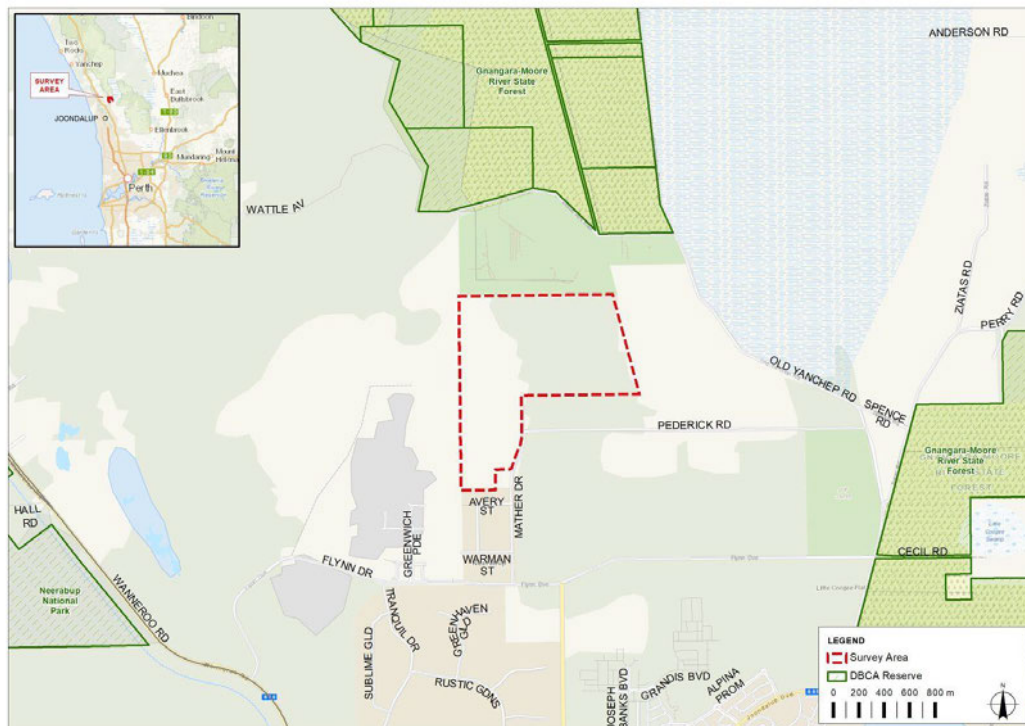


Figure 1: Survey area location

1.3 COMPLIANCE

This environmental assessment was conducted in accordance with the following Commonwealth and State legislation and guidelines:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Western Australian *Environmental Protection Act 1986* (EP Act)
- Western Australian *Biodiversity Conservation Act 2016* (BC Act)
- Western Australian *Biodiversity Conservation Regulations 2018*
- Department of Environment, Water, Heritage and the Arts (DEWHA 2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*

As well as those listed above, the assessment complied with Environmental Protection Authority (EPA) requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2020a) *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment*, known herein as the Fauna Technical Guidance
- EPA (2020b) *Statement of Environmental Principles, Factors and Objectives*.

1.3.1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The EPBC Act is a legal framework to protect and manage matters of national environmental significance (MNES) including important flora, fauna, ecological communities, and heritage areas listed under the Act. Threatened taxa (flora and fauna) are protected under the EPBC Act, which lists species and ecological communities that have been assessed as meeting the criteria to be listed as Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild, as detailed in **Table 7** in **Appendix One**. Threatened Ecological Communities are categorised as Critically Endangered, Endangered or Vulnerable, also detailed in this table.

1.3.2 WESTERN AUSTRALIAN ENVIRONMENTAL PROTECTION ACT 1986

The Western Australian EP Act was created to provide for an Environmental Protection Authority (the EPA) that has the responsibility for:

- prevention, control and abatement of pollution and environmental harm
- conservation, preservation, protection, enhancement, and management of the environment
- matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

1.3.3 WESTERN AUSTRALIAN BIODIVERSITY CONSERVATION ACT 2016

The Western Australian BC Act provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia.

Threatened species (both flora and fauna) and ecological communities that meet the categories listed within the BC Act are protected under this legislation and require authorisation by the Minister to take or disturb.

These are known as Threatened Flora, Threatened Fauna and Threatened Ecological Communities. The conservation categories of Critically Endangered, Endangered and Vulnerable are detailed in **Table 8** in **Appendix One**; these categories align with those of the EPBC Act.

Flora and fauna species may be listed as being of special conservation interest if they have a naturally low population, restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest, and the Minister considers that taking may result in depletion of the species. Migratory species and those subject to international agreement are also listed under the Act. These are known as specially protected species in the BC Act.

The most recent flora and fauna listings were published in the *Government Gazette* on 11 September 2018 (Government of Western Australia 2018a).

1.4 FAUNA

1.4.1 EPBC-LISTED THREATENED FAUNA

At a Commonwealth level, Threatened Fauna are protected under the EPBC Act, which lists species and ecological communities that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild (detailed in **Table 7** in **Appendix One**).

Migratory species subject to international agreements are also protected under the EPBC Act. The definition of a migratory species under the Act follows that prescribed by the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (DotEE 2020):

Migratory species are the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries.

Species listed by the following international agreements are currently protected under the EPBC Act:

- *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention)
- *China-Australia Migratory Bird Agreement* (CAMBA)
- *Japan-Australia Migratory Bird Agreement* (JAMBA)
- *Republic of Korea-Australia Migratory Bird Agreement* (ROKAMBA).

1.4.2 WESTERN AUSTRALIAN BC ACT-LISTED FAUNA

Threatened fauna that meet the categories listed within the BC Act are protected and require authorisation by the Minister to take or disturb. The conservation categories of Critically Endangered, Endangered and Vulnerable have been aligned with those detailed in the EPBC Act.

Fauna species may be listed as being of special conservation interest if they have a naturally low population, restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest, and the Minister considers that taking may result in depletion of the species. These are known as Specially Protected Species in the BC Act.

The categories covering State-listed threatened fauna species are outlined in **Table 8** in **Appendix One**.

1.4.3 WESTERN AUSTRALIAN PRIORITY FAUNA

Conservation significant fauna species are listed by the DBCA as Priority Fauna where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally

assign them to threatened fauna categories. Whilst Priority Fauna are not specifically listed in the BC Act, these have a greater level of significance than other native species. The categories covering Priority Fauna species are outlined in **Table 8** in **Appendix One**.

1.5 ENVIRONMENTALLY SENSITIVE AREAS

There are a number of areas around Western Australia identified as being of environmental significance within which the exemptions to the Native Vegetation Clearing Regulations do not apply. These are referred to as Environmentally Sensitive Areas (ESAs), and are declared under section 51B of the EP Act and described in the *Environmental Protection (Environmentally Sensitive Areas) Notice*.

1.6 CONSERVATION ESTATE

The National Reserve System is a network of protected areas managed for conservation under international guidelines. The objective of placing areas of bushland into the Conservation Estate is to achieve and maintain a comprehensive, adequate, and representative reserve system for Western Australia. The Conservation and Parks Commission is the vesting body for conservation lands, forest and marine reserves that are managed by DBCA (Government of Western Australia 2018b).

2 EXISTING ENVIRONMENT (DESKTOP ASSESSMENT)

2.1 PHYSICAL ENVIRONMENT

2.1.1 WETLANDS AND DRAINAGE

The survey area is located between Neerabup Lake (2 kms to the west) and Lake Pinjar (600 m to the east) (**Map 1**), both are significant wetland features that provide habitat for wetland birds including the conservation listed migratory species (DBCA 2019a). The survey area is situated on a limestone ridge and deep sand valleys and does not include any wetland features or habitats.

2.1.2 ENVIRONMENTALLY SENSITIVE AREAS

The survey area is in close proximity to lands classified as environmentally sensitive by DWER under the EP Act Clearing Regulations (**Map 1**). Environmentally Sensitive areas are classified based on known attributes that are considered locally or regionally significant to the natural environment in which they are located e.g. Wetlands, TEC's that are listed by the Commonwealth or State for example.

2.1.3 CONSERVATION LANDS

The only conservation managed land is approximately 3 km to the west of the survey area. Neerabup National Park is known to provide habitat for Carnaby's Cockatoo, Western Brush Wallaby, and the Honey Possum

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 THREATENED AND PRIORITY FAUNA

Database search results data (580 records) were reviewed for threatened and priority fauna species that had been recorded within the survey area 20 km buffer, within the previous 25 years, and which are listed as certain, very certain, or vouchered. The results are summarised in **Table 2**. Exclusively marine species (e.g. whales, sea turtles etc.) migratory wetland birds, and extinct species are not included in the Threatened and Priority Fauna lists as their habitat does not occur within with the survey area.

Table 2: Summary of DBCA threatened and priority fauna species records

Species	Common Name	Total Records	WAM Vouchered	Very Certain	Certain	Total Certain	Certainty (%)
<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black Cockatoo	7	0	1	0	1	14.3
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	411	3	316	8	327	79.6
<i>Falco peregrinus</i>	Peregrine Falcon	2	0	1	0	1	50.0
<i>Hylaeus globuliferus</i>	Woolybush Bee	5	0	5	0	5	100.0
<i>Idiosoma sigillatum</i>	Swan Coastal Plain Shield-backed Trapdoor Spider	3	0	3	0	3	100.0
<i>Isoodon fusciventer</i>	Quenda	80	0	19	11	30	37.5
<i>Neelaps calonotos</i>	Black-striped Snake	1	0	0	1	1	100.0
<i>Notamacropus irma</i>	Western Brush Wallaby	12	0	10	2	12	100.0
<i>Synemon gratiosa</i>	Graceful Sunmoth	59	1	14	44	59	100.0
Total		580	4	369	66	439	75.7

2.2.1.1 NatureMap

NatureMap (DBCA 2007-2020) is maintained collaboratively by the DBCA and the WAM. These records represent a combination of vouchered museum specimens and records obtained via the Fauna Survey Returns Database maintained by the DBCA.

The *NatureMap* search identified 226 vertebrate fauna species previously recorded within the applied 20 km buffer area (excluding marine, extinct, and uncertain records):

- 120 birds
- 59 reptiles
- 24 mammals (18 native; 6 introduced)
- 14 amphibians
- nine invertebrates.

Of these, 18 are conservation-listed and are incorporated into **Table 9** in **Appendix Two**.

2.2.1.2 DBCA Database Search

A search of the DBCA threatened and priority fauna species database was conducted (search reference: FaunaSearch_CityofWanneroo_Payne6384) using a 20 km buffer around the survey area. Twelve conservation-listed species (excluding marine, extinct, and uncertain records) were identified as having previously been recorded from within the search area buffer, consisting of:

- six birds
- three invertebrates.
- two mammals
- one reptile.

The results incorporate the conservation-listed species identified from the *NatureMap* search (as above), with the following additional species:

- *Neelaps calonotos* (Black-striped snake) – P3 DBCA.

DBCA database search results are incorporated into **Table 9** in **Appendix Two** and shown on **Map 1**.

2.2.1.3 Protected Matters Search

The PMST results are incorporated into **Table 9** in **Appendix Two**. Not all species identified by the PMST search have DBCA/Western Australian Museum (WAM) records (*NatureMap* and DBCA database searches); these have been included in the PMST results as habitat having potential to occur. The following were identified by the PMST search but not by the *NatureMap* and DBCA database searches (excluding marine, extinct, and uncertain records):

- *Leipoa ocellata* (Malleefowl) – VU EPBC Act, VU BC Act.

2.2.1.4 Threatened and Priority Fauna Likelihood Assessment

The likelihood of occurrence of significant fauna species identified by the database and literature searches was assessed using the following criteria:

- suitability of habitat types present within the survey area
- distance between previous record of conservation-listed species and the survey area
- frequency and number of records in the region

- date of record of conservation-listed species (recent or historical)
- sufficiency of information
- behavioural and ecological characteristics such as cryptic behaviours
- record certainty.

The categories of likelihood of occurrence, assessed using the above criteria, are shown in **Table 3**.

Table 3: Categories for likelihood of occurrence of conservation-listed fauna

Likelihood	Category
Recorded	Species recorded within the survey area within a reasonable timeframe (0-25 years)
High	Species recorded in close proximity to the survey area (<5 km) within the past 25 years; and suitable habitat occurs within the survey area
Medium	Species historically recorded in close proximity (<5 km) to the survey area, more than 25 years ago; and suitable habitat may exist within the survey area
Low	Species not recorded in the proximity of the survey area or rarely recorded within 10 km of the survey area; and suitable habitat unlikely to occur within the survey area
Very Low	Species not recorded by multiple surveys/databases within 20 km of the survey area and suitable habitat does not occur within the survey area, however, species or suitable habitat is listed as potentially occurring in the wider region

The likelihood of species occurring within the survey area are indicated in **Table 9** in **Appendix Two**. Six species were assessed as having a High likelihood of occurring within the survey area:

- Carnaby's Cockatoo
- Forest Red-tailed Black Cockatoo
- Baudin's Cockatoo
- Quenda
- Western Brush Wallaby
- Graceful Sunmoth.

Following the field survey when the actual survey area characteristics were better understood, and the level of survey effort was considered, the likelihood of occurrence was re-evaluated. The post-survey likelihood is also incorporated into this table and discussed further in **Section 5.3.1**.

3 METHODS

3.1 REVIEW OF PREVIOUS SURVEYS

Several relevant surveys were undertaken between 2007-2020 within and in close proximity to the survey area. Results reported were reviewed for information on the fauna assemblage and habitat types recorded during these surveys. An assessment on the level of detail of the reported information was made to determine whether additional survey will be required to provide sufficient information necessary for the environmental approval process. This will consider the fact that approval has been attained by the City to undertake the clearing process for development.

3.2 FAUNA FIELD SURVEY

3.2.1 GUIDING PRINCIPLES

The fauna and fauna habitat survey was conducted as a basic survey according to the Fauna Technical Guidance (EPA 2020a). The EPA recommends a basic survey should:

- be conducted as a low intensity survey to gather broad fauna and habitat information
- verify the adequacy of the desktop assessment
- map, describe and photograph habitats
- record opportunistic fauna observations
- identify possible future survey site locations, access and logistics
- determine if a detailed survey is required.

Targeted surveys were also conducted to gather information on significant fauna and/or habitats.

3.2.2 FIELD SURVEY METHODS

The methods utilised during the field survey followed those outlined in the Fauna Technical Guidance (EPA 2020a), conducted as a basic phase survey.

Conservation criteria used in this assessment are included in **Table 7** and **Table 8** in **Appendix One**.

Survey method details are outlined below.

3.2.2.1 Fauna Survey

The basic fauna survey incorporated a number of survey techniques as per the Terrestrial Fauna Technical Guidance (EPA 2020a) including habitat assessment, active searches (day and night time), raking of spoil heaps and leaf litter, searches for secondary evidence such as scats and tracks and use of trail cameras for the detection of fauna, as well as opportunistic searches.

Terrestrial vertebrate fauna were the main targets of the field survey. Survey techniques included:

- opportunistic bird observations while moving through the survey area
- turning of surface debris (rocks, logs, vegetation spoil heaps) that reptiles and mammals may shelter beneath
- raking of litter beds using a three pronged cultivator rake to locate fossorial reptile species
- tree hollow inspection to detect arboreal fauna.

Fauna species were identified opportunistically based on sightings, calls, remains, diggings, and other signs. Potential habitats for conservation significant species were identified and evaluated and their likelihood of occurrence assessed.

Based on the desktop assessment, the following were considered to have a High likelihood of occurring in the survey area and they, and habitat suitable to support them, were targeted during the field survey:

- Carnaby's Cockatoo
- Forest Red-tailed Black Cockatoo
- Baudin's Cockatoo
- Quenda
- Western Brush Wallaby
- Graceful Sunmoth.

3.2.2.2 Fauna Habitat Assessment

The fauna habitats present within the survey areas were identified and mapped. Fauna habitats were described as an area which is distinguishable from its surrounding area by its landform, vegetation and fauna assemblage occupying the area. In addition, its likelihood to harbour specialised fauna species which are not found in adjacent areas was taken into consideration.

The following information was used to identify and map all fauna habitats within the survey area:

- previous fauna habitat mapping
- land systems
- vegetation type and condition mapping
- aerial imagery
- landforms
- soil characteristic
- fauna assemblage information.

The composition and characteristics of each fauna habitat type was recorded, including noting suitability for various fauna suites or conservation-listed species. Habitat types were delineated in the field and digitised upon return from the field survey.

3.2.2.3 Targeted Survey Methods

3.2.2.4 Field Survey Timing

The survey was conducted over one day during October 2020. October is within the optimal timing for fauna survey for the majority of fauna groups likely to inhabit the survey area (EPA 2020a).

3.2.3 DATA MANAGEMENT

Data gathered through the desktop review, field survey habitat assessments and observations were collated to provide locations of significant fauna species records and maps of fauna habitat types. Fauna habitat quality was assessed at each sampling point to provide an overall habitat quality of the survey area as this may vary across habitats of different type.

4 RESULTS

4.1 LITERATURE REVIEW

Nine surveys and two Management Plans are known to have been previously undertaken within or at least partly within or in close proximity to the survey area:

- Construction Environmental Management Plan Meridian Business Park - Neerabup Industrial Area (City of Wanneroo 2020)
- Vegetation Assessment, Mather Reserve Neerabup and Lot 24 Mary Street Wanneroo (Ecoscape 2020)
- Flora, Vegetation and Fauna Survey, IWSS Neerabup GW Expansion (Ecoscape 2017)
- Black Cockatoo Habitat Survey (Neerabup Industrial Area (Ecoscape 2019)
- Conservation Area Management Plan - City of Wanneroo Landholdings - Meridian Business Park - Neerabup Industrial Area (AECOM 2016)
- Neerabup Road Extension Level 2 Fauna Survey (GHD 2014)
- Targeted Flora and Fauna Assessment Lot 4 Flynn Drive Neerabup (Eco Logical Australia Pty Ltd 2013a)
- Lot 4 Flynn Drive Industrial Development, Neerabup - Environmental Review (Eco Logical Australia Pty Ltd 2013b)
- Ground Truthing of Environmental Values for Lot 4 Flynn Drive, Neerabup (Eco Logical Australia Pty Ltd 2012)
- NewGen Neerabup Gas Pipeline Fauna Clearance Summary (ERM 2009)
- Lot 21 Flynn Drive, Neerabup Spring Flora and Vegetation Survey (Ecoscape 2009)
- Flora, vegetation and vertebrate fauna assessment Neerabup Industrial Area (NIA), Neerabup (ATA 2007)

The fauna Level 2 survey undertaken by ATA in 2007 has relevant information on the suite of fauna species and their habitats present within the survey area. Additional targeted species information was reported by Eco Logical in the three reports produced between 2012-2013, the species targeted were the three Black Cockatoo species and the Graceful Sunmoth.

The reports that detailed survey results from sites in close proximity to the survey area all provided similar information with respect to the fauna species recorded and expected to occur and are relevant to the survey area.

Fauna habitats identified by the literature review are listed as:

- Open Woodlands (either *Eucalyptus*, *Allocasuarina* or *Banksia* dominated)
- Degraded Grassland (Veldt Grass with isolated trees and shrubs)
- Cleared and disturbed (areas of cleared land lacking sufficient vegetation).

Conservation listed fauna species identified as occurring within the survey area, in the majority of the reports, includes the following:

- Carnaby's Cockatoo
- Forest Red-tailed Black Cockatoo
- Baudin's Cockatoo
- Quenda
- Western Brush Wallaby
- Graceful Sunmoth.

4.2 BASIC FAUNA FIELD SURVEY

The fauna survey was conducted by () during October 2020. The survey was conducted in accordance with the requirements outlined in the Fauna Technical Guidance (EPA 2020a).

The entire site was traversed on foot and all habitats were assessed for quality and capability of supporting both locally common and significant fauna species. Twelve fauna habitat assessment sites were completed, recording habitat values including vegetation structure; soil type; landform; litter cover and fire age. From the 12 assessment sites two fauna habitats were recorded (**Section 4.2.2**). Survey site results are listed in **Table 10** in **Appendix Three**.

4.2.1 FAUNA ASSEMBLAGE

Twenty eight vertebrate fauna species were recorded during the survey (**Table 4**). Of these, three are conservation-listed:

- *Calyptrorhynchus latirostris* (Carnaby's Cockatoo); EN EPBC status; EN BC status
- *Calyptrorhynchus banksii naso* (Forest Red-tailed Black Cockatoo); VU EPBC status; VU BC status
- *Isodon fusciventer* (Quenda); P4 DBCA status.

Table 4: Recorded fauna species

Species	Common name	EPBC Act status	Western Australian status
Mammals			
<i>*Canis familiaris</i>	Dog		
<i>*Felis catus</i>	Cat		
<i>Isodon fusciventer</i>	Quenda		P4
<i>Macropus fuliginosus</i>	Western Grey Kangaroo		
<i>*Oryctolagus cuniculus</i>	Rabbit		
Birds			
<i>Anthochaera carunculata</i>	Red Wattlebird		
<i>Artamus cyanopterus</i>	Dusky Woodswallow		
<i>Cacatua roseicapilla</i>	Galah		
<i>Calyptrorhynchus banksii naso</i>	Forest Red-tailed Black Cockatoo	VU	VU
<i>Calyptrorhynchus latirostris</i>	Carnaby's Cockatoo	EN	EN
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		
<i>Corvus coronoides</i>	Australian Raven		
<i>Cracticus tibicen</i>	Australian Magpie		
<i>*Dacelo novaeguineae</i>	Laughing Kookaburra		
<i>Falco berigora</i>	Brown Falcon		
<i>Gavicalis virescens</i>	Singing Honeyeater		
<i>Lichmera indistincta</i>	Brown Honeyeater		
<i>Malurus splendens</i>	Splendid Fairy-wren		
<i>Merops ornatus</i>	Rainbow Bee-eater	Marine	
<i>Petroica boodang</i>	Scarlet Robin		
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater		
<i>Platycercus spurius</i>	Red-capped Parrot		
<i>Platycercus zonarius</i>	Australian Ringneck		
<i>Rhipidura leucophrys</i>	Willie Wagtail		

Species	Common name	EPBC Act status	Western Australian status
<i>Threskiornis spinicollis</i>	Straw-necked Ibis		
<i>Todiramphus sanctus</i>	Sacred Kingfisher		
Reptiles			
<i>Tiliqua rugosa</i>	Bobtail Lizard		
<i>Varanus gouldii</i>	Bungarra or Sand Monitor		

* denotes introduced species

4.2.2 FAUNA HABITAT

Two fauna habitat types were recorded within the survey area (**Table 5**):

- Woodlands (Tuart, Jarrah, Marri, Banksia, Coastal Blackbutt)
- Degraded Grasslands.

Table 5: Fauna habitat types

Habitat type	Description	Photograph
Woodland	Description: Open Woodland over Low Open Shrubland on grey sandy flats Habitat is suitable for expected suite of small reptiles, mammals, and woodland birds. Breeding, foraging and roosting habitat for Black Cockatoo species. Extent: 98.6 ha; 73.6%	
Degraded Grassland	Description: Grassland of Veldt Grass with scattered shrubs Habitat is suitable for Western Grey Kangaroo and Rabbit for foraging and small reptiles, generally unsuitable for remaining species. Extent: 35.3 ha; 26.4%	

The quality of each habitat type was based on the field surveyor's experience and takes into consideration the level of disturbance to habitats from weeds, the amount of native vegetation, vegetation cover (density) and the context of the habitat with the surrounding landscape. Twelve habitat assessment sampling points were

undertaken in each habitat type recording the values of habitat characteristics that currently exist within the survey area (**Table 10** in **Appendix Three**). Images representing each sampling point are displayed in **Table 11** in **Appendix Three**.

4.2.3 SIGNIFICANT FAUNA AND ASSOCIATED HABITAT

The significant fauna species observed during the field survey are discussed below with respect to each species' habitat requirements, taking into consideration the findings of the field survey and survey effort.

4.2.3.1 Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – EN EPBC status; EN BC status

Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands and shrubland or kwongan heathland dominated by Hakea, Banksia, and Grevillea species. It is a seasonal visitor to plantations of exotic pines (*Pinus* spp.), and sometimes occurs in forests. The survey area falls within the species range with the woodlands of the survey area providing potential breeding, foraging, and roosting habitat for the species. This species was recorded within the survey area (DPaW 2013). Carnaby's Cockatoo was recorded flying over and perching within the survey area during the survey.

4.2.3.2 Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) - VU EPBC status; VU BC status

The Forest Red-tailed Black Cockatoo was formerly common but is now rare to uncommon and patchily distributed over a range which has become markedly reduced. Usually in pairs or small flocks, seldom large flocks (up to 200). It has declined due to destruction of forests and woodlands, also competition for nest hollows with native and exotic species and the impact of fire (DEC 2008).

The Woodland habitat within the survey area contains suitable potential nesting trees, suitable foraging habitat, and suitable night roosting habitat. This species was recorded foraging within the survey area during the fauna survey.

4.2.3.3 Quenda (*Isoodon fusciventer*) – P4 DBCA status

Quenda are widely distributed in the southwest of Western Australia from Guilderton, north of Perth, to east of Esperance. They have a patchy distribution through the Jarrah and Karri forest, the Swan Coastal Plain, and inland as far as Hyden and have been recorded in swampy vegetation with dense cover up to 1 m high. Quenda often feed in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. Populations inhabiting Jarrah and Wandoo forests are usually associated with watercourses. Quenda will thrive in more open habitat subject to introduced predator control (DEC 2012).

Quenda was observed within the survey area flushing from undergrowth during the survey and numerous diggings and scats were recorded at several habitat assessment points.

4.2.4 FAUNA SURVEY LIMITATIONS

The limitations of the basic fauna survey are summarised in **Table 6** below. There were no constraints in relation to survey adequacy.

Table 6: Fauna survey limitations

Possible limitations	Constraints (yes/no): Significant, moderate, or negligible	Comment
Competency/experience of the consultant conducting the survey	No	The fauna field surveyor was experienced with the fauna survey methods used and with the identification of fauna taxa.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	No	The survey was conducted as a Basic fauna assessment. Sufficient time was allocated to the fauna survey, which included active diurnal searches to adequately describe the fauna assemblage present in the survey area.
Proportion of fauna identified, recorded and/or collected.	No	All fauna species opportunistically observed were identified in the field.
Sources of information (previously available information as distinct from new data).	No	Many sources referencing field surveys in the vicinity were available. No constraints were associated with this previous data.
The proportion of the task achieved and further work which might be needed.	No	The survey area was adequately searched.
Timing/weather/season/cycle.	No	The timing of the field survey was within a period suitable to identify most components of the expected fauna assemblage if they were present on site. The seasonal conditions were suitable for fauna survey with warm daytime temperatures and fine weather during the survey period.
Disturbances which affected results of the survey (e.g., fire, flood, accidental human intervention).	No	No disturbance to the survey was detected.
Intensity (in retrospect was the intensity adequate).	No	The survey was considered suitable to determine the presence or potential presence of conservation significant fauna.
Completeness (e.g., was relevant area fully surveyed), remoteness and/or access problems	No	The entire survey area was adequately searched and was entirely accessible.
Resources (e.g., degree of expertise available in animal identification to taxon level).	No	Field staff has over 35 years' experience identifying fauna. All terrestrial vertebrate fauna was identified to species level.
Availability of contextual (e.g., biogeographic) information on the region).	No	Several fauna surveys have been conducted in the general region. There is ample literature available describing the suite of species present, giving context to the discussion in this report.
Efficacy of sampling methods (i.e., any groups not sampled by survey methods).	No	The survey was conducted as a Basic fauna assessment. All fauna species opportunistically observed were identified in the field. The survey did not include marine, subterranean, nor invertebrate species.

5 DISCUSSION

5.1 REVIEW OF PREVIOUS SURVEYS

The numerous previous surveys indicates a significant level of survey effort has been invested in the survey area and the surrounding landscapes. This has resulted in a well understood ecology for the survey area and therefore a comprehensive understanding of the threats and impacts to the biodiversity of the region.

The threatened and priority fauna species as listed have been adequately identified and their habitats appropriately assessed over the previous 13 years and many person hours spent on the surveys conducted.

The Conservation Area Management Plan (AECOM 2016) and Construction Environmental Management Plan (City of Wanneroo 2020) have therefore been developed with suitable consideration of the impacts, the setting of conditions, and the implementation of suitable offset arrangements and have addressed these accordingly and to the satisfaction of the relevant environmental regulators. This has contributed to the approval process and the subsequent issuing of Native Vegetation Clearing Permits for the development to proceed.

5.2 FAUNA SIGNIFICANCE

5.2.1 SIGNIFICANT FAUNA HABITAT TYPES

Two fauna habitat types were recorded within the survey area: Woodlands and Degraded Grasslands. Each of these habitat types supports a common suite of birds, mammals, and reptiles, some of which have specific requirements unique to a particular habitat such as passerine woodland bird species and small fossorial reptiles.

The Woodland habitat provides high quality Black Cockatoo foraging habitat as determined by forage species listed in the guidelines (DSEWPaC 2012). The survey identified suitable potential breeding and roosting habitat, confirmed by the Ecoscape Black Cockatoo Habitat survey of 2019 (Ecoscape 2019). This indicates that the site is of moderate quality breeding habitat as there is a small number of trees with hollows available for the Black Cockatoo species, and the presence of competitors (e.g. Galah, Corella, Feral Bees).

5.2.2 FAUNA ASSEMBLAGE

The fauna survey identified an expected suite of species for the existing habitats. The twenty eight species detected during the basic survey directly compares to the 226 previously recorded fauna species and adds to the knowledge of the local region. There were no identified range extensions or species not expected to occur.

5.3 CONSERVATION-LISTED SPECIES

Three conservation listed species were recorded during the field survey, Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), and Quenda (*Isodon fusciventer*). One EPBC Act species listed as Marine, Rainbow Bee-eater (*Merops ornata*), was also recorded (a species listed as Marine is also protected under the EPBC Act, even if not listed as threatened (e.g. endangered, vulnerable etc.)). Rainbow Bee-eater breed on the Swan Coastal Plain during the summer months and this is the ideal time to survey for nesting burrows in sandy soils.

The two Black Cockatoo species are known to utilise the woodland habitats for foraging and roosting with the potential for use as breeding habitat. The Quenda is a common resident making use of the large extents of bushland of the survey area and the connections to nearby wetlands to the north east.

5.3.1 POST-SURVEY LIKELIHOOD ASSESSMENT

The remaining (i.e. those not recorded) conservation-listed fauna species identified during the desktop assessment as having a High likelihood of occurring are discussed below with respect to each species' habitat requirements, taking into consideration the findings of the field survey and survey effort. The post-survey likelihood assessment is incorporated into **Table 9** in **Appendix Two**.

Baudin's Cockatoo (*Calyptrorhynchus baudinii*) – EN EPBC status; EN BC status/DBCA status

Baudin's Cockatoo is endemic to the high rainfall areas of the South-west of Western Australia in Eucalypt forests of Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) or Karri (*E. diversicolor*). Flocks move south on the Swan Coastal Plain during the non-breeding season (DEC 2008). The survey area falls outside of the northern limits of the species mapped distribution as per the Commonwealth guidelines.

The Woodland habitat within the survey area contains suitable potential nesting trees and suitable foraging habitat. There is suitable night roosting habitat within the Woodland habitat. Post survey results determined that this species occurs occasionally however it was not recorded during the field survey and is expected to be an irregular visitor as the survey area occurs outside of the Commonwealth mapped distribution for the species.

Western Brush Wallaby (*Notamacropus irma*)– P4 DBCA status

The Western Brush Wallaby's optimum habitat is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland and is uncommon in karri forest (DCE 2010).

The species has recently been recorded in the adjacent Mather Reserve and is expected to be present within the survey area due to larger extents of similar habitat within the survey area (Ecoscape 2018).

Graceful Sunmoth (*Synemon gratiosa*)– P4 DBCA status

Graceful Sunmoths are most common in sedgeland, heathlands, woodlands and sometimes in open parts of the forest where their 'foodplants' (various grasses, sedges, and mat-rushes) are found. Most Sunmoths only breed on one or two plant species - their caterpillars are adapted to feed only on these particular plants. The Graceful Sunmoth breeds on two species of Lomandra mat-rushes (*L. maritima* and *L. hermaphrodita*). The adult moths fly close to the ground and males are territorial, defending a small open area from fellow Sunmoth intruders. They are easiest to observe when perching on dead stems where they bask in sunshine (Bishop C, Williams M & Gamblin T 2009).

The life cycle of the Graceful Sunmoth (egg - larva - pupa - adult moth) takes two or more years. The eggs are laid at the base of the food-plant and the larvae (caterpillars) live entirely within or alongside the underground parts of the plant. The adult moths live for only two to ten days, but at a particular site the adult moths appear over a four-six week period, between mid-February and late March (Gamblin T, Bishop C & Williams M 2011).

Habitat for this species exists within the survey area and there are nearby records within 10 years, making this species likely to occur.

5.4 CONCLUSIONS

The 226 species recorded by NatureMap and the 580 DBCA threatened and priority fauna species records indicate a high level of survey effort within and adjacent to the survey area and include 20 identified threatened and priority fauna species. There were no significant changes in species taxonomy or conservation status that would affect the outcomes of an environmental review should this be undertaken. Two species have had their conservation status lowered since 2007, Graceful Sunmoth and Rainbow Bee-eater. The review of previous surveys and the results of the basic fauna survey are likely to be sufficient to satisfy approval conditions.

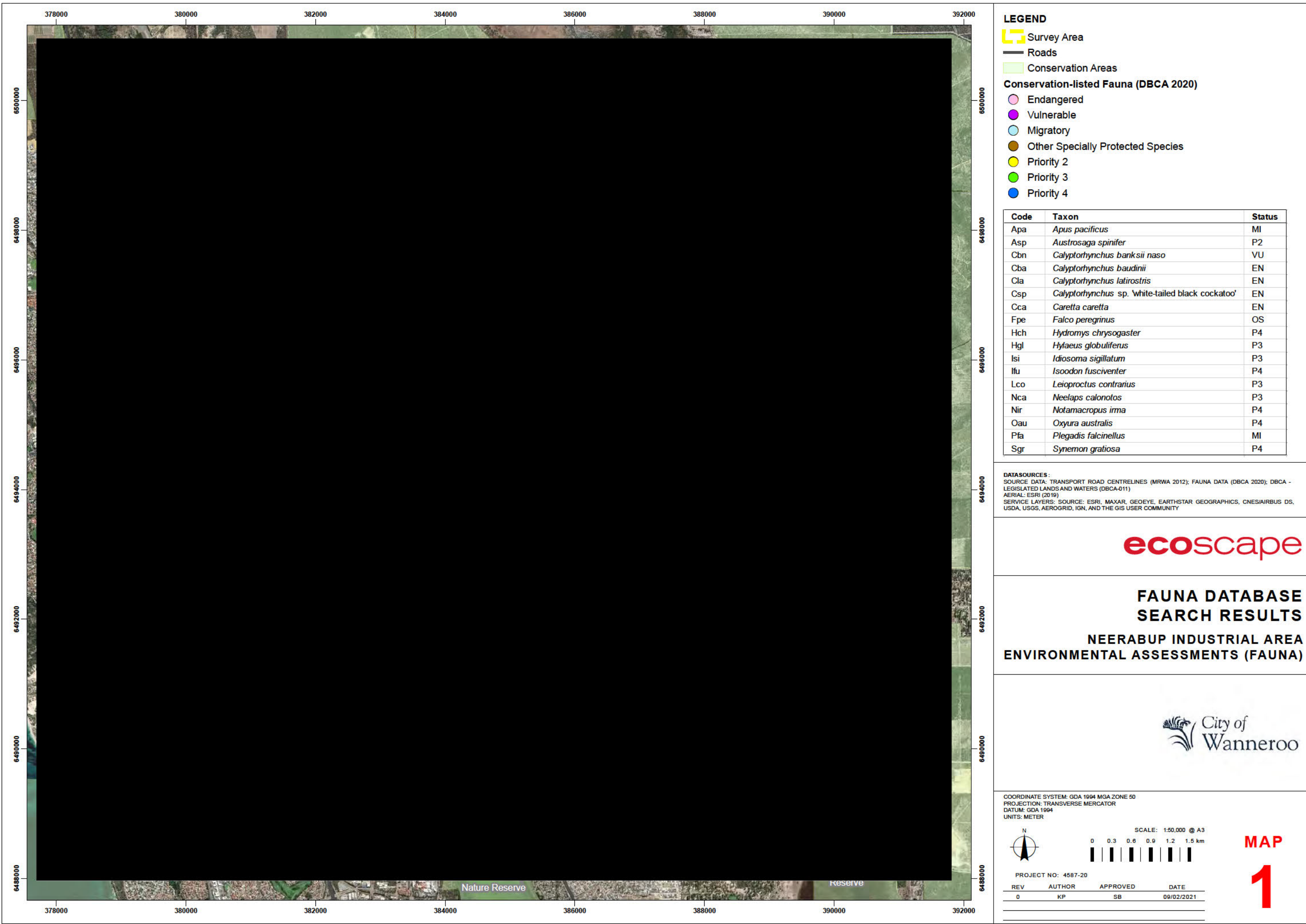
It is Ecoscape's opinion that further fauna surveys are very unlikely to be required as the habitat values for the threatened and priority fauna species are now well understood and have been considered in Management Plans that may be applied to the process of developing the survey area.

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MAPS



LEGEND

Survey Area

Roads

Conservation Areas

Conservation-listed Fauna (DBCA 2020)

Endangered

Vulnerable

Migratory

Other Specially Protected Species

Priority 2

Priority 3

Priority 4

Code	Taxon	Status
Apa	<i>Apus pacificus</i>	MI
Asp	<i>Austrosaga spinifer</i>	P2
Cbn	<i>Calyptorhynchus banksii naso</i>	VU
Cba	<i>Calyptorhynchus baudinii</i>	EN
Cla	<i>Calyptorhynchus latirostris</i>	EN
Csp	<i>Calyptorhynchus</i> sp. 'white-tailed black cockatoo'	EN
Cca	<i>Caretta caretta</i>	EN
Fpe	<i>Falco peregrinus</i>	OS
Hch	<i>Hydromys chrysogaster</i>	P4
Hgl	<i>Hytaeus globuliferus</i>	P3
Isi	<i>Idiosoma sigillatum</i>	P3
Ifu	<i>Isodon fusciventer</i>	P4
Lco	<i>Leioproctus contrarius</i>	P3
Nca	<i>Neelaps calonotos</i>	P3
Nir	<i>Notamacropus ima</i>	P4
Oau	<i>Oxyura australis</i>	P4
Pfa	<i>Plegadis falcinellus</i>	MI
Sgr	<i>Synemon gratiosa</i>	P4

DATASOURCES :
SOURCE DATA: TRANSPORT ROAD CENTRELINES (MRWA 2012); FAUNA DATA (DBCA 2020); DBCA - LEGISLATED LANDS AND WATERS (DBCA-011)
AERIAL: ESRI (2019)
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNESAIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY

**FAUNA DATABASE
SEARCH RESULTS**
**NEERABUP INDUSTRIAL AREA
ENVIRONMENTAL ASSESSMENTS (FAUNA)**

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

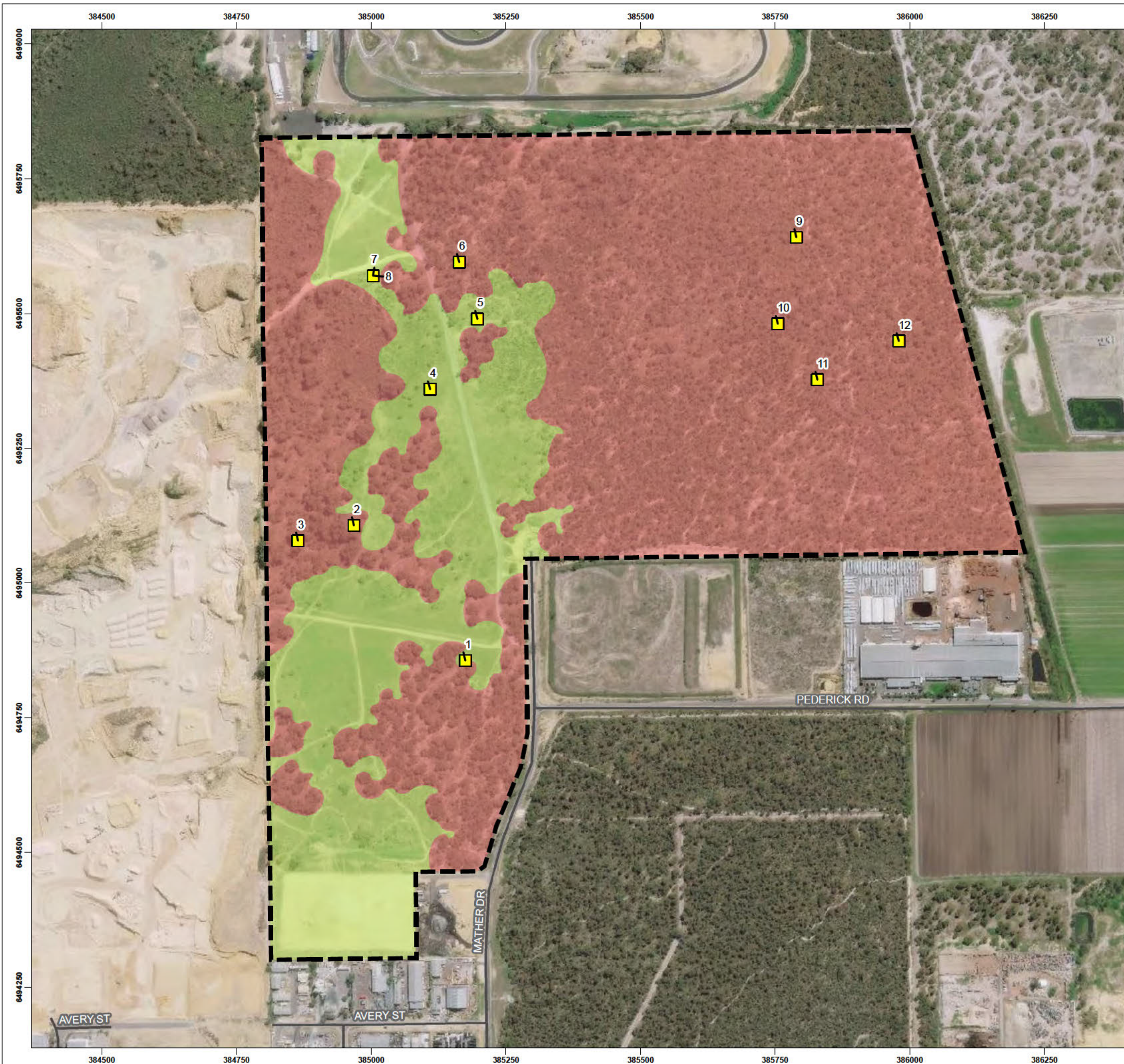
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PROJECT NO: 4587-20

REV	AUTHOR	APPROVED	DATE
0	KP	SB	09/02/2021

MAP

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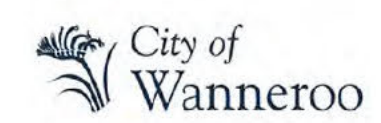
LEGEND

- Survey Area
- Roads
- Assessment Sites
- Fauna Habitat**
 - Grassland
 - Woodland

DATASOURCES:
SOURCE DATA: TRANSPORT ROAD CENTRELINES (MRWA 2012); FAUNA DATA (ECOSCAPE 2020)
AERIAL: ESRI (2019)
SERVICE LAYERS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNESAIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY



FAUNA HABITAT
NEERABUP INDUSTRIAL AREA
ENVIRONMENTAL ASSESSMENTS (FAUNA)



COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER



PROJECT NO: 4587-20			
REV	AUTHOR	APPROVED	DATE
0	KP	BT	09/02/2021

APPENDIX ONE

DEFINITIONS AND CRITERIA

Table 7: EPBC Act categories for flora, fauna, and ecological communities

Category	Threatened species	Threatened Ecological Communities
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.	n/a
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.	n/a
Critically Endangered (CE)	A native species is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria
Endangered (EN)	A native species is eligible to be included in the <i>endangered</i> category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>endangered</i> category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.	n/a

Table 8: Conservation codes for Western Australian flora and fauna (DBCA 2019b)

Conservation Codes for Western Australian Flora and Fauna	
Threatened, Extinct and Specially Protected fauna or flora ¹ are species ² which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.	
The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the Biodiversity Conservation Act 2016.	
Categories of Threatened, Extinct and Specially Protected fauna and flora are:	
T	Threatened species Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the <i>Biodiversity Conservation Act 2016</i> (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.
CR	Critically endangered species Threatened species considered to be "<i>facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines</i>". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for critically endangered fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for critically endangered flora.
EN	Endangered species Threatened species considered to be "<i>facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines</i>". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for endangered fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for endangered flora.
VU	Vulnerable species Threatened species considered to be "<i>facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines</i>". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for vulnerable fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for vulnerable flora.
Extinct species	
Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	Extinct species Species where "<i>there is no reasonable doubt that the last member of the species has died</i>", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for extinct fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for extinct flora.
EW	Extinct in the wild species Species that "<i>is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form</i>", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially protected species Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	

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MI	Migratory species Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the <i>Convention on the Conservation of Migratory Species of Wild Animals</i> (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.
CD	Species of special conservation interest (conservation dependent fauna) Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.
OS	Other specially protected species Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.
P	Priority species Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.
1	Priority 1: Poorly-known species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
2	Priority 2: Poorly-known species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
3	Priority 3: Poorly-known species Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

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4	Priority 4: Rare, Near Threatened and other species in need of monitoring (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
¹ The definition of flora includes algae, fungi and lichens. ² Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).	

APPENDIX TWO

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Table 9: Fauna database results and likelihood assessments for conservation listed species

Blue shading indicates high likelihood; darker blue indicates species is known (recorded) from the survey area

Species (*)	Common name	Conservation status		Database			Likelihood of occurrence	
		EPBC Act	Western Australian	PMST**	DBCA	NatureMap	Desktop	Post-survey
Mammals								
<i>Dasyurus geoffroii</i>	Chuditch	VU	VU	X		X	Low	Low
<i>Isodon fusciventer</i>	Quenda		P4		X	X	High	High
<i>Notamacropus irma</i>	Western Brush Wallaby		P4		X	X	High	High
Birds								
<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI	X	X	X	Medium	Medium
<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black Cockatoo	VU	VU	X	X	X	High	High
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo	EN	EN	X	X	X	High	High
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	EN	EN	X	X	X	High	High
<i>Falco peregrinus</i>	Peregrine Falcon		OS	X	X	X	Low	Low
<i>Leipoa ocellata</i>	Malleefowl	VU	VU	X			Very Low	Very Low
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI		X	X	Low	Low
<i>Tyto novaehollandiae</i>	Masked Owl		P3			X	Low	Low
Reptiles								
<i>Neelaps calonotos</i>	Black-striped Snake		P3		X	X	Medium	Medium
Invertebrates								
<i>Austroconops mcmillani</i>	McMillan's biting midge		P2			X	Low	Low
<i>Austrosaga spinifer</i>	Spiny Katydid		P2			X	Medium	Medium
<i>Glossurocolletes bilobatus</i>	Short-tongued Bee		P2			X	Medium	Medium
<i>Hesperocolletes douglasi</i>	Douglas's Broad-headed Bee		CR	X		X	Medium	Medium
<i>Hylaeus globuliferus</i>	Woolybush Bee		P3		X	X	Medium	Medium
<i>Idiosoma sigillatum</i>	Swan Coastal Plain Shield-backed Trapdoor Spider		P3		X	X	Medium	Medium
<i>Leioproctus contrarius</i>	A Short-tongued Bee		P3			X	Low	Low

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Species (*)	Common name	Conservation status		Database			Likelihood of occurrence	
		EPBC Act	Western Australian	PMST**	DBCA	NatureMap	Desktop	Post-survey
<i>Synemon gratiosa</i>	Graceful Sunmoth		P4			X	High	High

* introduced

** PMST likelihood of occurrence or likelihood of habitat occurring

APPENDIX THREE FIELD SURVEY RESULTS

Table 10: Fauna Survey Habitat Assessment Sites

Sampling Point No	Sampling Type	Habitat Unit	Habitat Description	Easting	Northing
1	Fauna: Habitat Assessment	Woodland (Open/Closed)	Todtiana/xanthorrhoea/veldt		
2	Fauna: Habitat Assessment	Woodland (Open/Closed)	Marri/veldt		
3	Fauna: Habitat Assessment	Woodland (Open/Closed)	Tuart/veldt		
4	Fauna: Habitat Assessment	Woodland (Open/Closed)	Grassland veldt		
5	Fauna: Habitat Assessment	Woodland (Open/Closed)	Banksia/Marri		
6	Fauna: Habitat Assessment	Woodland (Open/Closed)	Marri/veldt		
7	Fauna: Habitat Assessment	Woodland (Open/Closed)	Banksia/xanthorrhoea		
8	Fauna: Habitat Assessment	Woodland (Open/Closed)	Todtiana/Banksia		
9	Fauna: Habitat Assessment	Woodland (Open/Closed)	Jarrah/Banksia		
10	Fauna: Habitat Assessment	Woodland (Open/Closed)	Jarrah/xanthorrhoea		
11	Fauna: Habitat Assessment	Woodland (Open/Closed)	Jarrah/xanthorrhoea		
12	Fauna: Habitat Assessment	Woodland (Open/Closed)	Jarrah/Banksia		

Table 11: Representative assessment sampling point images

Point No.	Image
1. Todtiana/ xanthorrhoea/ veldt	

Point No.	Image
2 Marri/veldt	
3. Tuart/veldt	

Point No.	Image
4. Grassland veldt	
9. Jarrah/Banksia	

Point No.	Image
10. Jarrah/ xanthorrhoea	