Terrestrial Fauna Desktop Assessment

Huntly and Willowdale MMP – EPA Fauna Assessment

Alcoa of Australia

6 March 2025

Project name		Terrestrial Fauna Desktop Assessment Huntly and Willowdale 2024					
Document title		Terrestrial Fauna Assessment | Huntly and Willowdale MMP – EPA Fauna Desktop Assessment					
Project number		12565572					
File name		12565572-REP_REV0-Huntly and Willowdale Desktop Fauna Survey.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S0	Rev A	P. Patterson	R.Browne-Cooper		J. Collins		6/3/25
S0	Rev 0	P. Patterson	J. Collins		J. Collins		6/3/25

GHD Pty Ltd | ABN 39 008 488 373
999 Hay Street, Level 10
Perth, Western Australia 6000, Australia
T +61 8 6222 8222 | **F** +61 8 6222 8555 | **E** permail@ghd.com | **ghd.com**

→ The Power of Commitment

Executive summary

Alcoa of Australia Limited's (Alcoa) Western Australian (WA) mining operations comprise the Huntly and Willowdale bauxite mines, which are located in Alcoa's Mining Lease 1SA (ML1SA) within the Northern Jarrah Forest (NJF) IBRA subregion.

The purpose of this report is to establish a background desktop study of all terrestrial fauna attributes of the Huntly and Willowdale Study Areas via systematic searches and review of existing state and federal databases, previous survey literature assessments, reviews and existing survey recordings and identified fauna habitat types, with a specific focus on conservation significant species, including EPBC listed within the Study Areas.

Scope of works

This scope of work addresses the Huntly and Willowdale mine footprints.

The scope of work includes:

– Complete a desktop assessment
– Provide a fauna assessment conclusions of potential, likely or confirmed presence of conservation significant species and related habitat suitability based on historical surveys, database records, literature reviews and known confirmed species recordings either directly within the Study Areas or in close proximity to the Study Areas.
– Discussion of fauna habitats and alignment with vegetation mapping.

Methods

Methodology involved initial comprehensive desktop assessment to compile fauna database records and previous reports and understands the local fauna occurrence and fauna habitats in the Study Areas. These fauna habitats were assessed against known vegetation mapping and specific VT codes from the Mattiske vegetation assessment criteria tools to provide a more thorough understanding of the recorded presence of species and the identified habitats and vegetation types that comprise these habitats and therefore provide additional justification for likelihood of occurrence assessments provided for each species of conservation significance within the two mine footprint Study Areas.

Findings

Jarrah – Marri forest is by far the most extensive habitat type making up most of both Study Areas. This is based on the literature and previous studies of sites within the surrounding areas and within sites of the Huntly and Willowdale Study Areas.

With regards to the Huntly Study Area, a total of 16 species of conservation significance were assessed as being either likely to occur, or known to occur within the Study Area. Specifically, 15 species were assessed as being known to occur within the Study Area, and a further one species considered likely to occur. The 15 species of conservation significant species known to occur, based on literature reviews, recent GHD and SLR consultancy surveys and recent and historical database records at state and federal level, consist of all three species of black cockatoos (Baudin's, Carnaby's and Forest Red-tailed), Quenda, Chuditch, South-West Brush-tailed Phascogale Western Brush Wallaby, Quokka, Western False Pipistrelle, Carter's Freshwater Mussel, Peregrine Falcon, Dell's Skink, Rakali, Woylie and Southern Death Adder. This conclusion is based on numerous confirmed recordings of these species within the Study Area various consultancies, including those conducted by GHD, and the strong correlation of these species utilising Jarrah-Marri forest and other identified fauna habitats within the Huntly Study Area. The remaining one species considered like to occur consisted of the Masked Owl (South-Western).

With regards to the Willowdale Study Area, a total of 17 species of conservation significance were assessed as being either likely to occur or known to occur within the Study Area. Specifically, 5 species were assessed as being known to occur within the Study Area, and a further 12 species considered likely to occur. The 5 species of conservation significant species known to occur, based on literature reviews, recent GHD and SLR consultancy surveys and recent and historical database records at state and federal level, consist of all three species of black cockatoos (Baudin's, Carnaby's and Forest Red-tailed), Rakali, and Western Brush Wallaby. The remaining 12

species determined as being likely to occur consist of the Western False Pipistrelle, Woylie, Southern Death Adder, Dell's Skink, Peregrine Falcon, Masked Owl (South-Western), Quenda, South-West Brush- tailed Phascogale, Western Ringtail Possum, Quokka, and Chudich. As with the Huntly Area, this conclusion is based on confirmed recordings of these species within the Study Area various consultancies, including those conducted by GHD, and the strong correlation of these species utilising Jarrah-Marri forest and other identified fauna habitats within the Willowdale Area, with comparatively reduced Jarrah-Marri fauna habitat presence when compared with the Huntly Study Area, and the sections of the Willowdale Study Area still yet to be fully surveyed.

Contents

1. Introduction 1

1.1 Purpose of this report **1**

1.2 Scope and limitations **1**

1.3 Study Areas 1

1.4 Terminology **2**

2. Methods

2.1 Relevant legislation, conservation codes and background information **3**

2.2 Desktop assessment 3

2.2.1 Previous studies **3**

2.2.2 Guiding documents 3

3. Desktop assessment - Huntly Study Area **5**

3.1 Interim Biogeographic Regionalisation of Australia 5

3.2 Conservation reserves and environmentally sensitive areas 5

3.3 Identified Fauna Habitats 6

3.4 Terrestrial fauna 8

3.4.1 Fauna diversity 8

3.4.2 Significant fauna 8

3.5 Previous studies and Literature Review **9**

4. Desktop assessment – Willowdale Study Area **13**

4.1 Interim Biogeographic Regionalisation of Australia 13

4.2 Conservation reserves and environmentally sensitive areas 13

4.3 Identified Fauna Habitats 14

4.4 Terrestrial fauna 16

4.4.1 Fauna diversity 16

4.4.2 Significant fauna 16

4.5 Previous studies and Literature Review **18**

5. Conclusion **21**

6. References **23**

Table index

Table 1	Terminology and definitions	2
Table 2	Desktop Information Sources	3
Table 3	Fauna Habitat Profile of Huntly Mine	6
.		
Table 4	Previous studies Huntly Minesite	10
Table 5	Fauna habitat profile of Willowdale Mine Study Area	16
Table 6	Previous studies	20

Figure index

Figure 1	Huntly and Willowdale Study Areas	Appendix C
Figure 2	Mapping Overview of Previous Surveys across Study Areas	Appendix C
Figure 3	Fauna Habitat Profile for Huntly Study Aea	Appendix C
Figure 4	Fauna Habitat Profile for Willowdale Study Area	Appendix C
Figure 5	Conservation Significant fauna at Huntly Study Area	Appendix C
Figure 6	Conservation Significant fauna at Willowdale Study Area	Appendix C

Appendices

Appendix A Relevant legislation, background information and conservation codes

Appendix B Desktop Based EPBC and BC Act Guidelines and Fauna Species Classifications and Likelihood of Occurrence

Appendix C Figures

1. Introduction

Alcoa of Australia Limited's (Alcoa) Western Australian (WA) mining operations comprise the Huntly and Willowdale bauxite mines, which are located in Alcoa's Mining Lease 1SA (ML1SA) within the Northern Jarrah Forest (NJF) Interim Biogeographic Regionalisation of Australia (IBRA) subregion. Alcoa is currently putting together an Environmental Scoping Document (ESD) for the Section 6 areas at Huntly and Willowdale Mine sites. As part of this, an investigation into the occurrence, and gaps in knowledge of fauna habitat and likelihood of occurrence of fauna species of conservation significance is required.

1.1 Purpose of this report

The purpose of this Technical Report is to summarise the desktop assessment for fauna species presence and fauna habitat results for the Study Areas.

1.2 Scope and limitations

The Scope of works was as follows:

- Database searches both Naturemap (Dandjoo), Department of Biodiversity, Conservation, and Attractions (DBCA) and Protected Matters Search Tool (PMST) for each of the Study Areas (20 km radius of a central point).
- Identify various desktop-based environmental characteristics of both Study Areas including the alignment of fauna habitat types with vegetation types,
- A summary of surveys completed so far (presented as a table for each area), and
- An updated likelihood of occurrence assessment (for each area- based on desktop results and literature reviews).
- A final set of comments and conclusions for species of conservation significance that are likely to occur and justification based on habitats, historical databases and known literature of surveys conducted in the area.

1.3 Study Areas

The Study Areas are located in the Huntly and Willowdale Mines, located in the Southwest of Western Australia (WA). The Huntly Mine footprint (Huntly Study Area) includes parts of the Huntly, O'Neil, McCoy Huntly, Del Park, White, and Holyoake regions. The Willowdale Mine footprint (Willowdale Study Area) includes parts of the Larego and Orion regions.

The Huntly Mine is predominantly located within the Shire of Serpentine Jarrahdale and Shire of Murray, and extends from Dwellingup in the south to Jarrahdale in the north. The Huntly Mine lies within Dwellingup and Jarrahdale State Forest and is broadly bordered by Serpentine National Park and the Darling Scarp to the west, the Monadnocks Conservation Park and Albany Highway to the east, Dwellingup and Pinjarra-Williams Road to the south and the former Jarrahdale Mine to the north. The Huntly Mine Footprint comprises of two areas to the east and north-east of Pinjarra and occupies an area of 39,046 hectares (ha). The northern portion is approximately 29,323 ha and encompasses currently active mining areas, and the southern portion is approximately 9,724 ha and encompasses a previously mined area.

The Willowdale Mine is located within the Shire of Waroona and Shire of Harvey and is broadly bordered by Lane Poole Reserve in the east and north-east, the Darling Scarp to the west, and Harvey Dam and surrounding rural land to the south-east. The Willowdale Mine lies predominantly within Dwellingup State Forest and Lane Poole Reserve. The Willowdale Mine Footprint comprises of 3 areas to the east of Wagerup and occupies an area of 2,136 ha.

These specified Study Areas are highlighted in Figure 1 in Appendices.

1.4 Terminology

Common terminologies are described below in Table 1.

Table 1 Terminology and definitions

Term (Abbreviation)	Definition/Use
BoM	Bureau of Meteorology
Alcoa of Australia Limited	Proponent of the Proposal and Client of GHD for this Survey
DBCA	Department of Biodiversity, Conservation, and Attractions
ESA	Environmentally Sensitive Areas
GoWA	Government of Western Australia
GHD Pty Ltd (GHD)	Consultant engaged by Alcoa to prepare the environmental approvals documentation and supporting technical studies.
GIS	Geographic Information System
LOO	Likelihood of Occurrence
Study Area	The area in which Alcoa propose for future mining development activities that will be assessed by regulators
Study Area	The Study Area with a 20 km buffer used to define the limits of the desktop investigations.
TEC	Threatened Ecological Community

2. Methods

2.1 Relevant legislation, conservation codes and background information

An overview of key legislation and guidelines, conservation codes and background information relevant to this fauna survey are provided in Appendix B.

2.2 Desktop assessment

The desktop assessment of the Study Areas to identify environmental values and constraints was undertaken by viewing geographic information system (GIS) spatial files largely sourced from Government of Western Australia (GoWA) (2021a) and reviewing publicly available, government managed databases. The information sources utilised in this assessment are presented below in Table 2.

Table 2 Desktop Information Sources

Aspect	Information sources/Government Dataset
Significant fauna and Fauna Diversity	DCCEEW (Department of Climate Change, Energy, the Environment and Water) PMST database to identify fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the Study Area (Appendix C) DBCA *Naturemap (Dandjoo)* database (DBCA 2007–) (Appendix C) DBCA Threatened fauna database (DBCA 2021)
Literature review	Fauna papers, reports, internal data of Alcoa.

The fauna desktop assessment included a review of:

– DCCEEW PMST database to identify fauna species listed under the EPBC Act potentially occurring within the desktop Study Area
  - The DBCA Threatened and Priority Fauna database for the Study Area.
  - The DBCA *Naturemap (Dandjoo)* (DBCA 2007-) database for fauna species previously recorded within the Study Area.
– This database comprised of the following sources:
  - Atlas of Australian birds
  - Bird data -Birdlife Australia
  - Fauna Survey Returns Database (New)
  - WA Museum (WAM) databases (mammals, birds, reptiles).

2.2.1 Previous studies

A literature review was performed on previous terrestrial fauna studies in or adjacent to the Study Areas. The review focusses on all locally and regionally relevant significant species recorded during surveys on Alcoa mining lease and surrounding areas.

2.2.2 Guiding documents

The survey method and data collection that GHD employed was conducted in accordance with:

– EPA Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (2020)
– EPA Technical Guidance - Sampling methods for terrestrial vertebrate fauna (2020)
– DEHWA (2010a) Survey Guidelines for Australia's Threatened Bats
– DEWHA (2010b) Survey Guidelines for Australia's Threatened Mammals

- DEWHA (2010c) Survey Guidelines for Australia's Threatened Reptiles
- National Heritage Trust (NHT) National manual for the Malleefowl monitoring system standards (2007)
- Other published literature, including recent advances in species habitat and survey techniques.

3. Desktop assessment - Huntly Study Area

3.1 Interim Biogeographic Regionalisation of Australia

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Northen Jarrah Forest subregion (JF1) of the Jarrah Forest bioregion which is characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by woodlands of Wandoo - Marri on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. The climate is Warm Mediterranean ((Williams & Mitchell 2001).

3.2 Conservation reserves and environmentally sensitive areas

The Huntly Study Area occurs primarily within state forest (Jarrahdale, Dwellingup and Marrinup State Forest). Serpentine National Park intersects the northern portion of the Huntly Area.

3.3 Identified Fauna Habitats

Fauna habitat has been mapped in accordance with EPA guidance for terrestrial fauna surveys (EPA 2020) within the Myara North and Holyoake mine regions, and Preliminary fauna habitat mapping has been undertaken in areas of the Huntly mine where baseline fauna surveys have not been undertaken, and extrapolation of habitats was made using available historical site vegetation type mapping, undertaken by Mattiske Consulting. A mapping overview of all surveyed regions within the Huntly Study Area is highlighted in Figure 3 in Appendix C.

These fauna habitats were assessed against known vegetation mapping and specific VT codes from the Mattiske vegetation assessment criteria tools to provide a more thorough understanding of the recorded presence of species and the identified habitats and vegetation types that comprise these habitats and therefore provide additional justification for likelihood of occurrence assessments provided for each species of conservation significance within the two mine footprint Study Areas.

A total of eight broad fauna habitat types have been recorded and mapped across portions of the Huntly Mine area. Jarrah – Marri forest is by far the most extensive habitat type making up most of the Study Area. This is followed to a lesser extent by a mix of Blackbutt Forest, Bullich Forest, Flooded Gum Woodland, Granite Outcrop, Melaleuca Dampland, Pine Plantation, Mine Rehabilitation, and Cleared Area. These habitats provide an array of microhabitats such as logs, hollows, leaflitter, soft sand and dense foliage with a broad range of floristic species providing a range of foraging, roosting, denning and sheltering. The identified fauna habitats of Blackbutt, Bullich and Flooded Gum were distinguished from additional terrestrial fauna assessments by consultants with SLR, who utilised a similar overall methodology for habitat assessment, but whose technique for assessment was varied enough to warrant an overall description of these habitats as Drainage Line as opposed to the three distinct habitat types identified by GHD. This is likely due to slight variation in methodology criteria for what is considered the dominant vegetation types in those surveyed areas as opposed to whether species such as blackbutt and flooded are present at all. Therefore, even though previous SLR assessments classified certain areas as Drainage Lines, the presence of blackbutt and flooded gum species there is also highly likely to at least a reasonable degree.

Given the dominance of Jarrah-Marri forest habitat types across the majority of the Huntly site, the Study Area is considered to provide core habitat for Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Peregrine Falcon, Masked Owl, Western False Pipistrelle, Dell's Skink and Southern Death Adder. Foraging and potential roosting habitat for all three locally occurring Black Cockatoo (Calyptorhynchus) species, as well as breeding habitat for all three Black Cockatoo species. Quokka may also use dense areas of Jarrah Marri Forest for foraging and dispersal. The additional smaller sections of other habitat types are considered to provide additional sources of foraging and dispersal for these same species of conservation significance, including Quendas with regards to Blackbutt, Bullich and Flooded Gum habitats. The smaller habitat types such as Flooded Gum and Melaleuca

Dampland may also provide the potential for Western Ringtail Possum foraging and sheltering.

The details of the identified fauna habitats across the Study Area are outlined in Table 1 below and in the detailed fauna habitat mapping outlined in Figure 6 in Appendix C.

Table 1 Fauna Habitat Profile of Huntly Mine

Description
Blackbutt Forest (Mapped at Drainage Line in SLR 2024b) The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Huntly mine are AW, AX, CW, C, and CQ. The habitat vegetation consists of Blackbutt open forest with occasional Bullich, and Marri over sparse *Banksia littoralis* over *Trymalium, Macrozamia, Xanthorrhoea preissii*, over *Lepidosperma tetraquetrum*, *Astartea scoparia* and areas of dense Swamp peppermint (*Taxandria linearifolia*). This habitat is limited to localised patches often associated with creeks and drainage lines. Disturbance factors include frequent fire, feral pigs, dieback, trail bike and 4WD. **Habitat for conservation significant species:** Core habitat for Western Brush Wallaby, Quenda, Quokka, Chuditch and Western False Pipistrelle. Breeding and roosting habitat for all three Black Cockatoo species with moderate foraging to Forest Red-tailed Black Cockatoo. Feeding, foraging and refuge habitat is also a feature for Western Ringtail Possum and Woylie.
Bullich forest (Mapped at Drainage Line in SLR 2024b) The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Huntly mine are W, and WA. The habitat vegetation of this area consists of valleys and drainage areas dominated by Bullich (*Eucalyptus megacarpa*) and with some Blackbutt (*E. patens*), occasional Marri (*Corymbia calophylla*), over Sheoak (*Allocasuarina fraseriana*), *Banksia littoralis* over Grass trees (*Xanthorrhoea preissii*), Bracken fern, patches of dense *Gahnia trifida* shrubland over *Lasiopetalum floribundum*, sedges and herbs. Substrate is dark clayloam soil. These areas are associated with seasonal creeks and drainage areas. Disturbance factors include frequent fire, feral pigs, dieback. **Habitat for conservation significant species:** Core habitat for Black Cockatoos (all three, breeding and roosting with limited foraging), Chuditch, Quokka, Quenda, Western Brush Wallaby, Masked Owl, Brush-tailed Phascogale and Western False Pipistrelle. Feeding, foraging and refuge habitat is also a feature for Western Ringtail Possum and Woylie.
Flooded Gum woodland (Mapped at Drainage Line in SLR 2024b) The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data tools and review of surveyed areas across the Huntly mine are AC, and AX. The habitat vegetation associated with this area consists of Flooded Gum (*E. rudis*) open woodland with occasional Blackbutt, over open to open to sparse *Banksia littoralis* over Prickly Moses (*Acacia pulchella*), myrtaceous species such as Swamp peppermint (*Taxandria linearifolia*), *Astartea scoparia Trymalium odoratissimum*, low shrub/sedgeland. Substrate varies from dark grey to grey, brown sandy clays. Associated with poorly drained broad valleys forming seasonal swamps and occasionally tall open forest along drainage lines. Disturbance factors include frequent fire, feral pigs. **Habitat for conservation significant species:** Core habitat for Chuditch, Western Brush Wallaby, Quokka and Quenda for which it will also provide refuge and movement corridors. Foraging and roosting habitat for all Black Cockatoos. Foraging and feeding and refuge habitat potential is also present for Western Ringtail Possum, Woylie and Numbat. Breeding habitat for Carnaby's Cockatoo limited for others.
Granite outcrop The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Huntly mine are R, RG, G, G1, and G2. The vegetation associated with this habitat type consists of Granite outcrops with associated lithic vegetation complexes and adjacent associated fringing open Jarrah and Marri areas with scattered Sheoak, Melaleuca, *Banksia ilicifolia* over occasional Grass trees over mixed open heath communities of Myrtaceous and Proteaceous low shrubs. Soils are pale grey to yellowish fine sand or sandy clay. Granite outcrops often associated with seasonal watercourse and seasonally damp areas. This habitat found as localised patches throughout the Study Area. Disturbance factors include frequent fire, feral pigs, dieback, damage caused by rock removal, trail bike and 4WD on granite. The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data tools and review of surveyed areas across the Huntly mine are R, RG, G, G1, and G2. **Habitat for conservation significant species:** Foraging and denning habitat for Chuditch. Habitat for Western Brush Wallaby, Southern Death Adder, and Dell's Ctenotus. Fringing open forest provides foraging and potential breeding habitat for Black Cockatoo species.

Jarrah – Marri forest

The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Huntly mine are B, D, DG, E, J, M, P, PG, PS, PT, PW, Q, R/S, S, SP, SP-D, S-SP, ST, SW, SW-D, T, TP, TS, WD, and Z. The vegetation types forming this habitat type comprises of *E. marginata* and *C. calophylla* open forest over Grass trees (*Xanthorrhoea preissi*), *Lasiopetalum floribundum*, and Macrozamia mid shrubland. Patches have dominance of understory *Allocasuarina fraseriana* and *Banksia grandis*. Often with complex mosaic of low shrubs such as Fabaceae, *Hibbertia*, *Leucopogon*, *Adenanthos*, and *Pteridium*. This is the most extensive habitat identified and comprises a number of vegetation types dominated by Jarrah on upper, mid and low slopes and broad valleys. Soils range from well drained gravely sand to sandy clay loam. Historical logging is a significant disturbance factor: extensive areas of forest are at varying ages of regeneration. Other disturbances include frequent fire (significant), feral pigs, dieback, trail bike, 4WD and dumped rubbish including weed plants.

Habitat for conservation significant species:

Core habitat for Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Peregrine Falcon, Masked Owl, Western False Pipistrelle, Dell's Skink, Southern Death Adder. Foraging and potential roosting habitat for all three locally occurring Black Cockatoo (Calyptorhynchus) species. Breeding habitat for all three Black Cockatoo species. Quokka may use dense area of Jarrah Marri Forest for foraging and dispersal, which is also the case for Western Ringtail Possum, Woylie and Numbat.

Melaleuca dampland

The matching VT code types and values corresponding to this fauna habitat type based on Mattiske tools and review of surveyed areas across the Huntly mine are A, CA, and DA. The vegetation types forming this habitat type consist of Paperbark (*Melaleuca preissiana*) over sparse isolated *Banksia littoralis* over open *Hakea*, occasional Woody Pear (*Xylomelum*), Grass trees and over mixed shrub layer of Cyperaceae, Restionaceae, *Babingtonia*, *Jacksonia* and *Acacia*, over low shrubs, sedges and herbs. There are areas of sparse to occasional stunted Jarrah and Marri however these are limited to lowland transitional zones adjacent to slightly higher elevation and drainage open forest areas. Generally limited to areas of poor drainage and subject to winter inundation such as broad valleys and swamps. Substrate is grey gravely clay and clay loam. Disturbance factors include frequent fire and feral pigs.

Habitat for conservation significant species:

Western Brush Wallaby, Western False Pipistrelle. Foraging habitat for all three locally occurring Black Cockatoo (*Calyptorhynchus*) species although Jarrah and Marri are generally stunted and sub-optimal for potential breeding habitat. Where creek lines or dense vegetation is present Quokka and Quenda reside.

Mine rehabilitation

Mine rehabilitation of the Huntly and Willowdale Mines of varying ages. Areas of age greater than 8 years provide foraging habitat for Black Cockatoo species but lack trees of suitable age (trunk diameter) to have developed hollows of sufficient diameter and depth to be considered potentially suitable breeding trees for Black Cockatoos. These areas also provide continuity of forest or woodland connectivity allowing fauna movement and foraging habitat for a range of species ground such as terrestrial reptiles, birds, small mammals.

Habitat for conservation significant species

Research indicates use of mine rehabilitation within 2 years of establishment for Chuditch and Quenda, 4-5 years for Western Brush Wallaby, by Quokka (varying ages) and within 4-7 years for foraging by Black Cockatoos.

Pine plantation

These are monocultures of Pine timber tree species (*Pinus*). They represent very high quality foraging habit for Carnaby's and Baudin's Cockatoos. They tend to be devoid of understory and ground layer vegetation and lack habitat values for most other native vertebrates. The single matching VT code type and values corresponding to this fauna habitat type based on Mattiske data tools and review of surveyed areas across the Huntly mine is PL.

3.4 Terrestrial fauna

3.4.1 Fauna diversity

The *Naturemap (Dandjoo) (Dandjoo)* database search utilising a 20 km buffer zone around the Study Area, including additional literature searches and provided Alcoa data, identified 440 terrestrial vertebrate fauna species previously recorded within the Huntly Study Area. This total included 55 mammal species, 281 bird species, 70 reptile species and 16 amphibian species, with an additional 18 terrestrial freshwater system fish species.

It should be noted that *Naturemap (Dandjoo)* data contains some inaccuracies with nomenclature and accuracy of records. An extensive review and removal of clear irregularities and duplications has allowed for a more accurate summary and overview of species presence and abundance, yet absolute accuracy within the database is not guaranteed.

3.4.2 Significant fauna

Based on the *Naturemap* and PMST search and DBCA databases, Alcoa records, and confirmed survey recordings, 53 significant terrestrial vertebrate taxa were identified to potentially occur within the Study Area and wider Study Area.

These species Included:

- 5 (Five) species listed as Critically Endangered (CR) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 7 (Seven) species listed as Endangered (EN) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 6 (Six) species listed as Vulnerable (VU) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 22 (Twenty-two) species listed as Migratory (MI) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 1 (One) species listed as under Special Conservation Protection (OS) under the WA Biodiversity Conservation Act.
- 1 (One) species listed as Conservation Dependent (CD) under the WA Biodiversity Conservation Act.
- 6 (Six) species listed at Priority 4 (P4) category under the WA Biodiversity Conservation Act.
- And 5 (five) species listed at Priority 3 (P3) category under the WA Biodiversity Conservation Act.

The above list is compiled from broad database parameters and has been refined further based on the overall desktop assessment within the Likelihood of Occurrence (LOO) assessment and in the final conclusions section to accurately reflect the potential and actual occurrence of all locally relevant significant fauna.

Of these, 16 species have been recorded or are likely to exist in the Huntly Study Area:

- Forest Red-tailed Black Cockatoo (*Calytorhynchus banksii naso*) - Known
- Baudin's Black Cockatoo (*Zanda baudinii*) - Known
- Carnaby's Black Cockatoo (*Zanda latirostris*) – Known

- Chuditch (*Dasyurus geoffryi*) - Known
- Western Brush Wallaby (*Notamacropus irma*) – Known
- Western False Pipestrelle (*Falsistrellus mackenziei*) – Known
- Quenda (*Isoodon fusciventor*) – Known
- Quokka (*Setonix brachyurus*) – Known
- South-West Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) – Known
- Carter's Freshwater Mussel (*Westralunio carteri*) – Known
- Peregrine Falcon *(Falco peregrinus*) –Known
- Dell's Skink (*Ctenotus delli*) – Known.
- Carter's Freshwater Mussel *(Westralunia carteri*) – Known.
- Southern Death Adder (Acanthophis antarcticus) – Known.
- Woylie (*Bettongia penicilatta ogilbyi*) – Known.
- Masked Owl (*Tyto novaehollandiae novaehollandiae*) – Likely

Threatened species that were assessed as potentially occurring were the Numbat (*Myrmecobius fasciatus*) and the Western Ringtail Possum (*Pseudocheirus occidentalis),* while species assessed as unlikely to occur include the Noisy Scrub Bird (*Atrichornis clamosus*) and the Malleefowl (*Leipoa ocellata*). The mine areas may include suitable habitat for these species and Numbat and Malleefowl have previously been recorded in the Huntly and Willowdale mines and the Noisy Scrub Bird previously recorded south of Dwellingup. The Noisy Scrub bird was translocated into sites in the Northern Jarrah Forest from 1997-2003 however monitoring indicates that establishment of permanent populations was unsuccessful. The three species were not recorded during surveys in the Huntly mines. While individuals may occur as vagrants, the three species are unlikely to occur as significant populations, given the absence of evidence collected during extensive fauna survey within the Huntly regions.

No migratory bird species have been recorded in the Huntly mines nor are they considered likely to occur due to the lack of wetland habitats favoured by the species. The Flooded Gum Woodland and Melaleuca Dampland habitats are seasonally waterlogged and may have areas that are seasonally inundated, however they do not contain large areas of wading habitat with mudflat, grasses, sedges, rushes or reeds. Similarly, the Huntly Areas are unlikely to support populations of threatened birds that use such wetland habitats, such as the Australasian Bittern (*Botaurus poiciloptilus*) and Australian Painted Snipe (*Rostratula australis*).

The conservation significant fauna records and results across DBCA and all previous surveys have been provided for the Huntly Study Area in Figure 4, Appendix C.

3.5 Previous Studies and Literature Review

Table 4 outlines the previous studies conducted within the region relating to the Huntly Study Area. With those outlined previous studies for the Huntly Study Area, those identified studies that were conducted to EPA guidelines, standards and procedures are mentioned within the key findings of each study.

Table 4 Previous Studies Huntly Mine Site Study Area

Study	Location and key findings	Location in relation to this region
SLR (2024a) Huntly – Carter's Freshwater Mussel Targeted Survey, Unpublished	**Location: Huntly region, Huntly Mine** This report highlighted findings from the targeted species search for the state and federally listed Vulnerable Carter's Freshwater Mussel (CFM) within the Huntly survey region. Six highlighted sites were surveyed across a period of several weeks in October and November of 2023 approximately 12km upstream from known locations within Serpentine Dam. The survey was conducted according to current EPA guidelines. No confirmed sightings or evidence was found of CFM in any of the six surveyed areas, and Ph and oxygen levels analysed suggested that the existing areas with water bodies were outside normal range for suitable long-term habitat for the species.	Within Huntly Study Area
SLR (2024b) Huntly Region – Targeted Fauna Survey for Chuditch, Quokka and Woylie, Unpublished	**Location: Huntly region, Huntly Mine** This report highlighted findings from the targeted species survey for Quokka, Chuditch and Woylie across the Huntly area of 928.6ha within the Pinjarra and Jarrah Forest bioregion. Two main habitat types were identified throughout the Study Area, that being Jarrah-Marri forest, and drainage lines, both of which provide core habitat for the three targeted species. The survey was conducted according to current EPA guidelines. The targeted surveys recorded 52 instances of Chuditch with 14 specific individuals reliably recorded, along with 18 recordings of quokkas. In addition to the two targeted fauna taxa, six significant taxa were recorded during the fauna survey in Jarrah-Marri Forest and Drainage Line habitats: – Baudin's Cockatoo (*Zanda baudinii).* – Carnaby's Cockatoo (*Zanda latirostris).* – Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*). – Wambenger Brush-tailed Phascogale (*Phascogale tapoatafa wambenger).* – Quenda (*Isoodon fusciventer).* – Western Brush Wallaby (*Notamacropus irma).*	Within Huntly Study Area
SLR (2024c) Huntly Region – Black Cockatoo Habitat Assessment, Unpublished	**Location: Huntly region, Huntly Mine** This report highlighted findings from a targeted species assessment for all three EPBC listed Black Cockatoo species in terms of direct observation and recorded feeding, foraging behaviour, as well as identification of suitable roosting, feeding and breeding hollow habitat within the Huntly Study Area covering 501.7 ha of Jarrah-Marri Forest bioregion. Ground-based, drone and camera searches were conducted, using specific government referral guidelines for all three black cockatoo species. The survey was conducted according to current EPA guidelines. The surveys recorded significant direct observations of all three EPBC listed black cockatoo species, as well as recorded feeding, roosting and numerous suitable breeding hollows for all three species, with six confirmed nesting hollows and 11 confirmed mass roosting sites within the Study Area itself.	Within Huntly Study Area

GHD (2024e). Myara pre-clearance targeted fauna assessment	**Location: Huntly Region, Alcoa Huntly Mine** The Purpose of the memorandum is to summarise the methodology and the survey results of the targeted pre-clearance assessment for Myara site. The Survey Areas for identified for assessment were split into two types: a Targeted Fauna Survey (Sites 1 -5) comprising of 185.7 hectares (ha) and a targeted Black Cockatoo Assessment covering 10.3 ha (bordering site 3. Targeted fauna assessment were performed with a specific focus to identify significant fauna constraints focusing on significant fauna species of Chuditch, Woylies and Quokka. The most extensive habitat identified within all five Survey Areas was Jarrah-Marri forest. Habitat dominated by Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) forest with a mixed understory open to scattered to patchy Sheoak (*Allocasuarina fraseriana*), Bull Banksia (*Banksia grandis*) and Myrtaceous shrubs over *Persoonia, Xanthorrhoea, Macrozamia* and diverse low shrub layer The Survey Areas represented a large continuous tract of forest and woodland with good connectivity. 34 terrestrial fauna vertebrates were identified comprising nine mammals, 21 Birds and four Reptiles. Of the nine mammal species, two are introduced. Furthermore, five significant fauna species were recorded, these included: • Chuditch • Forest Red-tailed Black Cockatoo • Western Brush Wallaby • Southwestern Brush-tailed Phascogale • Quenda	Within Huntly Study Area
GHD (2024d) McCoy Haul Road Fauna Pre-clearance Survey, Unpublished	**Location: McCoy and O'Neil regions, Huntly Mine** This memo outlines the results of a targeted preclearance assessment for the McCoy Haul road within the O'Neil region covering approximately 563.4 ha. In total nine significant fauna species were recorded including Carnaby's Black Cockatoo, Baudin's Black Cockatoo, Forest Red-tailed Black Cockatoo, Chuditch, Quokka,	Partly within Huntly Study Area

Study	Location and key findings	Location in relation to this region
	South-western Brush-tailed Phascogale, Peregrine Falcon, Western Brush Wallaby and Quenda. The survey was conducted according to current EPA guidelines. Foraging for all three Black Cockatoo species was recorded within the area along with roosting sites and three known nesting trees were recorded.	
GHD (2024c) O'Neil East Targeted Woylie Assessment. Unpublished,	**Location: O'Neil East region, Huntly Mine** This memo outlines the results of a targeted Woylie assessment within the O'Neil East Study Area and Study Area. Covering an area approximately 1,402 ha. In total approximately 3 – 6 Woylies were observed within the Area. Five other conservation significant species were also recorded within the area, Chuditch, Quokka, Southwestern Brush-tailed Phascogale, Western Brush Wallaby and Quenda. The survey was conducted according to current EPA guidelines.	Within boundary of the Huntly Study Area.
GHD (2024b) Terrestrial Fauna Assessment O'Neil East. Unpublished	**Location: O'Neil East region, Huntly Mine** This report outlines the results of the terrestrial vertebrate fauna survey of the Alcoa O'Neil development envelope. The O'Neil East Study Area covers an approximate 2,425.65 ha and is located approximately 30km east of the township of Jarrahdale, WA. The survey was conducted according to current EPA guidelines. In total nine significant species were recorded in the Study Area including: Woylie, Baudin's Black Cockatoo, Forest Red-tailed Black Cockatoo, Chuditch, Quokka, Southwestern Brush-tailed Phascogale, Western Brush Wallaby, Dell's Skink and Quenda. Extensive foraging habitat for the two recorded Black Cockatoos (Baudin's and Forest Red-tailed Black Cockatoo) was found within the Study Area.	Approximately 5km southeast of the Huntly Study Area
GHD (2024a) Terrestrial Fauna Assessment O'Neil. Unpublished	**Location: O'Neil region, Huntly Mine** This report outlines the results of a terrestrial vertebrate fauna survey of the Alcoa O'Neil development envelope. The O'Neil Study Area is approximately 30kms east of the town of Dwellingup in the Southwest of Western Australia. The Study Area covered an approximate of 12,687.48 ha. The survey was conducted according to current EPA guidelines. In total nine significant fauna species was recorded in the Study Area including: Chuditch, Baudin's Black Cockatoo, Forest Red-tailed Black Cockatoo, Quokka, Rakali, Western Brush Wallaby, Dell's Skink, Quenda and Carter's Fresh Water Mussel. Extensive foraging habitat for two of the Black Cockatoos (Baudin's and Forest Red-tailed Black Cockatoo)	Within Huntly Study Area

GHD (2023). Myara North Terrestrial Fauna Pre-Clearance Survey	**Location: Myara North Region, Huntly Mine** The Huntly Mine transition into the Myara North mine region is a component of the Pinjarra Alumina Refinery Revised Proposal (the Alcoa Proposal). GHD was commissioned, on behalf of Alcoa, to prepare a comprehensive Environmental Review Document for the Alcoa Proposal, which includes commitments for environmental management, including pre-clearance surveys. From a terrestrial fauna perspective. The purpose of the survey was to identify the presence of significant fauna and significant fauna habitat features in the survey area. The outcome of the survey and information supplied in this biological survey report will be used to inform the environmental assessment and approvals process, and the results will be used to assist in the preparation of Environmental Impact Assessment documentation. Six significant fauna species were recorded within the survey area during the surveys. These are: • Baudin's Cockatoo (*Zanda baudinii*) – listed as Endangered under the BC Act and Endangered under the EPBC Act. • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act. • Chuditch (*Dasyurus geoffroii*) listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act. • Quenda (*Isoodon fusciventer*) – listed as Priority 4 by the DBCA. • Western Bush Wallaby (*Notamacropus irma*) – listed as Priority 4 by the DBCA. • South-Western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) – listed as Conservation Dependent by the DBCA.	Within Huntly Study Area
	In line with GHD's (2021) assessment, no evidence of Woylie (*Bettongia penicillata ogilbyi*) or Numbat (*Myrmecobius fasciatus*) were observed during the survey. These species have the potential to occur, although unlikely. Potential breeding habitat trees were identified in the survey area for Black Cockatoos. A total of 62suitable trees were identified in the survey area, containing a total of 82 hollows. A total of 9 hollows with evidence of use by Black Cockatoos (chew marks around hollow) were recorded in the survey area. Three of these hollows were in Marri, and the remaining 6 were in Jarrah. No evidence of Quokka was recorded during the 2023 survey at Myara North, however, previous records from GHD (2021) are close to the area and Quokka is likely to occur.	
GHD (2021) Terrestrial Fauna Survey and Black Cockatoo Habitat Assessment for Huntly Mine - Holyoake	**Location: Holyoake region, Huntly Mine** This report details the results of a terrestrial vertebrate fauna survey of the Holyoake Development Envelope and adjacent conveyor and haul road corridors. The region is located approximately five kilometres east of the Dwellingup town site in the south-west of WA. The region covers approximately 10,541 hectares (ha). The survey was conducted according to current EPA guidelines. In total ten significant species were recorded in the region including the Quokka, Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Forest Red-tailed Black Cockatoo, Baudin's Black Cockatoo, Carnaby's Black Cockatoo, Western False Pipistrelle, Quenda and Peregrine Falcon. All significant species identified are likely to have resident populations and habitat present within the region. Although recorded nearby and outside	Abuts the western boundary of the Huntly Study Area (extending up to 10 km west)

Study	Location and key findings	Location in relation to this region
	of the region the presence of Carter's Freshwater Mussel is unlikely due to the lack of permanent surface waterbodies present. The region has extensive foraging habitat for the three Black Cockatoo species, and potential breeding habitat (limited in extent) for Carnaby's and Forest Red-tailed Black Cockatoo. Regarding migratory shorebirds, the region lacks open water such as shallow shorelines or tidal zones for foraging habitat. The creek lines and vegetated dampland areas within the region are not suitable for migratory shorebirds.	
McGregor *et al*. (2014). Does forest restoration in fragmented landscapes provide habitat for a wide-ranging carnivore?	**Location: Huntly and Willowdale mines** Fourteen Chuditch trapping sessions (13 at Huntly, one at Willowdale) across 9 trapping transects (8 at Huntly, one at Willowdale) were undertaken between June 2009 and Dec 2010. Radio collars with a two-stage transmitter and mortality mode were attached to 14 adult Chuditch (9 female, 5 males – all trapped at Huntly). Chuditch were tracked to their dens during the day. Spool and line tracking was also used. In total 29 individual Chuditch were captured on 60 occasions. Of the 14 individuals fitted with radio collars, three were found dead on the Huntly mine access road with evidence of road trauma. Another three Chuditch were also found dead from vehicle strikes along this road. The study identified 138 den sites from 11 tracked animals: 75 in unmined forest and 63 in restored forest ranging from 2-32 years old. In unmined forest, dens were mostly in hollow logs and ground burrows beneath tree stumps, but these substrates were never used in restored forest where dens were mostly ground burrows, usually associated with rock piles at the surface.	Huntly Mine. Willowdale mine, South of the current Study Area.
Burn (2000) A survey of the impact of burning on mammals and birds in Alcoa's rehabilitated Bauxite mines at Jarrahdale	**Location: Jarrahdale forest (two unmined and four rehabilitated bauxite mine pits)** To ascertain the impact of burning on birds and mammals at the above location pre burning monitoring took place 1997, and post burn monitoring commenced in 1998 in both burnt and unburnt, rehabilitated and unmined forest sites. Low numbers of mammals were caught making it difficult to conclude with certainty whether burning influenced most species. New epicormic growth may have attracted possums into one rehabilitated area, while mice invaded the dense rehabilitated site after the burn. There was a large decline in the numbers of birds and bird species following the burn in the dense rehabilitation. Burning sparse rehabilitation only resulted in a small decline while fire had little effect on bird populations of unmined forest. It was concluded that more time was needed to define the longer-term effects of burning on mammals and birds. The present survey was therefore undertaken in 2000 to assess the situation three years after burning.	North of the Huntly Study Area.

4. Desktop assessment – Willowdale Study Area

4.1 Interim Biogeographic Regionalisation of Australia

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Northen Jarrah Forest subregion (JF1) of the Jarrah Forest bioregion which is characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by woodlands of Wandoo - Marri on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. The climate is Warm Mediterranean ((Williams & Mitchell 2001).

4.2 Conservation reserves and environmentally sensitive areas

The Willowdale Footprint and Study Area occurs primarily within state forest (Jarrahdale, Dwellingup and Marrinup State Forest). Lane Poole Reserve intersects the eastern and western perimeter of the Willowdale Footprint and Study Area.

4.3 Identified Fauna Habitats

Fauna habitat has been mapped in accordance with EPA guidance for terrestrial fauna surveys (EPA 2020), and Preliminary fauna habitat mapping has been undertaken in areas of the Willowdale mine where baseline fauna surveys have not been undertaken, and extrapolation of habitats was made using available historical site vegetation type mapping, undertaken by Mattiske Consulting. The findings are also based on an additional fauna habitat assessment conducted by SLR.

These fauna habitats were assessed against known vegetation mapping and specific VT codes from the Mattiske vegetation assessment criteria tools to provide a more thorough understanding of the recorded presence of species and the identified habitats and vegetation types that comprise these habitats and therefore provide additional justification for likelihood of occurrence assessments provided for each species of conservation significance within the two mine footprint Study Areas. A mapping overview of all surveyed regions within the Willowdale Study Area is highlighted in Figure 3 in Appendix C.

A total of eight broad fauna habitat types have been recorded and mapped across portions of the Willowdale Mine area, with a similar overall variety and type to that found for the Huntly Study Area. Jarrah – Marri forest is by far the most extensive habitat type making up most of the Study Area (28.5%). This is followed to a lesser extent by a mix of Blackbutt Forest Bullich Forest (2.8%), Flooded Gum Woodland (0.8%), Granite Outcrop (0.2%), Melaleuca Dampland (0.1%), Mine Rehabilitation (8.9%), and Cleared Area (3.2%). These habitats provide an array of microhabitats such as logs, hollows, leaflitter, soft sand and dense foliage with a broad range of floristic species providing a range of foraging, roosting, denning and sheltering habitat.

Given the dominance of Jarrah-Marri forest habitat types across the majority of the Willowdale site, the Study Area is considered to provide core habitat for Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Peregrine Falcon, Masked Owl, Western False Pipistrelle, Dell's Skink and Southern Death Adder. Foraging and potential roosting habitat for all three locally occurring Black Cockatoo (Calyptorhynchus) species, as well as breeding habitat for all three Black Cockatoo species. Quokka may also use dense areas of Jarrah Marri Forest for foraging and dispersal. The additional smaller sections of other habitat types are considered to provide additional sources of foraging and dispersal for these same species of conservation significance, including Quendas with regards to Blackbutt, Bullich and Flooded Gum habitats. The smaller habitat types such as Flooded Gum and Melaleuca Dampland may also provide the potential for Western Ringtail Possum foraging and sheltering.

The details of the identified fauna habitats across the Study Area are outlined in Table 5 below and in Appendix C.

Table 5 Fauna habitat profile of Willowdale Mine Study Area

Description
Blackbutt Forest (Mapped as Drainage Line by SLR 2024). The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Willowdale mine are AW, AX, CW, C, and CQ. These vegetation types associated with this habitat type consist of Blackbutt open forest with occasional Bullich, and Marri over sparse *Banksia littoralis* over *Trymalium, Macrozamia, Xanthorrhoea preissii*, over *Lepidosperma tetraquetrum*, *Astartea scoparia* and areas of dense Swamp peppermint (*Taxandria linearifolia*). This habitat is limited to localised patches often associated with creeks and drainage lines. Disturbance factors include frequent fire, feral pigs, dieback, trail bike and 4WD. **Habitat for conservation significant species:** Core habitat for Western Brush Wallaby, Quenda, Quokka, Chuditch and Western False Pipistrelle. Breeding and roosting habitat for all three Black Cockatoo species with moderate foraging to Forest Red-tailed Black Cockatoo. Feeding, foraging and refuge habitat is also a feature for Western Ringtail Possum and Woylie.
Bullich Forest (Mapped as Drainage Line by SLR 2024). The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Willowdale mine are W, and WA. These vegetation types corresponding to this habitat type consist of Valleys and drainage areas dominated by Bullich (*Eucalyptus megacarpa*) and with some Blackbutt (*E. patens*), occasional Marri (*Corymbia calophylla*), over Sheoak (*Allocasuarina fraseriana*), *Banksia littoralis* over Grass trees (*Xanthorrhoea preissii*), Bracken fern, patches of dense *Gahnia trifida* shrubland over *Lasiopetalum floribundum,* sedges and herbs. Substrate is dark clayloam soil. These areas are associated with seasonal creeks and drainage areas. Disturbance factors include frequent fire, feral pigs, dieback. **Habitat for conservation significant species:** Core habitat for Black Cockatoos (all three, breeding and roosting with limited foraging), Chuditch, Quokka, Quenda, Western Brush Wallaby, Masked Owl, Brush-tailed Phascogale and Western False Pipistrelle. Feeding, foraging and refuge habitat is also a feature for Western Ringtail Possum and Woylie.
Flooded Gum woodland (Mapped as Drainage Line by SLR 2024). The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Willowdale mine are W, and WA. The vegetation types associated with this habitat type comprise of Flooded Gum (*E. rudis*) open woodland with occasional Blackbutt, over open to open to sparse *Banksia littoralis* over Prickly Moses (*Acacia pulchella*), myrtaceous species such as Swamp peppermint (*Taxandria linearifolia*), *Astartea scoparia Trymalium odoratissimum*, low shrub/sedgeland. Substrate varies from dark grey to grey, brown sandy clays. Associated with poorly drained broad valleys forming seasonal swamps and occasionally tall open forest along drainage lines. Disturbance factors include frequent fire, feral pigs. **Habitat for conservation significant species:** Core habitat for Chuditch, Western Brush Wallaby, Quokka and Quenda for which it will also provide refuge and movement corridors. Foraging and roosting habitat for all Black Cockatoos. Foraging and feeding and refuge habitat potential is also present for Western Ringtail Possum, Woylie and Numbat. Breeding habitat for Carnaby's Cockatoo limited for others.
Granite outcrop The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Willowdale mine area are R, RG, G, G1, and G2. These vegetation types associated with this fauna habitat type consist of Granite outcrops with associated lithic vegetation complexes and adjacent associated fringing open Jarrah and Marri areas with scattered Sheoak, Melaleuca, *Banksia ilicifolia* over occasional Grass trees over mixed open heath communities of Myrtaceous and Proteaceous low shrubs. Soils are pale grey to yellowish fine sand or sandy clay. Granite outcrops often associated with seasonal watercourse and seasonally damp areas. This habitat found as localised patches throughout the Study Area. Disturbance factors include frequent fire, feral pigs, dieback, damage caused by rock removal, trail bike and 4WD on granite. **Habitat for conservation significant species:** Foraging and denning habitat for Chuditch. Habitat for Western Brush Wallaby, Southern Death Adder, and Dell's Ctenotus. Fringing open forest provides foraging and potential breeding habitat for Black Cockatoo species.

Jarrah – Marri forest The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data and review of surveyed areas across the Willowdale mine are B, D, DG, E, J, M, P, PG, PS, PT, PW, Q, R/S, S, SP, SP-D, S-SP, ST, SW, SW-D, T, TP, TS, WD, and Z. The vegetation types associated with this habitat type consist of *E. marginata* and *C. calophylla* open forest over Grass trees (*Xanthorrhoea preissi*), *Lasiopetalum floribundum*, Macrozamia mid shrubland. Patches have dominance of understory *Allocasuarina fraseriana* and *Banksia grandis*. Often with complex mosaic of low shrubs such as Fabaceae, *Hibbertia*, *Leucopogon*, *Adenanthos*, and *Pteridium*. This is the most extensive habitat identified and comprises a number of vegetation types dominated by Jarrah on upper, mid and low slopes and broad valleys. Soils range from well drained gravely sand to sandy clay loam. Historical logging is a significant disturbance factor: extensive areas of forest are at varying ages of regeneration. Other disturbances include frequent fire (significant), feral pigs, dieback, trail bike, 4WD and dumped rubbish including weed plants. **Habitat for conservation significant species:** Core habitat for Chuditch, Brush-tailed Phascogale, Western Brush Wallaby, Peregrine Falcon, Masked Owl, Western False Pipistrelle, Dell's Skink, Southern Death Adder. Foraging and potential roosting habitat for all three locally occurring Black Cockatoo (Calyptorhynchus) species. Breeding habitat for all three Black Cockatoo species. Quokka may use dense area of Jarrah Marri Forest for foraging and dispersal, which is also the case for Western Ringtail Possum, Woylie and Numbat.
Melaleuca dampland The matching VT code types and values corresponding to this fauna habitat type based on Mattiske data tools and review of surveyed areas across the Willowdale mine area are A, CA, and DA. The vegetation types associated with this fauna habitat types consist of Paperbark (*Melaleuca preissiana*) over sparse isolated *Banksia littoralis* over open *Hakea*, occasional Woody Pear (*Xylomelum*), Grass trees and over mixed shrub layer of Cyperaceae, Restionaceae, *Babingtonia*, *Jacksonia* and *Acacia*, over low shrubs, sedges and herbs. There are areas of sparse to occasional stunted Jarrah and Marri however these are limited to lowland transitional zones adjacent to slightly higher elevation and drainage open forest areas. Generally limited to areas of poor drainage and subject to winter inundation such as broad valleys and swamps. Substrate is grey gravely clay and clay loam. Disturbance factors include frequent fire and feral pigs. **Habitat for conservation significant species:** Western Brush Wallaby, Western False Pipistrelle. Foraging habitat for all three locally occurring Black Cockatoo (*Calyptorhynchus*) species although Jarrah and Marri are generally stunted and sub-optimal for potential breeding habitat. Where creek lines or dense vegetation is present Quokka and Quenda reside.
Mine rehabilitation Mine rehabilitation of the Willowdale Mine of varying ages. Areas of age greater than 8 years provide foraging habitat for Black Cockatoo species but lack trees of suitable age (trunk diameter) to have developed hollows of sufficient diameter and depth to be considered potentially suitable breeding trees for Black Cockatoos. These areas also provide continuity of forest or woodland connectivity allowing fauna movement and foraging habitat for a range of species ground such as terrestrial reptiles, birds, small mammals. **Habitat for conservation significant species** Research indicates use of mine rehabilitation within 2 years of establishment for Chuditch and Quenda, 4-5 years for Western Brush Wallaby, by Quokka (varying ages) and within 4-7 years for foraging by Black Cockatoos.
Cleared areas

4.4 Terrestrial fauna

4.4.1 Fauna diversity

The *Naturemap (Dandjoo)* database search utilising a 20 km buffer zone in the request, and including the survey literature from surveys of the Alcoa sites, identified 261 terrestrial vertebrate fauna species previously recorded within the region. This total included 39 mammal species, 156 bird species, 46 reptile species and 14 amphibian species, with an additional 6 terrestrial freshwater fish species. Of the species three are introduced species.

Please note that *Naturemap (Dandjoo)* data contains some inaccuracies, with nomenclature and accuracy of records. An extensive review and removal of clear irregularities and duplications has allowed for a more accurate summary and overview of species presence and abundance, yet absolute accuracy within the database is not guaranteed.

4.4.2 Significant fauna

Based on the *Naturemap/Dandjoo*, DBCA, and PMST search, along with recent 2024 SLR Fauna Survey assessments and previous fauna surveys within the Willowdale Mine region by Western Environmental and Biologic, along with the review of the existing literature from surveys within and surrounding the Alcoa sites, 38

significant terrestrial vertebrate taxa were identified to potentially occurring within the Study Area.

These Species Included:

- 4 (Four) species listed as Critically Endangered (CR) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 7 (Seven) species listed as Endangered (EN) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 7 (Seven) species listed as Vulnerable (VU) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 9 (Nine) species listed as Migratory (MI) under the Federal EPBC Act and WA Biodiversity Conservation Act.
- 1 (One) species listed as under Special Conservation Protection (OS) under the WA Biodiversity Conservation Act.
- 1 (One) species listed as Conservation Dependent (CD) under the WA Biodiversity Conservation Act.
- 5 (Five) species listed at Priority 4 (P4) category under the WA Biodiversity Conservation Act.
- And 4(Four) species listed as Priority 3 (P3) under the WA Biodiversity Conservation Act.

Of these, 17 have been recorded or are likely to exist in the Willowdale Study Area:

- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*) - Known
- Baudin's Black Cockatoo (*Zanda baudinii*) – Known
- Carnaby's Black Cockatoo (*Zanda latirostris*) - Known
- Rakali (*Hydromys chrysogaster*) – Known.
- Western Brush Wallaby (*Notamacropus irma*) – Known.
- South-West Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) – Likely.
- Quenda (*Isoodon fusciventor*) – Likely.
- Quokka (*Setonix brachyurus*) – Likely
- Chuditch (*Dasyurus geoffroyii*) – Likely.
- Western Ringtail Possum (*Pseudocheirus occidentalis)* – Likely.
- Woylie (*Bettongia penicillata ogilbyi*) – Likely.
- Peregrine Falcon (*Falco peregrinus*) – Likely.
- Western False Pipestrelle (*Falsistrellus mackenziei)* – Likely.
- Masked Owl (*Tyto novaehollandiae novaehollandiae)* – Likely.
- Southern Death-adder (*Acanthophis antarcticus*) – Likely.
- Dell's Skink (*Ctenotus delli*) – Likely
- Carter's Freshwater Mussel (*Westralunia carteri*) – Likely.

Threatened species that were assessed as potentially or possibly occurring in the Willowdale Areas include the Numbat (*Myrmecobius fasciatus*), while other threatened species assessed as being unlikely to occur include Noisy Scrub Bird (*Atrichornis clamosus) and Malleefowl (Leipoa ocellata).* The mine areas may include suitable habitat for these species and Numbat and Malleefowl have previously been recorded in the mines and the Noisy Scrub Bird previously recorded south of Dwellingup. The Noisy Scrub bird was translocated into sites in the Northern Jarrah Forest from 1997-2003 however monitoring indicates that establishment of permanent populations was unsuccessful. The three species were not recorded during surveys in the Huntly mines. While individuals may occur as vagrants, the three species are unlikely to occur as significant populations, given the absence of evidence collected during extensive fauna surveys within the Willowdale regions. Historically, the Western Ringtail Possum was considered as unlikely to occur based on fewer recent DBCA records and comparatively small areas of potentially suitable foraging and sheltering habitat within the area, and no recorded findings having been made by previous survey efforts. However, recent SLR surveys of the Larego section of the Willowdale mine area in July 2024 (Pers. Comm) have confirmed sightings of a single individual (observed twice) utilising Blackbutt saplings as part of dense section of BlackButt forest habitat approximately five metres from the edge of the vegetation. This species has now been classified as Known to Occur within the Willowdale mine.

No migratory bird species have been recorded in the Willowdale mines nor are they considered likely to occur due to the lack of wetland habitats favoured by the species. The Flooded Gum Woodland and Melaleuca Dampland habitats are seasonally waterlogged and may have areas that are seasonally inundated, however they do not contain large areas of wading habitat with mudflat, grasses, sedges, rushes or reeds. Similarly, the Willowdale Areas are unlikely to support populations of threatened birds that use such wetland habitats, such as the Australasian Bittern (*Botaurus poiciloptilus*) and Australian Painted Snipe (*Rostratula australis*).

The conservation significant fauna results and recordings across both DBCA records and surveyed areas have been provided for the Willowdale Study Area in Figure 7, Appendix C.

4.5 Previous studies and Literature Review

Table 6 outlines the previous studies conducted within the region. As with those previous studies for the Huntly Study Area, those identified studies that were conducted to EPA guidelines, standards and procedures are mentioned within the key findings of each study.

Table 6 Previous studies Willowdale Minesite

Study	Location and key findings	Location in relation to this region
SLR (2024) Larego Region – Chuditch, Quokka and Woylie Targeted Survey, Unpublished	This report highlighted findings from the targeted species survey for Quokka, Chuditch and Woylie across the Larego mine area of 4518 ha within the Pinjarra and Jarrah Forest bioregion. Two main habitat types were identified throughout the Study Area, that being Jarrah-Marri forest, and drainage lines, both of which provide core habitat for the three targeted species. One targeted species was identified throughout the study, that being secondary scat-based evidence for Chuditch presence. No direct evidence for either Woylies or Quokka were recorded within the Study Area, however historical records from previous studies and databases revealed recordings of both such species within 200metres of the Study Area. The survey was conducted according to current EPA guidelines. In addition to the targeted fauna, a further four conservation significant species were identified within the Study Area; – Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*). – Baudin's Cockatoo (*Zanda baudinii)* – Rakali (*Hydromys chrysogaster)* – Western Brush Wallaby (*Notamacropus irma).*	Within Willowdale Study Area
Western Environmental (2023) Willowdale Mine Black Cockatoo Targeted Assessment, Unpublished	Location: Willowdale Mine, Larego Site This report highlighted findings from a targeted species assessment for all three EPBC listed Black Cockatoo species in terms of direct observation and recorded feeding, foraging behaviour, as well as identification of suitable roosting, feeding and breeding hollow habitat within the Willowdale Mine and Larego Study Area covering 477.7 ha of Jarrah-Marri Forest bioregion. Ground-based, drone and camera searches were conducted, using specific government referral guidelines for all three black cockatoo species. The survey was conducted according to current EPA guidelines. A combined total of 13,267 potential, suitable or known nesting trees were recorded. The vast majority (97%) of these trees were Bamford Class 4 or 5 trees, defined by DAWE, 2022 as potential nesting trees, however these do not currently contain suitable nesting hollows. Analysis of regional habitat extent indicates there is 63,554.92 ha of remnant native vegetation mapped within a 12 km buffer of the Study Area. It is expected that the majority of this vegetation would contain suitable foraging species at the same or greater rate than that present within the Study Area. Therefore, the approximately 470ha of foraging habitat represents 0.74 % of the estimated regional habitat extent. Six locations were recorded that displayed evidence of having been used as a roost site, and based on additional mapping and direct evidence of cockatoo species presence, it is considered highly likely that more roosting sites exist within the Study Area than the six confirmed locations.	Within Willowdale Study Area
Stokes (2011) Orion Long Term Fauna Monitoring Program	Location: six monitoring sites within Alcoa's Orion mine region comprising two typical upland forest areas, two associated with stream zones and two within rehabilitated forest (8 years old). Mammals, birds, reptiles and frogs were surveyed during both summer (March) and winter (July), and ground dwelling invertebrates were sampled in summer only. Survey methods were similar to those used in EMRC (2006) with the addition of a single large trapping transect designed to specifically target Chuditch and species of goanna. This transect covered approx. 880 ha and comprised 40 wire cage traps spaced 300 m apart and was trapped over four successive nights at the same time as the generic mammal survey. A total of 10 mammals (three introduced), 38 birds, 9 reptiles, two frogs, 22 ground invertebrates, 49 ant species was recorded. Recorded threatened fauna comprise: – Chuditch – five males trapped in summer – Quenda – one trapped – Western Brush Wallaby – multiple sightings – Baudin's Black Cockatoo – sightings	Within 10 km of the far western boundary of the Willowdale Study Area

Study	Location and key findings	Location in relation to this region
	– Forest Red-tailed Black Cockatoo - sightings	
McGregor *et al*. (2014). Does forest restoration in fragmented landscapes provide habitat for a wide-ranging carnivore?	Location: Huntly and Willowdale mines Fourteen Chuditch trapping sessions (13 at Huntly, one at Willowdale) across 9 trapping transects (8 at Huntly, one at Willowdale) were undertaken between June 2009 and Dec 2010. Radio collars with a two-stage transmitter and mortality mode were attached to 14 adult Chuditch (9 female, 5 males – all trapped at Huntly). Chuditch were tracked to their dens during the day. Spool and line tracking was also used. In total 29 individual Chuditch were captured on 60 occasions. Of the 14 individuals fitted with radio collars, three were found dead on the Huntly mine access road with evidence of road trauma. Another three Chuditch were also found dead from vehicle strikes along this road. The study identified 138 den sites from 11 tracked animals: 75 in unmined forest and 63 in restored forest ranging from 2-32 years old. In unmined forest, dens were mostly in hollow logs and ground burrows beneath tree stumps, but these substrates were never used in restored forest where dens were mostly ground burrows, usually associated with rock piles at the surface.	Willowdale region.
EMRC (2015) Long Term Fauna Monitoring Program Summary of Results at Orion Mining region.	Location: Numerous plots over the Willowdale Mine area Results of the 3rd survey of the LTFMP. Same methodology and plot locations as 2010 survey of the area. Additionally a large trapping transect targeting Chuditch and remote sensing cameras also deployed. Trapping conducted over 4 nights in both winter and summer seasons. The study results: – Twelve mammal species were trapped – Thirty-five bird species recorded – Thirteen reptile species recorded – Three frog species recorded Results were indicative of some species being affected (not present afterwards or in lower numbers) by the January 2016 wildfire that burnt through the Willowdale Mine and surrounding areas including four of the six Orion sites.	Within Willowdale Study Area
EMRC (2004) Orion LTFMP report 2004 Final	Location: Willowdale -north east portion of Orion region (two healthy forest and two dieback forest plots, two steam zone plots and two plots in rehabilitation) The LTMFP was reviewed in 2003 (Majer, 2003) which included a recommendation for a similar program to be established at Orion so that any differences in faunal successional processes taking place at Willowdale could be detected. Similar techniques to those used at Jarrahdale, Huntly and McCoy. Mammals recorded during the survey included the Chuditch, Quokka, Mardo, Dunnart, Common Brushtail Possum, Western Brush Wallaby. Only one mammal species was recorded in the young rehabilitation (Feral Mouse). Forty-one bird species was recorded including the Baudin's Cockatoo. Bird numbers were highest at steam sites and lowest at rehabilitated sites. Six reptile species were recorded compared with 15 species recorded in the 1999 pre-mining survey. Three frog species were recorded. Fifty ant species were recorded. Further monitoring was recommended to determine successional patterns.	Within Willowdale Study Area
EMRC (1999) A fauna survey of planned mining areas at Alcoa's Orion Mining region	Location: Orion mining region at Willowdale This report provides the results of the fauna survey conducted between February and November 1999. The habitats monitored were poorly surveyed in current mining areas, extensive dieback affected areas, small dieback free areas and on sites where mining operations are planned. A total of 46 bird species, nine mammals (6 native, 3 introduced), 13 reptiles and five frogs were recorded. These included three rare species (the Chuditch, Baudin's Cockatoo and possibly the Quokka) and one Specially Protected species (the Carpet Python). As well as these, the Noisy Scrub-bird has been reintroduced into the area and the uncommon Brush-tailed Phascogale is present albeit in low densities. The fauna of the Orion area was largely comparable to that of existing Willowdale mining areas. Results emphasise the need for ongoing fox control. Rehabilitation using Jarrah and other indigenous species offers the	Within Willowdale Study Area

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

5. Conclusion

With regards to the Huntly Study Area, a total of eight broad fauna habitat types have been recorded and mapped across portions of the area. Jarrah – Marri forest is by far the most extensive habitat type making up most of the Study Area, with a total percentage of over 55%. This is followed to a lesser extent by a mix of Blackbutt Forest Bullich Forest, Flooded Gum Woodland, Granite Outcrop, Melaleuca Dampland, Mine Rehabilitation, and Cleared Area. A total of 16 species of conservation significance were assessed as being either likely to occur or known to occur within the Huntly Area. Specifically, 15 species were assessed as being known to occur within the Study Area, and one species considered likely to occur. The 15 species of conservation significant species known to occur, based on literature reviews, recent GHD and SLR consultancy surveys and recent and historical database records at state and federal level, consist of all three species of black cockatoos (Baudin's, Carnaby's and Forest Red-tailed), Quenda, Chuditch, South-West Brush-tailed Phascogale and Western Brush Wallaby, Rakali, Quokka, Western False Pipistrelle, Peregrine falcon, Dell's Skink, Carter's Freshwater Mussel, Woylie, and Southern Death Adder. This conclusion is based on numerous confirmed recordings of these species within the Study Area various consultancies, including those conducted by GHD, and the strong correlation of these species utilising Jarrah- Marri forest and other identified fauna habitats within the Huntly Study Area. The remaining one species considered likely to occur consisted of the Masked Owl (South-Western).

With regards to the Willowdale Study Area, a total of eight broad fauna habitat types have been recorded and mapped across portions of the Willowdale Mine area, with a similar overall variety and type to that found for the Huntly Study Area. Jarrah – Marri forest is by far the most extensive habitat type making up most of the Study Area, with a total percentage of over 28%. This is followed to a lesser extent by a mix of Blackbutt Forest, Bullich Forest, Flooded Gum Woodland Granite Outcrop, Melaleuca Dampland, Mine Rehabilitation, and Cleared Areas. These habitats provide an array of microhabitats such as logs, hollows, leaflitter, soft sand and dense foliage with a broad range of floristic species providing a range of foraging, roosting, denning and sheltering habitat.

A total of 17 species of conservation significance were assessed as being either likely to occur or known to occur within the Study Area. Specifically, 5 species were assessed as being known to occur within the Study Area, and a further seven species considered likely to occur. The 5 species of conservation significant species known to occur, based on literature reviews, recent GHD and SLR consultancy surveys and recent and historical database records at state and federal level, consist of all three species of black cockatoos (Baudin's, Carnaby's and Forest Red-tailed), Western Brush Wallaby and Rakali. The remaining 12 species determined as being likely to occur consist of the Western False Pipistrelle, Woylie, Southern Death Adder, Dell's Skink, Peregrine Falcon, Masked Owl (South- Western), Carter's Freshwater Mussel, Quenda, Chuditch, South-West Brush-tailed Phascogale, Western Ringtail Possum and Quokka.

6. References

Allen, G.R., Midgley, S.H. and Allen, M. 2002. Field guide to the Freshwater Fishes of Australia. Western Australian Museum, Perth, Western Australia.

ALCOA World Alumina Australia 2010, 'No 40. *Threatened fauna species management plans for Alcoa's bauxite mining operations in the Jarrah forest'*

Bureau of Meteorology 2024, *Climate statistics for Australian locations*, retrieved June 2024, from **http://www.bom.gov.au/climate**

Burgar, JM, Craig, MD & Stokes, VL 2015, '*The importance of mature forest as bat roosting habitat within a production landscape'*, Forest Ecology and Management, vol 356, pp 112-123.

Burgar, JM, Stokes, VL & Craig, MD 2017, '*Habitat features act as unidirectional and dynamic filers to bat use of production landscapes'*, Biological conversations, vol 209, pp 280-288.

Burn 2000, *A Survey of the impact of burning on mammals and birds in Alcoa's rehabilitated Bauxite mines at Jarrahdale*.

Churchill, S 2008, *Australian Bats*, second edition, Milton, Australia, Allen & Unwin.

Cogger, H 2014, *Reptiles and Amphibians of Australia*, Collingwood, Victoria, CSIRO Publishing

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

de Tores, P, Hayward, MW, Dillon, MJ & Brazell, RI 2007, *'Review of the distribution, causes for decline and recommendations for management of the quokka, Setonix bracyurus (Macropodidae: Marsupialia), an endemic macropodid marsupial from south-west Western Australia*', Conservation Science Western Australia, vol 6(1), pp 13-73.

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

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

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

Department of Agriculture Water and Energy (DAWE) 2022. Referral guidelines for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo. Department of Agriculture, Water and the Environment, Canberra.

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

Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2023, *Environmental Protection and Biodiversity Conservation Act* 1999 Protected Matters Search Tool Results, retrieved May 2022, from http://www.environment.gov.au/epbc/pmst/index.html

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

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

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

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

Department of the Environment (DotE) 2015. Referral guideline for 14 birds listed as migratory species under the EPBC Act. Commonwealth of Australia.

Department of Environment and Conservation (DEC) 2012. Chuditch (*Dasyurus geoffroii*) Recovery Plan. Wildlife Management Program No. 54. Department of Environment and Conservation, Perth, Western Australia.

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

de Tores, P, Hayward, MW, Dillon, MJ & Brazell, RI 2007, *'Review of the distribution, causes for decline and recommendations for management of the quokka, Setonix bracyurus (Macropodidae: Marsupialia), an endemic macropodid marsupial from south-west Western Australia*', Conservation Science Western Australia, vol 6(1), pp 13-73.

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

EMRC, 1999. A fauna survey of planned mining areas at Alcoa's Orion Mining region

EMRC, 2001b. A Vertebrate Fauna Survey of rehabilitated areas at Alcoa's Willowdale Mine site

EMRC, 2004. Orion LTFMP report 2004 Final.

EMRC, 2007b. A Vertebrate Fauna Survey of Rehabilitated Areas at Alcoa's Willowdale Minesite

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

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

Environmental Management and Research Consultants (EMRC) 1998, *Long Term Fauna Monitoring Program (1998)*, a report prepared for Alcoa of Australia.

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

Environmental Management and Research Consultants (EMRC) 2004, *'A Vertebrate Survey of Rehabilitated Areas at Alcoa's Huntly Mine site – year 2000 results'*, report prepared for Alcoa of Australia.

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

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

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

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

Environmental Management and Research Consultants (EMRC) 2007a, '*McCoy Long Term Fauna Monitoring Program –results of the 2007 survey*', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2007b, 'A Vertebrate Fauna Survey of Rehabilitated Area's at Alcoa's Huntly Minesite -year 2007 results Final Report', report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2007, *'A Vertebrate Survey of Rehabilitated areas at Alcoa's Willowdale Minesite – Year 2007 results'*, report prepared for Alcoa of Australia.

Environmental Management and Research Consultants (EMRC) 2015, '*Long Term Fauna Monitoring Program Summary of Results at Alcoa's Orion Mining Region'*, report prepared for Alcoa of Australia.

Environmental Protection Authority (EPA) 2016a, '*EPA Technical Guidance –Terrestrial Fauna Surveys'*, Perth.

Environmental Protection Authority (EPA) 2016b, 'EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna', Perth.

Environmental Protection Authority (EPA) 2020, 'EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna', Perth.

EMRC 2015 Long Term Fauna Monitoring Program Summary of Results at Orion Mining region.

Freegard C 2007. Nomination of a Western Australian species for listing as threatened change of Status or delisting: Woylie. Report. Department of Environment and Conservation, Kensington, WA.

GHD 2024a, Terrestrial Fauna Survey Assessment, Holyoake Mine Development – O'Neil. For Alcoa of Australia Limited. Unpublished Report.

GHD 2024b, Terrestrial Fauna Survey Assessment, Holyoake Mine Development – O'Neil East. For Alcoa of Australia Limited. Unpublished Report.

GHD 2024c, O'Neil East Targeted Woylie Assessment. For Alcoa of Australia Limited. Unpublished report.

GHD 2024d, McCoy Haul Road Fauna Pre-clearance Survey. For Alcoa of Australia. Unpublished report

GHD 2024e. Myara pre-clearance targeted fauna assessment. Prepared for Alcoa of Australia. Unpublished Report.

GHD 2023. Fauna Management Plan, Huntly and Willowdale Mines. For Alcoa of Australia Limited. Unpublished Report.

GHD 2023b. Myara North Terrestrial Fauna Pre-Clearance Survey. For Alcoa of Australia Limited. Unpublished Report.

GHD 2022a, Holyoake East Terrestrial Fauna Survey Assessment, Holyoake Mine Development, For Alcoa of Australia. Unpublished report.

GHD 2022b, Holyoake West Terrestrial Fauna Survey Assessment, Holyoake Mine Development, For Alcoa of Australia. Unpublished report.

GHD 2021, Terrestrial Fauna Survey and Black Cockatoo Habitat Assessment for Huntly Mine – Holyoake Pinjarra Alumina Refinery Revised Proposal. For Alcoa of Australia Limited. Unpublished Report

Hohnen, R, Ashby, J, Tuft, K, & McGregor, H 2012, *'Individual identification of northern quolls (Dasyurus hallacatus) using remote cameras'*, Australian Mammalogy, CSIRO Publishing. http://dx.doi.org/10.1071/AM12015.

Johnstone, RE 1997, 'Current studies on three endemic Western Australian cockatoos', Eclectus, vol 3, pp 34--35.

Johnstone, RE & Kirkby, T 1999, '*Food of the Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso in south-west Western Australia', Western Australian Naturalist*, vol 22, pp 167-177.

Johnstone, RE & Storr, GM 1998, Handbook of Western Australian Birds. Volume 1: Nonpasserines (Emu to Dollarbird), Western Australian Museum, Perth.

Johnstone, RE, Kirkby, T & Sarti, K 2017, 'The distribution, status movements and diet of the Forest Red-tailed Black Cockatoo in the south-west with emphasis on the greater Perth regions', Western Australia, Western Australian Naturalist, vol 30 (4), pp 1-193.

Kitchener, DJ 1995, '*Quokka*', In R. Strahan (Ed.) The Mammals of Australia, Australian

Klunzinger MW 2012, 'Ecology, life history and conservation status of Westralunio carteri Iredale 1934, an endemic freshwater mussel of south-western Australia', PHD Thesis, Murdoch University, Perth Western Australia.

Klunzinger, MK, Beatty, SJ, Morgan, DL, & Lymbery, AJ 2012, '*Distribution of Westralunio carteri Iredale, 1934 (Bivalvia: Unionoida: Hyriidae) on the south coast of south-western Australia, including new records of the species'*, Journal of the Royal Society of Western Australia, vol 95, pp 77-81.

Mawson, PR & Johnstone, RE 1997, 'Conservation status of parrots and cockatoos in Western Australia', Eclectus, vol 2, pp 4-9.

Mastrantonis, S, Craig, MD, Renton, M, Kirkby, T & Hobbs, RJ. 2019. *'Climate change indirectly reduces breeding*

McKenzie, N & Start, T. 1999. The Action Plan for Australian Bats 2000. Environment Australia, Canberra, Australia

Menkhorst, P & Knight, F, 2011, *A Field Guide to Mammals of Australia*, third edition, South Melbourne, Australia, Oxford University Press.

Morcombe, M 2014, *Field Guide to Australian Birds,* Steve Parish Publishing, Archerfield, Queensland.

Nevill, SJ 2013, *Birds of Western Australia,* Simon Nevill Publications, Perth, Western Australia.

Pizzey, G & Knight, F 2012, *The Field Guide to the Birds of Australia,* Harper Collins Publishers, Sydney, Australia.

Scida, M and Gration, R 2017, 'Monitoring the threatened brush-tailed phascogale (Phascogale tapoatafa tapoatafa) at Sugarloaf Reservoir, Victoria', Australian Mammalogy, vol 40(2), pp 307-311.

SLR 2024a Huntly – Carter's Freshwater Mussel Targeted Survey, Unpublished

SLR 2024b Huntly Region – Targeted Fauna Survey for Chuditch, Quokka and Woylie, Unpublished

SLR 2024c Huntly Region – Black Cockatoo Habitat Assessment, Unpublished

SLR 2024d Larego Region – Chuditch, Quokka and Woylie Targeted Survey, Unpublished

Stokes, V 2011 Orion Long Term Fauna Monitoring Program

Stokes, V 2012, 'Vertebrate Fauna Survey of Planned Mining Areas at Alcoa's Keats Mining Region 2011/12', Internal report for Alcoa of Australia.

Van Dyck, S & Strahan, R 2008, *The Mammals of Australia*, fourth edition, Sydney, Australia, New Holland Publishers.

Way, S, Stokes, V & Majer, J 2013, *'McCoy Long Term Fauna Monitoring Program Report of the 2013 Field Survey'*, report prepared for Alcoa of Australia by Environmental Research Department

Western Environmental 2023. Willowdale Mine Black Cockatoo Targeted Assessment, Unpublished

Wilson, S & Swan, G 2021, *A Complete Guide to Reptiles of Australia*, Sixth edition, Sydney, Australia, New Holland Press.

Appendices

Appendix A

Relevant legislation, background information and conservation codes

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

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

The biological aspects listed as MNES include:

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

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

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

State *Environment Protection Act 1986*

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

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

1. Native vegetation should not be cleared if it comprises a high level of biodiversity.
2. Native vegetation should not be cleared if it comprises the whole or a part of or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.
3. Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.
4. Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.
5. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
6. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
7. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
8. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
9. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
10. Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

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

State *Biodiversity and Conservation Act 2016*

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

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

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

State *Biosecurity and Agriculture Management Act 2007*

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

– Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA.
– Manage the impact and spread of those pests already present in the state.
– Safely manage the use of agricultural and veterinary chemicals
– Increased control over the sale of agricultural products that contain violative chemical residues.

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

Fauna Conservation codes

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

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

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

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

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

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

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

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

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

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with criteria set out in section 20 and the ministerial guidelines.
Endangered (EN)	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines.

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

Conservation codes for DBCA listed Priority fauna

Priority category	Definition
Priority 1	Poorly-known taxa Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	Poorly-known taxa Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	Poorly-known taxa Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

Priority category	Definition
Priority 4	Rare, Near Threatened and other taxa in need of monitoring Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant fauna

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

References

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

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

EPA 2010, Technical Guide – Terrestrial Fauna Surveys, EPA, Perth.

Appendix B

Desktop Based EPBC and BC Act Guidelines and Fauna Species Classifications and Likelihood of Occurrence

Fauna likelihood of occurrence assessment guideline and definitions

Fauna Likelihood of occurrence assessments

Species recorded from studies and database searches

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

Fauna Likelihood of Occurrence assessment guidelines

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

Source information - desktop searches

NM – *DBCA Naturemap (Dandjoo)/Dandjoo* (accessed August 2024)

PMST – DAWE Protected Matters Search Tool (PMST) to identify fauna listed under the EPBC Act potentially occurring within the Study Area (accessed August 2024).

Definitions

Term	Description
Database search area	A 20 km buffer around the Study Area
Study Area	the area subject to the current survey
CR	Critically endangered under the EPBC Act or BC Act
EN	Endangered under the EPBC Act or BC Act
VU	Vulnerable under the EPBC Act or BC Act
IA	Migratory birds protected under an international agreement
MI, MA	Migratory, Marine
CD	Conservation dependent fauna
OS	Other specially protected fauna under the BC Act

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

Fauna Likelihood of Occurrence assessment of significant species relevant to the Huntly Study Area

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Atrichornis clamosus	Noisy Scrub-bird	EN	EN	The Noisy Scrub-bird inhabits areas with dense understorey or lower stratum of sedges and shrubs, dense leaf litter and abundant litter-dwelling invertebrates. It mainly occurs in low closed forests 5–15 m in height that are dominated by Eucalyptus or Agonis and *Banksia littoralis*, and occur in the steep and wetter gullies, and drainage lines of hills and granite mountains (Eucalyptus), and on the margins of freshwater lakes (Agonis and *B. littoralis*). It is also common in low closed forests up to 5 m in height that are dominated by *Hakea elliptica*, Eucalyptus or Agonis and *B. littoralis* and occur around granite outcrops, in shallower and drier gullies and on the margins of freshwater lakes. It mostly occurs at sites that have not been burnt for 10 or more years. It occurs at two locations in the south west; on the mainland in coastal areas from Two Peoples Bay Nature Reserve to Cheyne Beach, and on Bald Island (DAWE 2022b).	**Unlikely.** Some historical relocation attempts within the wider region have occurred, but no reliable recordings for the species have been made within the Huntly Study Area	PMST, Naturemap (Dandjoo), DBCA, EMRC
Botaurus poiciloptilus	Australasian Bittern	EN	EN	The Australasian Bittern's preferred habitat is wetlands with tall dense vegetation. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. *Phragmites*, *Cyperus*, *Eleocharis*, *Juncus*, *Typha*, *Baumea*, *Bolboschoenus*) or cutting grass (*Gahnia*) growing over a muddy or peaty substrate. In the South-West, the Bittern is largely confined to coastal areas, especially along the south coast. It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum *Muehlenbeckia*, cane grass *Eragrostis* or other dense vegetation (Marchant 1990). They can be found in reed beds near Two Peoples Bay, in lakes near Mt Manypeaks, and the Lake Muir area (Nevill 2013).	**Highly Unlikely.** Suitable habitat for the species does not occur within the Huntly Study Area.	Naturemap(Dandjoo), DBCA,
Calidris ferruginea	Curlew Sandpiper	CR	CR	Curlew Sandpipers mainly occur in areas with soft mud conditions, including intertidal mudflats in	**Highly Unlikely**	PMST, Naturemap(Dandjoo), DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are found inland less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. In WA, they are widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division but are more sparsely distributed between Carnarvon and Dampier Archipelago (DAWE 2021e). They are common on the Swan Coastal Plain, particularly near large drying lakes like Thompson and Forrestdale, and Peel Inlet. They are less common along the southern coast to Esperance (Nevill 2013).	The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	
Calidris ruficollis	Red-necked Stint	MI	MI	The Red-necked Stint breeds in north-eastern Siberia and northern and western Alaska. It follows the East Asian-Australasian Flyway to spend the southern summer months in Australia. It is found widely in Australia, except in the arid inland. In Australia, Rednecked Stints are found on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores (Pizzey and Knight 2012).	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	PMST, Naturemap(Dandjoo), DBCA
Calidris subminuta	Long-toed Stint	MI	MI	In WA the species is found mainly along the coast, with a few scattered inland records. On the south coast the Long-toed Stint is found from Esperance to Albany and inland to Lake Cassencarry and Dumbleyung. On the south-west coast the species is known from the Vasse River estuary, Guraga Lake and the Namming Nature Reserve. The species has occasionally been recorded in the Gascoyne Region, around Lake Wooleen, Meeberrie Station and McNeill Claypan. It is widespread around the Pilbara region and the Kimberley Division between Karratha and Wyndham-Kununurra (DEE 2019b). It occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes,	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	PMST, Naturemap(Dandjoo), DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				swamps, river floodplains, streams, lagoons and sewage ponds.		
Calidris tenuirostris	Great Knot	CR	CR	The Great Knot has been recorded around the entirety of the Australian coast, with a few scattered records inland. It is now absent from some sites along the south coast where it used to be a regular visitor (Garnett and Crowley 2000). The greatest numbers are found in northern Australia; where the species is common on the coasts of the Pilbara and Kimberley, from the Dampier Archipelago to the Northern Territory border, and in the Northern Territory from Darwin and Melville Island, through Arnhem Land to the south-east Gulf of Carpentaria. In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbors, estuaries, and lagoons (DEE 2019b).	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	PMST, Naturemap(Dandjoo), DBCA
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	VU	The Forest Red-tailed Black Cockatoo inhabits the dense Jarrah, karri, and Marri forests receiving more than 600 mm annual average rainfall but also occurs in a range of other forest and woodland types, including Blackbutt (*E. patens*), Wandoo (*E. wandoo*), Tuart (*E. gomphocephala*), Albany Blackbutt (*E. staeri*), Yate (*E. cornuta*), and Flooded Gum (*E. rudis*) (DAWE 2021b). Habitats tend to have an understorey of balga (*Xanthorrhoea* spp.), kingia (*Kingia australis*), snottygobble (*Persoonia* spp.), parrot bush (*Banksia sessillis*), holly-leaved mirbelia (*Mirbelia dilatata*), bull banksia (*B. grandis*), bullich (*Taxandria* spp.) and sheoak (*Allocasuraina fraseriana*). They are most common in the Jarrah forest region of the northern Darling Range from Collie north to Mundaring and are very local throughout the lower south-west. They can be found on the Swan Coastal Plain, mainly in search of food the exotic white cedar (*Melia azedarach*). There are also several small, isolated populations in the eastern parts of its range (DAWE 2021b).	**Known.** This species has been recorded during surveys from several consultants via remote cameras and several locations. The Huntly Study Area provides suitable roosting, foraging and potential breeding habitat to support this species, notably Jarrah-Marri forest and additional habitats such as BlackButt Forest.	NatureMap(Dandjoo), PMST, DBCA GHD, SLR Western Environmental, Stokes, EMRC

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Charadrius leschenaultii	Greater Sand Plover	VU	VU	In Australia, the Greater Sand Plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia, especially the north-west (Marchant & Higgins 1993). In northern Australia, the species is especially widespread between North West Cape and Roebuck Bay in WA; there are sparsely scattered records from the largely inaccessible area between Roebuck Bay and Darwin, but it often occurs in the Top End of the Northern Territory, including on Groote Eylandt (DCCEEW 2022).	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	PMST, Naturemap/Dandjoo, DBCA
Chlidonias leucopterus	White-winged Tern	MI	MI	White-winged Black Terns are non-breeding migrants to Australia from the North. They arrive anywhere along the tropical coast of Australia and disperse around basically the entire Australian seaboard, including the East coast of Tasmania and many small offshore islands. They can be found farther inland, in parts of the Great Dividing Range and in particular in the central part of the Murray-Darling Basin near the NSW/VIC border. There are also White-winged Black Terns in an area around Perth, WA. Elsewhere on the continent White-winged Black Terns are found only rarely, and never in the great deserts of WA/SA/NT or the Nullarbor. White-winged Black Terns live around lakes including ephemeral lakes, in estuaries and in coastal waters.	**Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	PMST, Naturemap/Dandjoo, DBCA
Zanda baudinii	Baudin's Black Cockatoo	EN	EN	Baudin's Black Cockatoo mainly occurs in eucalypt forests, especially Jarrah, Marri and karri forest that receives 750 mm of annual rainfall. The species is less frequently in woodlands of wandoo (*Eucalyptus wandoo*), blackbutt (*E. patens*), flooded gum (*E. rudis*), yate (*E. cornuta*), partly cleared farmlands and urban areas. The range of the species extends from Albany northward to Gidgegannup and Mundaring (east of Perth), and inland to the Stirling Ranges and near Kojonup. Preferred roosts are in areas with a dense canopy close to permanent sources of water (DAWE 2021c).	**Known.** This species has been recorded during surveys from several consultants opportunistically and via remote cameras at several locations. The Huntly Study Area provides suitable roosting and foraging habitat to support this species.	Naturemap (Dandjoo), PMST, DBCA , GHD, SLR, Western Environmental, Stokes

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Zanda latirostris	Carnaby's Black Cockatoo	EN	EN	Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain Salmon gum, Wandoo, Marri, Jarrah and Karri, and in shrubland or kwongan heathland dominated by Hakea, Dryandra, Banksia and Grevillea species. Breeding activity is restricted to eucalypt woodlands mainly in the semiarid and subhumid interior, from Kalbarri in the north, Three Springs District south to the Stirling Range, west to Cockleshell Gully and east to Manmanning. The species has expanded its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp and into the tuart forests of the Swan Coastal Plain, including the Yanchep area, Lake Clifton and near Bunbury. It nests in trees older than 120-150 years (DAWE 2021d).	**Known.** This species has been recorded during surveys from several consultants via remote cameras and several locations. The Huntly Study Area provides suitable roosting, foraging, and potential breeding habitat to support this species.	Naturemap (Dandjoo), PMST, DBCA , GHD, SLR, Western Environmental
Falco peregrinus macropus	Peregrine Falcon	OS	-	The Peregrine Falcon is found on and near cliffs, gorges, timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings, though less frequently in desert regions (Morcombe 2004; Pizzey & Knight 2012). They are not common but can be found almost anywhere throughout WA and in the southwest, including particularly at Fitzgerald River, Stirling Range, Porongurup National Parks, Kondinin, and Peak Charles, with many more locations north of Perth (Nevill 2013).	**Known** Recent records from 2024 from within the region, including GHD, recorded within the Huntly Study Area, and suitable foraging habitat and prey species are known within the area, along with DBCA recordings within the Study Area.	Naturemap/Dandjoo, DBCA, GHD,
Glareola muldivarum	Oriental Pratincole	MI	MI	Non-breeding habitat only: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodlands. Frequently at edges or ecotones between habitat types. Riparian forest is favoured habitat in the Kimberley region. Typically in denser vegetation with more closed canopy (DCCEEW 2023).	**Unlikely.** No significant suitable foraging habitat and prey species are known within the area.	PMST, Naturemap/Dandjoo, DBCA
Hydropogne caspia	Caspian Tern	MI	MI	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands	**Highly Unlikely**. The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species	PMST, NatureMap/Dandjoo, DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs (DEE 2019b).	within the Huntly Study Area are very rare	
Leipoa ocellata	Malleefowl	VU	VU	The Malleefowl generally occurs in semi-arid areas of WA, in shrublands and low woodlands that are dominated by mallee vegetation, as well as native pine Callitris woodlands, Acacia shrublands, paperbark, sheoak, Broombush *Melaleuca uncinata* vegetation, eucalypt woodlands, or coastal heathlands. Mostly they are found where there are sandy or gravel soils. The nest is a large mound of sand or soil and organic matter (Jones & Goth 2008; Morcombe 2014; Nevill 2013). In WA they are found from the southwest Nullarbor to Albany, north, and then west from Moore River up to Shark Bay, past Cue, across to Wiluna and east to the northern Victoria Desert south of the Blackstone Ranges (Nevill 2013; Pizzey & Knight 2012).	**Unlikely** Regional records are historical. The Study Area does not contain suitable undisturbed habitat to support this species. The area is too readily logged and burnt to persist in the area.	Naturemap (Dandjoo), Dandjoo,PMST & DBCA
Limosa lapponica	Bar-tailed Godwit	MI	MI	Bar-tailed Godwits arrive in Australia each year in August from breeding grounds in the northern hemisphere. Birds are more numerous in northern Australia Bar-tailed Godwits inhabit estuarine mudflats, beaches and mangroves. They are common in coastal areas around Australia. They are social birds and are often seen in large flocks and in the company of other waders (Birdlife Australia 2019).	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	PMST, Naturemap/Dandjoo, DBCA
Limosa limosa	Black-tailed Godwit	MI	MI	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	Naturemap/Dandjoo, DBCA, PMST

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near coastal, wetlands; such as saltmarsh, salt flats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies 1996).		
Numenius madagascariensis	Eastern Curlew	CR	CR	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, sometimes within the mangroves, and in coastal saltworks and sewage farms. In the south west, Eastern Curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet (Marchant & Higgins 1993). They are uncommon further south of Geraldton, but can be spotted in Alfred Cove, Peel Inlet and the Albany region (Nevill 2013).	**Highly Unlikely** The Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	DBCA, Naturemap/Dandjoo & PMST
Oxyura australis	Blue-billed duck	P4	-	The blue-billed Duck is a small Australian almost entirely aquatic duck, with both the male and female growing to a length of 40 cm. The male has a slate-blue bill which changes to bright blue during the breeding season. The Blue-billed Duck is endemic to Australia's temperate regions, ranging from the South-West of WA, extending to southern Queensland, through New South Wales and Victoria, to Tasmania. The species is readily seen on freshwater lakes and billabongs where deep fresh water is present (Morcombe 2004).	**Unlikely.** While database records for the species do exist in the wider areas surrounding the Huntly Study Area, suitable freshwater sources and lakes and wetlands are not present for persistent species presence.	DBCA, Naturemap/Dandjoo
Pandion cristatus	Osprey	MI	MI	The breeding range of the Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in WA to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South	**Unlikely.** While database records for the species do exist in the wider areas surrounding the Huntly Study Area, suitable coastal environments and	DBCA, Naturemap/Dandjoo

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island. Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (DCCEEW 2022).	feeding and nesting habitats are not present for persistent species presence.	
Philomachus pugnax	Ruff	MI	MI	In Australia the Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and flood-lands. They are occasionally seen on sheltered coasts, in harbours, estuaries, seashores and are known to visit sewage farms and saltworks. They are sometimes found on wetlands surrounded by dense vegetation including grass, sedges, saltmarsh and reeds. They have been observed on sand spits and other sandy habitats including shingles. The Ruff forages on exposed mudflats, in shallow water and occasionally on dry mud. They have been observed foraging in dry waterside plants and in swampy areas next to aeration tanks in sewage farms. They prefer to roost amongst shorter vegetation (Higgins & Davies 1996).	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	DBCA, Naturemap/Dandjoo
Plegadis falcinellus	Glossy Ibis	MI	MI	The Glossy Ibis' preferred habitat for foraging and breeding are freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes, and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat are in inland and northern floodplain areas (Marchant and Higgins 1990).	**Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species have been on the outskirts of the current Huntly Study Area buffer zone.	DCBA, Naturemap/Dandjoo
Pluvialis fulva	Pacific Golden Plover	MI	MI	The Pacific Golden Plover breeds on the Arctic tundra in western Alaska. It winters in South America and islands of the Pacific Ocean to India, Indonesia and Australia. In Australia it is widespread along the coastline. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	DBCA, Naturemap/Dandjoo

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks. The species is also sometimes recorded on islands, sand and coral cays and exposed reefs and rocks (DEE 2019b).		
Pluvialis squatarola	Grey Plover	MI	MI	The Grey Plover breeds around the Arctic regions and migrates to the southern hemisphere, being a regular summer migrant to Australia, mostly to the west and south coasts. It is generally sparse but not uncommon in some areas. It is occasionally found inland. It is almost entirely coastal, being found mainly on marine shores, inlets, estuaries and lagoons with large tidal mudflats or sandflats for feeding, sandy beaches for roosting, and also on rocky coasts (Birdlife Australia 2019).	**Highly Unlikely.** the Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	DBCA, Naturemap/Dandjoo
Thalasseus bergii	Greater Crested Tern	MI	MI	Crested Terns occur singularly or in flocks in coastal areas, estuaries, inlets, islands and occasionally on large inland lakes or rivers. They are often seen perching with gulls on beaches, sand spits or jetties. Crested Terns are widespread from the south coast of Africa north to Asia, south to Australia and east to Polynesia. They also occur on many islands in the Indian and Pacific Oceans (DEE 2018).	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	DBCA, Naturemap/Dandjoo
Tringa brevipes	Grey-tailed Tattler	MI	MI	Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found in most coastal regions. It is found in the south-west between Augusta and Cervantes (DAWE 2021d).	**Highly Unlikely** The Huntly Study Area lacks suitable wetland or shoreline habitat.	Naturemap (Dandjoo), DBCA
Tringa glareola	Wood Sandpiper	MI	MI	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. Wood Sandpipers are more numerous in the north than the south of Australia and are also found in New Guinea, Africa, the Indian subcontinent and South-east Asia. They breed widely across the north of Europe and Asia, mostly in Scandinavia, Baltic countries and Russia.	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	Naturemap (Dandjoo), DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				They are the most abundant migratory wader in non-coastal areas of Asia (DEE 2019b).		
Tringa nebularia	Common Greenshank	MI	MI	The Common Greenshank is a heavily built, elegant wader, 30–35 cm in length, with a wingspan of 55–65 cm and weight up to 190 g for both males and females. The bill is long and slightly upturned and the legs are long and yellowish-green. In flight, all plumages show uniformly dark upper-wing and contrasting white rump extending in a white wedge up the back, whitish tail and tips of toes projecting slightly beyond the tip of the tail. The sexes are alike (Higgins & Davies 1996). The species is seen singly or in small to large flocks (sometimes hundreds) in a variety of coastal and inland wetlands. The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies 1996). It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberleys it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago (Higgins & Davies 1996).	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	Naturemap (Dandjoo), DBCA
Tringa stagnatilis	Marsh Sandpiper	MI	MI	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats (Higgins & Davies 1996), although surveys in Kakadu National Park recorded more birds around shallow freshwater lakes than in areas influenced by tide. At the Top End they often use ephemeral pools on inundated freshwater and tidal floodplains	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	Naturemap (Dandjoo), Dandjoo, DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				(Higgins & Davies 1996). They are found infrequently around mangroves (Higgins & Davies 1996).		
Tyto novaehollandiae novaehollandiae	Masked Owl (southern sub species)	P3	-	The Masked Owl is found in forests (wet and dry sclerophyll, non-eucalypt dominated), open woodlands, farmlands or scrub with large trees (12-20 m) and adjacent cleared country, timbered watercourses, paperbark woodlands, and caves (Pizzey & Knight 2012). It requires large hollows in old growth eucalypts or bare sand or the earth of a cave for nesting, and often favours areas with dense understorey or ecotones comprising dense and sparse ground cover. It is often recorded foraging within 100-300 m of the boundary of two vegetation types (Bell & Mooney 2002). The bird is restricted to the thicker humid forests of the southwest region, particularly in the Pemberton and Manjimup area and along the Murray River in the Lane Poole area (Kavanagh & Murray 1996). It nests in hollows in large Karri (*Eucalyptus diversicolor*), Marri (*Corymbia calophylla*) and Jarrah (*E. marginata*) trees (Nevill 2013).	**Known** This species is known to occur in the region. Suitable habitat occurs within the Huntly Study Area. This species was recorded in the O'Neil section of the overall Alcoa region.	Naturemap (Dandjoo), DBCA &GHD
Apus pacificus	Fork-tailed Swift	Mi	Mi	The Fork-tailed Swift is common in coastal and sub coastal areas between Carnarvon and Augusta including near and offshore islands. There are scattered records along south coast from Denmark east to Cocklebiddy on the Great Australian Bight, and sparsely scattered records inland. They are found across a range of habitats, from inland open plains to wooded areas. They are most often observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas. They have been recorded well out to sea as well as from offshore islands especially when on passage from Indonesia. This species is almost exclusively aerial (DotE 2015).	**Unlikely** The species is occasionally observed in the south-west of WA but roosting infrequently. May occasionally fly over Huntly Study Area.	PMST
Rostratula australis	Australian Painted Snipe	En	En	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and	**Highly Unlikely** The Huntly Study Area lacks suitable wetlands, and the	PMST

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire. It sometimes use areas that are lined with trees, or that have some scattered fallen or washed-up timber (DAWE 2021e). In the south west it can be found around Carnarvon and wetlands north of Perth, particularly those west of Moora and Gingin (Nevill 2013).	species is not typically known from this region.	
Motacilla cinerea	Grey Wagtail	Mi	Mi	The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia (Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DAWE 2021e). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in forest and open country; but occurs almost anywhere during migration (Johnstone & Storr 2004).	**Highly Unlikely** The Huntly Study Area lacks suitable habitat, and the species is not typically known from this area.	PMST
Actitis hypoleucos	Common Sandpiper	Mi	Mi	The Common Sandpiper is found along all coastlines of Australia and uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around often narrow and steep muddy margins or rocky shores. The species has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, mangroves, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. It is often found near mangroves, and sometimes in areas of mud littered with rocks or snags (DAWE 2021e). They are somewhat uncommon in the south west, but can be found on Rottnest and Penguin Islands, and along the south coast all the	**Highly Unlikely** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Study Area are very rare.	PMST, Naturemap/Dandjoo, DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				way to the Esperance region, including the inland lakes like Lake Warden (Nevill 2013).		
Calidris acuminata	Sharp-tailed Sandpiper	Mi	Mi	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. Sometimes they occur on rocky shores (DAWE 2021e). They are found throughout many wetlands on the Swan Coastal Plain, in Perth lakes with wet grassed margins and receding waters, Vasse and Harvey Estuaries, and the Busselton wetlands, but are less common on the south coast until the Esperance region (Nevill 2013).	**Highly Unlikely** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	PMST, DBCA, Naturemap/Dandjoo,
Calidris canutus	Red Knot	EN	EN	In Australasia, the Red Knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (DCCEEW 2022).They are found near mudflats and estuaries from Murchison to Bunbury but are then uncommon from Wilson Inlet to Esperance. In the Perth region they are mainly found in Alfred Cove and Peel Inlet (Nevill 2013).	**Highly Unlikely.** The Huntly Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	PMST, Naturemap/Dandjoo, DBCA
Calidris melanotos	Pectoral Sandpiper	Mi	Mi	In Australia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at	**Highly Unlikely**	PMST, Naturemap/Dandjoo,DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The bird can be seen on the Swan Coastal Plain but is rare to scarce on Lake Thompson, and as well on any freshwater wetland in the southwest with shallow, well-grassed margins. They are seen at Lake Warden, Esperance, and at Lake McLarty (Nevill 2013).	The Study Area lacks suitable wetland or shoreline habitat, and recordings of the species within the Huntly Study Area are very rare.	
MAMMALS						
Bettongia penicillata ogilbyi	Woylie	CR	CR	Preferred habitat for the Woylie includes dense undergrowth, logs and rock-cavities and occasionally in burrows (Burbidge 2004). Scattered Woylie populations may be found throughout the Jarrah forest in the south-west corner of WA. Extant naturally occurring populations of the species are restricted to three small wheatbelt reserves – Dryandra Woodland, Tutanning Nature Reserve and Perup Forest. All are characterised by the presence of thickets of the plant *Gastrolobium* (Van Dyck and Strahan 2008). The species is now restricted to forests and areas where predation has been controlled (or excluded). It rests during the day in a well-concealed nest, built over a shallow depression. The nest is most commonly built using long strands, of grasses, but other material such as strips of bark are also used (in the forest) or dried seagrass and/or triodia (in arid coastal areas) (Freegard 2007).	**Known** Woylies were recorded in the Alcoa operations area of the O'Neil region in 2023, and additional confirmed recordings of the species were made in the O'Neil region by Spectrum in 2024. Additional DBCA records have also been made within the Huntly Study Area.	Naturemap/Dandjoo, PMST, & DBCA, GHD and Spectrum
Dasyurus geoffroii	Chuditch	VU	VU	The Chuditch inhabits eucalypt forest (especially Jarrah, *Eucalyptus marginata*), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. They also occur at lower densities in drier woodland and mallee shrubland in the goldfields and wheatbelt, as well as in Kalbarri National Park (translocated). Chuditch require	**Known** This species has been recorded during surveys from several consultants via remote cameras and several locations. The Huntly Study Area provides suitable denning and	Naturemap/Dandjoo, PMST, DBCA, GHD, SLR, Stokes, EMRC,

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) to survive (DEC 2012b). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest (Van Dyck & Strahan 2008). The species can travel large distances, and for this reason requires habitats that are of a suitable size and not excessively fragmented.	foraging/hunting habitat to support this species.	
Hydromys chrysogaster	Rakali, Water-rat	P4	-	The Water Rat lives in the vicinity of permanent bodies of fresh, brackish, or marine water, lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. In the south-west of WA they have been shown to prefer areas with riparian vegetation, better water quality and a degree of habitat complexity. Woody debris, rock ledges and wetland islands are likely to be important areas for feeding and refuge (DEC 2012a). It is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck & Strahan 2008).	**Known** DBCA records of the species within the Study Area and confirmed recordings made from previous surveys within the Huntly Study Area, particularly through Dandalup Dam.	Naturemap/Dandjoo, DBCA, SLR, GHD.
Falsistrellus mackenziei	Western False Pipistrelle	P4	-	The Western False Pipistrelle occurs in wet sclerophyll forest dominated by Karri, and in the high rainfall zones of the Jarrah and Tuart dry sclerophyll forests. The species is restricted to areas in or adjacent to stands of old growth forest. Marri, Sheoak and Peppermint are often codominant at its collection localities (Churchill 2008; McKenzie and Start 1999).	**Known** This species is known from this region. Suitable habitat of Jarrah – Marri woodland is found within the Huntly Study Area. Furthermore, the species has also been recorded in the O'Neil site of the overall Alcoa project region.	Naturemap, Dandjoo, DBCA & GHD
Isoodon fusciventer	Quenda (Southern Brown Bandicoot)	P4	-	The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck & Strahan 2008).	**Known** This species has been recorded during surveys from several consultants via remote cameras at several locations. The Huntly Study Area provides suitable denning and foraging/hunting habitat to support this species.	Naturemap/Dandjoo, DBCA &GHD, SLR,, Stokes

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Myrmecobius fasciatus	Numbat	EN	EN	Current Numbat populations occupy several different habitat types: upland Jarrah forest, open eucalypt woodland, banksia woodland and tall closed shrubland. The only remaining original subpopulations are at Dryandra Woodland and the Upper Warren area (including Tone Perup Nature Reserve, Greater Kingston National Park and adjoining State Forest). In WA there are nine translocation sites, including Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve (see DPaW 2015 for complete list and details). At Dryandra, numbats inhabit brown mallet (*Eucalyptus astringens*) plantations. Habitats usually have an abundance of termites in the soil, and hollow logs, tree hollows, burrows and branches for shelter (DAWE 2021e; Van Dyck & Strahan 2008).	**Potential** Historical records include the region. A resident population occurs in the Narrogin area and re-introduced population at Boyagin rock. However, no records of the species have been made from studies within the Study Area.	Naturemap/Dandjoo & DBCA,.
Notamacropus eugenii	Tammar Wallaby	P4	-	This Tammar wallaby is a smaller species of true macropod reaching a maximum of 7kg and a grey-brown coat with a distinctive dark mid-line on the forehead. The species has a preference for dense, coastal heath and scrub, with some dry sclerophyll forests with significant cover. Their current distribution across Western Australia is limited to Dryandra, Tutanning and Perup forests, and offshore islands of Garden, Middle and Recherche Archipelago (Menkhorst & Knight, 2004).	**Unlikely.** Some suitable habitat for the species does occur within the Huntly Study Area but records of the species and it's known and current distributions are outside of the current Huntly Study Area and no records have been made from surveys conducted.	DBCA, Naturemap/Dandjoo
Notamacropus irma	Western Brush Wallaby	P4	-	The Western Brush Wallaby is found primarily in open forest or woodland, particularly favouring open, seasonally- wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland and is uncommon in karri forest (DEC 2011; Van Dyck & Strahan 2008).	**Known** This species has been recorded during surveys from several consultants via remote cameras at several locations. The Huntly Study Area provides suitable denning and foraging/hunting habitat to support this species, especially Jarrah-Marri forest.	Dandjoo, DBCA & GHD, SLR, EMRC, Stokes
Phascogale tapoatafa wambenger	South-west Brush Tailed Phascogale	CD	-	The Brush-tailed Phascogale is sparsely distributed outside the semi-arid zone in dry sclerophyll forest and monsoonal forest and woodland. The species is generally rare and threatened by habitat	**Known** This species has been recorded during surveys from several	Dandjoo, DBCA & GHD, SLR

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				fragmentation in the south west of WA. (Scida et al 2017). Habitat varies but forest or woodlands is required with large trees to provide hollows and cover. Canopy connection provides excellent cover and connectivity for the species to mover through their environment (Scida et al 2017).	consultants via remote cameras and several locations. The Huntly Study Area provides suitable denning and foraging/hunting habitat to support this species, especially Jarrah-Marri forest.	
Pseudocheirus occidentalis	Western Ringtail Possum	CR	CR	The Western Ringtail Possum occurs in coastal and near coastal and Peppermint Tree (*Agonis flexuosa*) forest and Tuart (*Eucalyptus gomphocephala*) dominated forest with a Peppermint Tree understorey from Bunbury to Albany. Also occurs in Jarrah (*E. marginata*) forest and Jarrah-Marri *(Corymbia calophylla*) forest associated with Peppermint Tree (Van Dyck & Strahan 2008).	**Potential** This species has been recorded recently within neighbouring Alcoa sites at Larego, and DBCA records are also present historically. However, previous surveys within the Huntly Study Area have not recorded the species and previous surveys of areas such as Myara North have indicated that suitable habitat does not occur for a significant population.	Naturemap/Dandjoo & DBCA, SLR (Pers Comm.)

Setonix brachyurus	Quokka	VU	VU	The current distribution of the Quokka includes Rottnest and Bald Islands, and at least 25 sites on the mainland, including Two Peoples Bay Nature Reserve and Torndirrup, Mt Manypeaks and Walpole-Nornalup National Parks, and swamp areas through the south-west forests from Jarrahdale to Walpole. The last known population on the Swan Coastal Plain occurs in Muddy Lakes near Bunbury. Quokkas have also been reintroduced to Karakamia Sanctuary (DEC 2013). They occupy dense forests and thickets, streamside vegetation, heaths, shrublands, *Agonis linearifolia*-dominated swamps in the Jarrah (*Eucalyptus marginata*) forest, and sometimes tea-tree thickets on sandy soils along creek systems. The northern extent on the mainland is in the Jarrah forest immediately south-east of the Perth metropolitan area, from where it extends southward through the southern Jarrah, Marri and Karri forests to the south coast, but largely confined throughout	**Known** This species was recorded during surveys across the Alcoa O'Neil areas. The Study Area looks to provided suitable breeding and foraging habitat to support this species within the low lying and riparian areas which lies adjacent to the Study Areas, especially Jarrah-Marri forest.	Naturemap (Dandjoo), PMST, DBCA, SLR, GHD
				to areas receiving an annual rainfall of 1,000 mm or more (DEC 2013; Van Dyck & Strahan 2008).		
REPTILES						
Acanthophis antarcticus	Southern Death Adder	P3	-	The Southern Death Adder habitat ranges from rainforest to shrublands and heaths. This species is declining in many areas, probably due to habitat destruction and altered fire regimes (Wilson & Swan 2021).	**Likely** Known to occur locally albeit patchily within northern Jarrah forests. Habitat is present for this species, even though was not recorded during the surveys.	GHD, Naturemap/Dandjoo, DBCA
Aspidites ramsayi	Woma Python	P1	-	The Woma is one of 13 native species of python in Australia and one of two members of the Aspidites genus. The species reaches a maximum of 2m in length, and has a distinctive brown striped markings across a sandy-coloured body and marked yellow head. It's habitat preference ranges from sub-humid and arid interior sandy dune systems to spinifex-based woodlands and shrublands with distributions across the North West of WA to the interior, and a small, increasingly rare distribution to in the Wheatbelt region of the South-West (Wilson & Swan, 2013).	**Highly Unlikely.** Suitable habitat for the species such as dry, sandy burrowing systems and dune-type habitat types are not present, and species records in the area are very rare and not considered part of the species typical distribution and range.	DBCA

Ctenotus delli	Dell's Skink	P4		Dell's Skink is associated with Jarrah-Marri woodland that has a shrub-dominated understorey, on laterite, sandy or clay soils. It is found in the north Darling Range and inhabits dry sclerophyll forest on granite outcrops, stony hills and ranges. It is absent from the Swan Coastal Plain (Cogger 2014; Wilson & Swan 2021).	**Known.** The Study Area contains suitable habitat such as granite and lateritic clay to support this species and recent records from the O'Neil Region of the Alcoa operations area by GHD. Furthermore, DBCA and Dandjoo records of the species have been confirmed within the Study Area.	Naturemap/Dandjoo, DBCA, GHD
FISH						
G*eotria australis*	Pouched Lamprey	P3	-	This species utilises freshwater streams in the south west (Perth to Albany) to breed and grow before migrating to the ocean to mature (Allen *et al*. 2002). Dams and weirs are the main obstacles for the species. Sporadic records exist throughout the	**Highly Unlikely** The Huntly Study Area lacks suitable water ways and presumed locally extinct	Natureamap/Dandjoo & DBCA
				South West Coast Drainage Division between Perth and Albany including the Swan, Canning, Serpentine, Margaret, Donnelly, Warren and Goodga rivers.	upstream of South Dandalup Dam.	
INVERT						
Westralunio carteri	Carter's Freshwater Mussel	VU	VU	Carter's Freshwater Mussel is usually found in freshwater river pools. They are most common in areas with muddy, silty and sandy bottoms and flowing permanent water. Environmental tolerances of *W. carteri* are not precisely known but they can be found where water temperatures range from 4° C to over 30° C. Formerly this species occurred widely through the southwest including interior rivers of southwest such as Avon, Murray and Blackwood, however Salination of many waterways has severely reduced this species distribution (Klunzinger 2012; Klunzinger, et al. 2012).	**Known** Confirmed records of the species in the O'Neil region of the Alcoa operations, and additional recent recordings from DBCA within the Study Area.	PMST, Naturemap/ (Dandjoo), DBCA, GHD

Fauna Likelihood of Occurrence assessment of significant species relevant to the Willowdale Study Area

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Anous stolidus	Common Noddy	MI	MI	The Common Noddy is found in tropical and sub-tropical seas off the west, north and east coasts of Australia, from the Abrolhos Islands in WA to the islands of the Great Barrier Reef in Qld, as well as Norfolk and Lord Howe Islands. Some are seen almost annually in NSW as far south as Sydney. It also ranges across tropical parts of the Pacific, Indian and Atlantic Oceans (DCCEEW 2022).	**Highly Unlikely.** Suitable habitat for the species does not occur within the Willowdale Study Area on a meaningful scale.	PMST
Atrichornis clamosus	Noisy Scrub-bird	EN	EN	The Noisy Scrub-bird inhabits areas with dense understorey or lower stratum of sedges and shrubs, dense leaf litter and abundant litter-dwelling invertebrates. It mainly occurs in low closed forests 5–15 m in height that are dominated by Eucalyptus or Agonis and *Banksia littoralis*, and occur in the steep and wetter gullies, and drainage lines of hills and granite mountains (Eucalyptus), and on the margins of freshwater lakes (Agonis and *B. littoralis*). It is also common in low closed forests up to 5 m in height that are dominated by *Hakea elliptica*, Eucalyptus or Agonis and *B. littoralis* and occur around granite outcrops, in shallower and drier gullies and on the margins of freshwater lakes. It mostly occurs at sites that have not been burnt for 10 or more years. It occurs at two locations in the south west; on the mainland in coastal areas from Two Peoples Bay Nature Reserve to Cheyne Beach, and on Bald Island (DAWE 2022b).	**Unlikely.** Some elements of suitable habitat are present for the species and historical relocation attempts within the wider region have occurred, but no reliable recordings for the species have been made within the Study Area, and the known distribution for the species is highly localised and away from the Willowdale Study Area.	PMST, EMRC, Naturemap/Dandjoo, DBCA
Botaurus poiciloptilus	Australasian Bittern	EN	EN	The Australasian Bittern's preferred habitat is wetlands with tall dense vegetation. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. *Phragmites*, *Cyperus*, *Eleocharis*, *Juncus*, *Typha*, *Baumea*, *Bolboschoenus*) or cutting grass (*Gahnia*)	**Unlikely.** Suitable habitat for the species does not occur within the Willowdale Study Area, and recordings of the species within the Study Area and Mine Footprint are very rare.	Naturemap/Dandjoo, DBCA,

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				growing over a muddy or peaty substrate. In the South-West, the Bittern is largely confined to coastal areas, especially along the south coast. It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum *Muehlenbeckia*, cane grass *Eragrostis* or other dense vegetation (Marchant 1990). They can be found in reed beds near Two Peoples Bay, in lakes near Mt Manypeaks, and the Lake Muir area (Nevill 2013).		
Calidris ferruginea	Curlew Sandpiper	CR	CR	Curlew Sandpipers mainly occur in areas with soft mud conditions, including intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are found inland less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. In WA, they are widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division but are more sparsely distributed between Carnarvon and Dampier Archipelago (DAWE 2021e). They are common on the Swan Coastal Plain, particularly near large drying lakes like Thompson and Forrestdale, and Peel Inlet. They are less common along the southern coast to Esperance (Nevill 2013).	**Highly Unlikely** The Willowdale Study Area lacks suitable wetland or shoreline habitat and recordings surrounding the Study Area are rare.	PMST, DBCA
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	VU	The Forest Red-tailed Black Cockatoo inhabits the dense Jarrah, karri, and Marri forests receiving more than 600 mm annual average rainfall but also occurs in a range of other forest and woodland types, including Blackbutt (*E. patens*), Wandoo (*E. wandoo*), Tuart (*E. gomphocephala*), Albany Blackbutt (*E. staeri*), Yate (*E. cornuta*), and Flooded Gum (*E. rudis*) (DAWE 2021b). Habitats tend to have an understorey of balga	**Known** Known to occur within the Willowdale Study Area. Recorded sightings, foraging, and breeds within the Willowdale Study Area, especially Jarrah-Marri forest habitat.	Naturemap/Dandjoo, PMST, DBCA, ,GHD, SLR, Western Environmental, Stokes, EMRC

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				(*Xanthorrhoea* spp.), kingia (*Kingia australis*), snottygobble (*Persoonia* spp.), parrot bush (*Banksia sessilis*), holly-leaved mirbelia (*Mirbelia dilatata*), bull banksia (*B. grandis*), bullich (*E.megacarpa*), Myrtle (*Taxandria spp*.) and sheoak (*Allocasuarina fraseriana*). They are most common in the Jarrah forest region of the northern Darling Range from Collie north to Mundaring and are very local throughout the lower south-west. They can be found on the Swan Coastal Plain, mainly in search of food the exotic white cedar (*Melia azedarach*). There are also several small, isolated populations in the eastern parts of its range (DAWE 2021b).		
Charadrius leschenaultii	Greater Sand Plover	VU	VU	In Australia, the Greater Sand Plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia, especially the north-west (Marchant & Higgins 1993). In northern Australia, the species is especially widespread between North West Cape and Roebuck Bay in WA; there are sparsely scattered records from the largely inaccessible area between Roebuck Bay and Darwin, but it often occurs in the Top End of the Northern Territory, including on Groote Eylandt (DCCEEW 2022).	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat.	PMST
Zanda baudinii	Baudin's Black Cockatoo	EN	EN	Baudin's Black Cockatoo mainly occurs in eucalypt forests, especially Jarrah, Marri and karri forest that receives 750 mm of annual rainfall. The species is less frequently in woodlands of wandoo (*Eucalyptus wandoo*), blackbutt (*E. patens*), flooded gum (*E. rudis*), yate (*E. cornuta*), partly cleared farmlands and urban areas. The range of the species extends from Albany northward to Gidgegannup and Mundaring (east of Perth), and inland to the Stirling Ranges and near Kojonup. Preferred roosts are in areas with a dense canopy close to permanent sources of water (DAWE 2021c).	**Known.** This species has been recorded during surveys from several consultants via remote cameras at several locations. The Willowdale Study Area provides suitable nesting, roosting and foraging habitat to support this species, especially Jarrah-Marri habitat.	Naturemap(Dandjoo), PMST, DBCA , GHD, SLR, Western Environmental, Stokes

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Zanda latirostris	Carnaby's Black Cockatoo	EN	EN	Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain Salmon gum, Wandoo, Marri, Jarrah and Karri, and in shrubland or kwongan heathland dominated by Hakea, Dryandra, Banksia and Grevillea species. Breeding activity is restricted to eucalypt woodlands mainly in the semiarid and subhumid interior, from Kalbarri in the north, Three Springs District south to the Stirling Range, west to Cockleshell Gully and east to Manmanning. The species has expanded its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp and into the tuart forests of the Swan Coastal Plain, including the Yanchep area, Lake Clifton and near Bunbury. It nests in trees older than 120-150 years (DAWE 2021d).	**Known.** This species has been recorded during surveys from several consultants via opportunistic sightings and from confirmed historical DBCA records within the Study Area. The Willowdale Study Area provides suitable nesting, roosting and foraging habitat to support this species, especially Jarrah-Marri habitat.	Naturemap (Dandjoo), PMST, DBCA , GHD, SLR, Western Environmental
Falco peregrinus	Peregrine Falcon	OS	-	The Peregrine Falcon is found on and near cliffs, gorges, timbered watercourses, riverine environments, wetlands, plains, open woodlands, and pylons and spires of buildings, though less frequently in desert regions (Morcombe 2004; Pizzey & Knight 2012). They are not common but can be found almost anywhere throughout WA and in the southwest, including particularly at Fitzgerald River, Stirling Range, Porongurup National Parks, Kondinin, and Peak Charles, with many more locations north of Perth (Nevill 2013).	**Likely** Recent DBCA records have been made in close proximity to the Study Area, and suitable foraging habitat and prey species are known within the area.	Dandjoo, DBCA,
Leipoa ocellata	Malleefowl	VU	VU	The Malleefowl generally occurs in semi-arid areas of WA, in shrublands and low woodlands that are dominated by mallee vegetation, as well as native pine Callitris woodlands, Acacia shrublands, paperbark, sheoak, Broombush *Melaleuca uncinata* vegetation, eucalypt woodlands, or coastal heathlands. Mostly they are found where there are sandy or gravel soils. The nest is a	**Unlikely** Regional records are historical. The Willowdale Study Area does not contain suitable undisturbed habitat to support this species. The area is too readily logged and burnt to persist in the area.	Naturemap/Dandjoo, PMST & DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				large mound of sand or soil and organic matter (Jones & Goth 2008; Morcombe 2014; Nevill 2013). In WA they are found from the southwest Nullarbor to Albany, north, and then west from Moore River up to Shark Bay, past Cue, across to Wiluna and east to the northern Victoria Desert south of the Blackstone Ranges (Nevill 2013; Pizzey & Knight 2012).		
Limosa lapponica	Bar-tailed Godwit	MI	MI	Bar-tailed Godwits arrive in Australia each year in August from breeding grounds in the northern hemisphere. Birds are more numerous in northern Australia Bar-tailed Godwits inhabit estuarine mudflats, beaches and mangroves. They are common in coastal areas around Australia. They are social birds and are often seen in large flocks and in the company of other waders (Birdlife Australia 2019).	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat.	PMST
Numenius madagascariensis	Eastern Curlew	CR	CR	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, sometimes within the mangroves, and in coastal saltworks and sewage farms. In the south west, Eastern Curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet (Marchant & Higgins 1993). They are uncommon further south of Geraldton, but can be spotted in Alfred Cove, Peel Inlet and the Albany region (Nevill 2013).	**Highly Unlikely** The Study Area lacks suitable wetland or shoreline habitat.	PMST
Pandion haliaetus	Osprey	MI	MI	The breeding range of the Osprey extends around the northern coast of Australia	**Unlikely.** Previous DBCA records have been made from within the region,	PMST, DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				(including many offshore islands) from Albany in WA to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island. Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands (DCCEEW 2022).	including fly-over records within the Study Area, although suitable habitat is not likely for consistent feeding and nesting.	
Sternula nereis nereis	Australian Fairy Tern	VU	VU	The Fairy Tern is approximately 22–27 cm in length, 70 g in weight and has a wingspan of 44–53 cm (Higgins & Davies 1996). The Fairy Tern is bulky and round bodied (Simpson & Day 2004). The breeding plumage of both sexes is pale grey-white, with a black crown, nape, ear coverts and patch in front of the eyes (square to round in shape). The forehead is white and the bill is orange-yellow (Higgins & Davies 1996). Legs are dull yellow and the iris is dark brown (Lindsey 1986a). The species is gregarious and often found in flocks of 50–150 birds. However the bird is also seen singularly or in pairs (Higgins & Davies 1996). The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline (Higgins & Davies 1996; Lindsey 1986a). The bird roosts on beaches at night (Higgins & Davies 1996). Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier Archipelago near Karratha.	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat.	PMST
Tringa nebularia	Common Greenshank	EN	EN	The Common Greenshank is a heavily built, elegant wader, 30–35 cm in length, with a wingspan of 55–65 cm and weight up to 190 g for both males and females. The bill is long	**Highly Unlikely.** The Study Area lacks suitable wetland or shoreline habitat.	PMST

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				and slightly upturned and the legs are long and yellowish-green. In flight, all plumages show uniformly dark upperwing and contrasting white rump extending in a white wedge up the back, whitish tail and tips of toes projecting slightly beyond the tip of the tail. The sexes are alike (Higgins & Davies 1996). The species is seen singly or in small to large flocks (sometimes hundreds) in a variety of coastal and inland wetlands. The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies 1996). It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberleys it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago (Higgins & Davies 1996).		
Tyto novaehollandiae novaehollandiae	Masked Owl (southern sub species)	P3	-	The Masked Owl is found in forests (wet and dry sclerophyll, non-eucalypt dominated), open woodlands, farmlands or scrub with large trees (12-20 m) and adjacent cleared country, timbered watercourses, paperbark woodlands, and caves (Pizzey & Knight 2012). It requires large hollows in old growth eucalypts or bare sand or the earth of a cave for nesting, and often favours areas with dense understorey or ecotones comprising dense and sparse ground cover. It is often recorded foraging within 100-300 m of the boundary of two vegetation types (Bell & Mooney 2002). The bird is restricted to the thicker humid forests of the southwest region, particularly in the Pemberton and Manjimup area and along the Murray River in the Lane Poole area (Kavanagh & Murray 1996). It nests in hollows in large Karri (*Eucalyptus*	**Likely.** This species is known to occur in the region from previous DBCA recordings. Suitable habitat occurs within the Willowdale Study Area.	Dandjoo, DBCA, SLR,

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				diversicolor), Marri (*Corymbia calophylla*) and Jarrah (*E. marginata*) trees (Nevill 2013).		
Apus pacificus	Fork-tailed Swift	MI	MI	The Fork-tailed Swift is common in coastal and sub coastal areas between Carnarvon and Augusta including near and offshore islands. There are scattered records along south coast from Denmark east to Cocklebiddy on the Great Australian Bight, and sparsely scattered records inland. They are found across a range of habitats, from inland open plains to wooded areas. They are most often observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas. They have been recorded well out to sea as well as from offshore islands especially when on passage from Indonesia. This species is almost exclusively aerial (DotE 2015).	**Unlikely** The species is occasionally observed in the south-west of WA but roosting infrequently. May occasionally fly over Willowdale Study Area.	PMST
Rostratula australis	Australian Painted Snipe	EN	EN	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire. It sometimes use areas that are lined with trees, or that have some scattered fallen or washed-up timber (DAWE 2021e). In the south west it can be found around Carnarvon and wetlands north of Perth, particularly those west of Moora and Gin Gin (Nevill 2013).	**Highly Unlikely** The Willowdale Study Area lacks suitable wetlands, and the species is not typically known from this region.	PMST
Motacilla cinerea	Grey Wagtail	MI	MI	The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia	**Highly Unlikely** The Willowdale Study Area lacks suitable habitat and there are no DBCA or survey-based recordings surrounding the Willowdale Study Area.	PMST

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				(Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DAWE 2021e). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in forest and open country; but occurs almost anywhere during migration (Johnstone & Storr 2004).		
Actitis hypoleucos	Common Sandpiper	MI	MI	The Common Sandpiper is found along all coastlines of Australia and uses a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around often narrow and steep muddy margins or rocky shores. The species has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, mangroves, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. It is often found near mangroves, and sometimes in areas of mud littered with rocks or snags (DAWE 2021e). They are somewhat uncommon in the south west, but can be found on Rottnest and Penguin Islands, and along the south coast all the way to the Esperance region, including the inland lakes like Lake Warden (Nevill 2013).	**Highly Unlikely** The Willowdale Study Area lacks suitable habitat and there are no DBCA recordings or survey-based results from the surrounding Willowdale Study Area.	PMST
Calidris acuminata	Sharp-tailed Sandpiper	MI	MI	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal	**Highly Unlikely** The Willowdale Study Area lacks suitable habitat and there are no DBCA recordings or survey-based records in the surrounding the Willowdale Study Area.	PMST

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. Sometimes they occur on rocky shores (DAWE 2021e). They are found throughout many wetlands on the Swan Coastal Plain, in Perth lakes with wet grassed margins and receding waters, Vasse and Harvey Estuaries, and the Busselton wetlands, but are less common on the south coast until the Esperance region (Nevill 2013).		
Calidris canutus	Red Knot	MI	MI	In Australasia, the Red Knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (DCCEEW 2022).They are found near mudflats and estuaries from Murchison to Bunbury but are then uncommon from Wilson Inlet to Esperance. In the Perth region they are mainly found in Alfred Cove and Peel Inlet (Nevill 2013).	**Highly Unlikely.** The Willowdale Study Area lacks suitable habitat and there are no DBCA recordings surrounding the Willowdale Study Area.	PMST
Calidris melanotos	Pectoral Sandpiper	MI	MI	In Australia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The bird can be seen on the Swan Coastal Plain but is rare to scarce	**Highly Unlikely** The Willowdale Study Area lacks suitable habitat and there are no DBCA or survey-based recordings surrounding the Willowdale Study Area or within the Study Area.	PMST

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				on Lake Thompson, and as well on any freshwater wetland in the southwest with shallow, well-grassed margins. They are seen at Lake Warden, Esperance, and at Lake McLarty (Nevill 2013).		
MAMMAL						
Bettongia penicillata ogilbyi	Woylie	CR	EN	Preferred habitat for the Woylie includes dense undergrowth, logs and rock-cavities and occasionally in burrows (Burbidge 2004). Scattered Woylie populations may be found throughout the Jarrah forest in the south-west corner of WA. Extant naturally occurring populations of the species are restricted to three small wheatbelt reserves – Dryandra Woodland, Tutanning Nature Reserve and Perup Forest. All are characterised by the presence of thickets of the plant *Gastrolobium* (Van Dyck and Strahan 2008). The species is now restricted to forests and areas where predation has been controlled (or excluded). It rests during the day in a well-concealed nest, built over a shallow depression. The nest is most commonly built using long strands, of grasses, but other material such as strips of bark are also used (in the forest) or dried seagrass and/or triodia (in arid coastal areas) (Freegard 2007).	**Likely** Woylies were recorded in the O'Neil region in 2024 (GHD 2024b and GHD 2024c) to the North of the Willowdale Study Area, and DBCA recordings have also been made in close proximity to the current Willowdale Study Area. Furthermore, suitable habitat for the species does occur within the Study Area.	Naturemap/Dandjoo, PMST, & DBCA, GHD.
Dasyurus geoffroii	Chuditch	VU	VU	The Chuditch inhabits eucalypt forest (especially Jarrah, *Eucalyptus marginata*), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. They also occur at lower densities in drier woodland and mallee shrubland in the goldfields and wheatbelt, as well as in Kalbarri National Park (translocated). Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) to survive (DEC 2012b). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated,	**Likely.** This species has had scat recordings during surveys in the current study Area, and numerous DCBA and older historical surveys within the region have confirmed sightings. The Study Area provides suitable denning and foraging/hunting habitat to support this species.	Naturemap/Dandjoo, PMST, DBCA, SLR, EMRC

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				steeply sloping forest and drier, open, gently sloping forest (Van Dyck & Strahan 2008). The species can travel large distances, and for this reason requires habitats that are of a suitable size and not excessively fragmented.		
Hydromys chrysogaster	Rakali, Water-Rat	P4	-	The Water Rat lives in the vicinity of permanent bodies of fresh, brackish, or marine water, lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. In the south-west of WA they have been shown to prefer areas with riparian vegetation, better water quality and a degree of habitat complexity. Woody debris, rock ledges and wetland islands are likely to be important areas for feeding and refuge (DEC 2012a). It is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck & Strahan 2008).	**Known** The species has been recorded previously by SLR in the Study Area and DBCA has confirmed historical DBCA recordings within and around the Study Area.	Naturemap/Dandjoo, DBCA, SLR.
Falsistrellus mackenziei	Western False Pipistrelle	P4	-	The Western False Pipistrelle occurs in wet sclerophyll forest dominated by Karri, and in the high rainfall zones of the Jarrah and Tuart dry sclerophyll forests. The species is restricted to areas in or adjacent to stands of old growth forest. Marri, Sheoak and Peppermint are often codominant at its collection localities (Churchill 2008; McKenzie and Start 1999).	**Likely** This species is known from this region. Suitable habitat of Jarrah – Marri woodland is found within the Study Area, and DBCA recordings have also confirmed recent sightings in close proximity to the area.	Naturemap/Dandjoo, DBCA
Isoodon fusciventer	Quenda (Southern Brown Bandicoot)	P4	-	The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck & Strahan 2008).	**Likely.** This species has been recorded during surveys from several consultants via remote cameras and several locations, and suitable habitat for the species occurs in the Study Area, especially Jarrah-Marri forest.	Naturemap(Dandjoo), SLR, DBCA, EMRC, Stokes

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Myrmecobius fasciatus	Numbat	EN	EN	Current Numbat populations occupy several different habitat types: upland Jarrah forest, open eucalypt woodland, banksia woodland and tall closed shrubland. The only remaining original subpopulations are at Dryandra Woodland and the Upper Warren area (including Tone Perup Nature Reserve, Greater Kingston National Park and adjoining State Forest). In WA there are nine translocation sites, including Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve (see DPaW 2015 for complete list and details). At Dryandra, numbats inhabit brown mallet (*Eucalyptus astringens*) plantations. Habitats usually have an abundance of termites in the soil, and hollow logs, tree hollows, burrows and branches for shelter (DAWE 2021e; Van Dyck & Strahan 2008).	**Unlikely.** Historical records include the region. A resident population occurs in the Narrogin area and re-introduced population at Boyagin rock, but no recording of the species have been made in recent surveys within the Study Area.	Naturemap (Dandjoo) & DBCA
Notamacropus eugenii	Tammar Wallaby	P4	-	This Tammar wallaby is a smaller species of true macropod reaching a maximum of 7kg and a grey-brown coat with a distinctive dark mid-line on the forehead. The species has a preference for dense, coastal heath and scrub, with some dry sclerophyll forests with significant cover. Their current distribution across Western Australia is limited to Dryandra, Tutanning and Perup forests, and offshore islands of Garden, Middle and Recherche Archipelago (Menkhorst & Knight, 2004).	**Unlikely.** Some suitable habitat for the species does occur within the Willowdale Study Area but records of the species and it's known and current distributions are outside of the current Willowdale Study Area buffer zones. No records from previous surveys within and/or surrounding the Study Area.	DBCA, Naturemap/Dandjoo
Notamacropus irma	Western Brush Wallaby	P4	-	The Western Brush Wallaby is found primarily in open forest or woodland, particularly favouring open, seasonally- wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland and is uncommon in karri forest (DEC 2011; Van Dyck & Strahan 2008).	**Known** This species has been recorded during surveys from several consultants via remote cameras and several locations, with suitable habitat being found throughout the Study Area, especially Jarrah-Marri forest.	Naturemap/Dandjoo, DBCA, SLR

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
Phascogale tapoatafa wambenger	South-west Brush Tailed Phascogale	CD	-	The Brush-tailed Phascogale is sparsely distributed outside the semi-arid zone in dry sclerophyll forest and monsoonal forest and woodland. The species is generally rare and threatened by habitat fragmentation in the south west of WA. (Scida et al 2017). Habitat varies but forest or woodlands is required with large trees to provide hollows and cover. Canopy connection provides excellent cover and connectivity for the species to mover through their environment (Scida et al 2017).	**Likely** This species has been recorded during surveys from several consultants via remote cameras and several locations, with suitable habitat being found throughout the Study Area, especially Jarrah-Marri forest.	Naturemap/Dandjoo, DBCA, EMRC, SLR
Pseudocheirus occidentalis	Western Ringtail Possum	CR	CR	The Western Ringtail Possum occurs in coastal and near coastal and Peppermint Tree (*Agonis flexuosa*) forest and Tuart (*Eucalyptus gomphocephala*) dominated forest with a Peppermint Tree understorey from Bunbury to Albany. Also occurs in Jarrah (*E. marginata*) forest and Jarrah-Marri *(Corymbia calophylla*) forest associated with Peppermint Tree (Van Dyck & Strahan 2008).	**Likely** Some suitable habitat is present to support this species (Blackbutt forest), although in lower density than other known sub-populations, and one recent confirmed sighting been made within the (SLR,pers. Comm.), along with historical recordings of the species within the Willowdale Study Area.	Dandjoo, DBCA, SLR
Setonix brachyurus	Quokka	VU	VU	The current distribution of the Quokka includes Rottnest and Bald Islands, and at least 25 sites on the mainland, including Two Peoples Bay Nature Reserve and Torndirrup, Mt Manypeaks and Walpole-Nornalup National Parks, and swamp areas through the south-west forests from Jarrahdale to Walpole. The last known population on the Swan Coastal Plain occurs in Muddy Lakes near Bunbury. Quokkas have also been reintroduced to Karakamia Sanctuary (DEC 2013). They occupy dense forests and thickets, streamside vegetation, heaths, shrublands, *Agonis linearifolia*-dominated swamps in the Jarrah (*Eucalyptus marginata*) forest, and sometimes tea-tree thickets on sandy soils along creek systems. The northern extent on the mainland is in the Jarrah forest immediately south-east of the Perth metropolitan area, from where it	**Likely.** This species was recorded during surveys of the Alcoa O'Neil site operations nearby to the Willowdale Study Area, with confirmed recordings by EMRC at the Willowdale Study Area. Furthermore, DBCA records have been made within the Study Area itself.	Naturemap/Dandjoo, PMST, DBCA, EMRC

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				extends southward through the southern Jarrah, Marri and Karri forests to the south coast, but largely confined throughout to areas receiving an annual rainfall of 1,000 mm or more (DEC 2013; Van Dyck & Strahan 2008).		
REPTILE						
Acanthophis antarcticus	Southern Death Adder	P3	-	The Southern Death Adder habitat ranges from rainforest to shrublands and heaths. This species is declining in many areas, probably due to habitat destruction and altered fire regimes (Wilson & Swan 2021).	**Likely** Known to occur locally albeit patchily within northern Jarrah forests. Habitat is present for this species.	GHD, DBCA
Aspidites ramsayi	Woma Python	P1	-	The Woma is one of 13 native species of python in Australia and one of two members of the Aspidites genus. The species reaches a maximum of 2m in length, and has a distinctive brown striped markings across a sandy-coloured body and marked yellow head. It's habitat preference ranges from sub-humid and arid interior sandy dune systems to spinifex-based woodlands and shrublands with distributions across the North West of WA to the interior, and a small, increasingly rare distribution to in the Wheatbelt region of the South-West (Wilson & Swan, 2013).	**Highly Unlikely.** Suitable habitat for the species such as dry, sandy burrowing systems and dune-type habitat types are not present, and species records in the area are very rare and not considered part of the species typical distribution and range.	DBCA
Ctenotus delli	Dell's Skink	P4	-	Dell's Skink is associated with Jarrah-Marri woodland that has a shrub-dominated understorey, on laterite, sandy or clay soils. It is found in the north Darling Range and inhabits dry sclerophyll forest on granite outcrops, stony hills and ranges. It is absent from the Swan Coastal Plain (Cogger 2014; Wilson & Swan 2021).	**Likely** There is suitable habitat support this species, as well as DBCA recordings within the Study Area.	Naturemap/Dandjoo, DBCA, GHD.
FISH						
G*eotria australis*	Pouched Lamprey	P3	-	This species utilises freshwater streams in the south west (Perth to Albany) to breed and grow before migrating to the ocean to mature (Allen *et al*. 2002). Dams and weirs are the	**Highly Unlikely** The Study Area lacks suitable water ways and habitat in general and DBCA	Naturemap/Dandjoo & DBCA

Species name	Common name	Status		Habitat requirements	Likelihood of occurrence assessment	Source
		BC Act	EPBC Act			
				main obstacles for the species. Sporadic records exist throughout the South West Coast Drainage Division between Perth and Albany including the Swan, Canning, Serpentine, Margaret, Donnelly, Warren and Goodga rivers.	records within the Study Area and around the Study Area are rare.	
INVERT						
Westralunio carteri	Carter's Freshwater Mussel	VU	VU	Carter's Freshwater Mussel is usually found in freshwater river pools. They are most common in areas with muddy, silty and sandy bottoms and flowing permanent water. Environmental tolerances of *W. carteri* are not precisely known but they can be found where water temperatures range from 4° C to over 30° C. Formerly this species occurred widely through the southwest including interior rivers of southwest such as Avon, Murray and Blackwood, however Salination of many waterways has severely reduced this species distribution (Klunzinger 2012; Klunzinger, et al. 2012).	**Likely.** Confirmed recordings have been made by Biologic in nearby areas to the Willowdale Study Area, and DBCA records have been made within the Study Area. ,	Naturemap/Dandjoo, DBCA, Biologic

Appendix C

Figures

Figure 1 *Huntly and Willowdale Study Areas*

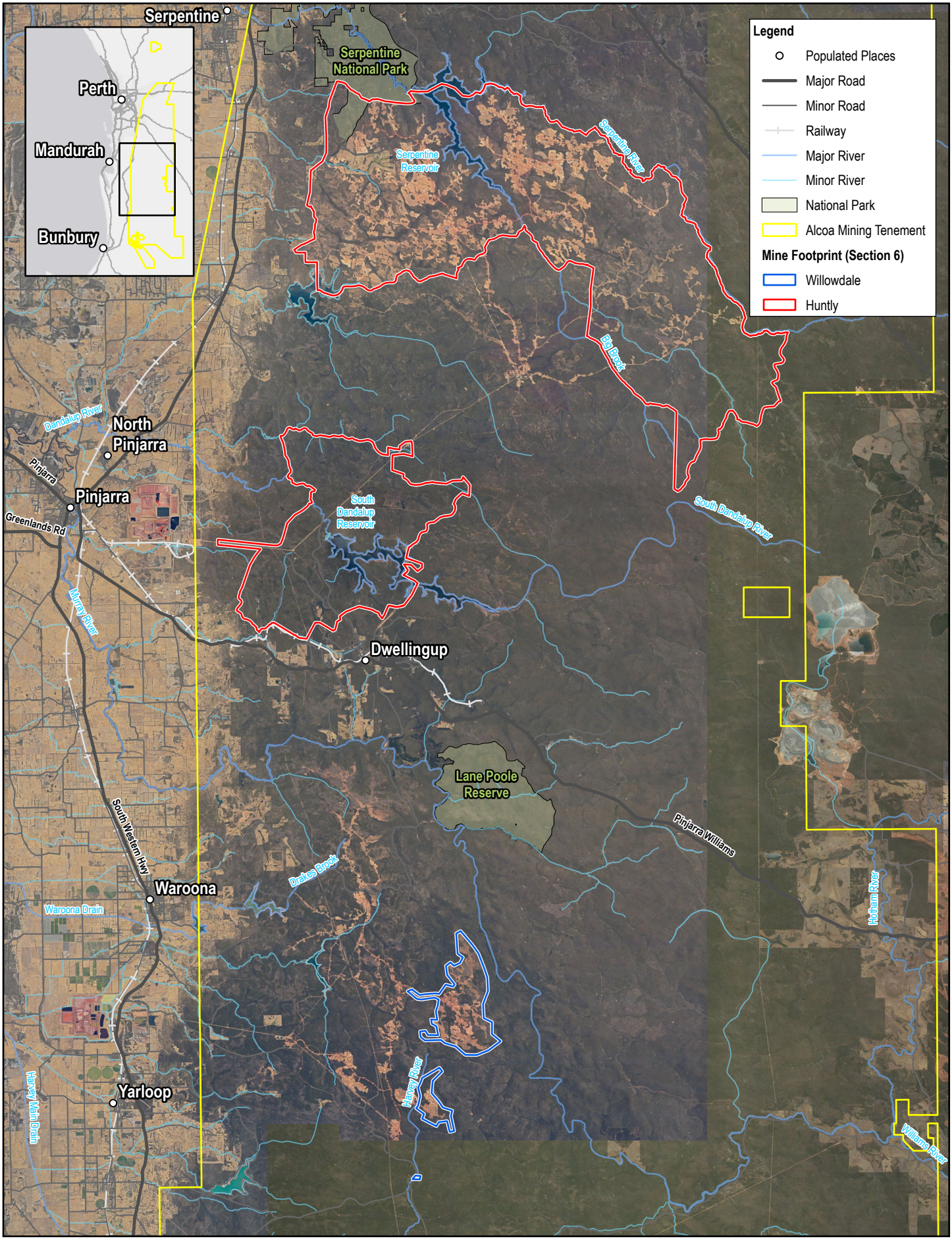
Figure 2 *Mapping Overview of Previous Survey Areas of Huntly and Willowdale Mines*

Figure 3 *Fauna Habitat Profile for Huntly Study Aea*

Figure 4 *Fauna Habitat Profile for Willowdale Study Area*

Figures 5 ***Significant*** *Fauna Records at Huntly Study Area*

Figure 6 *Significant Fauna Records at Willowdale Study Area*



Paper Size ISO A4

0 2.5 5 7.5 10

Kilometers

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

N

GHD

Alcoa
Fauna Desktop Assessment

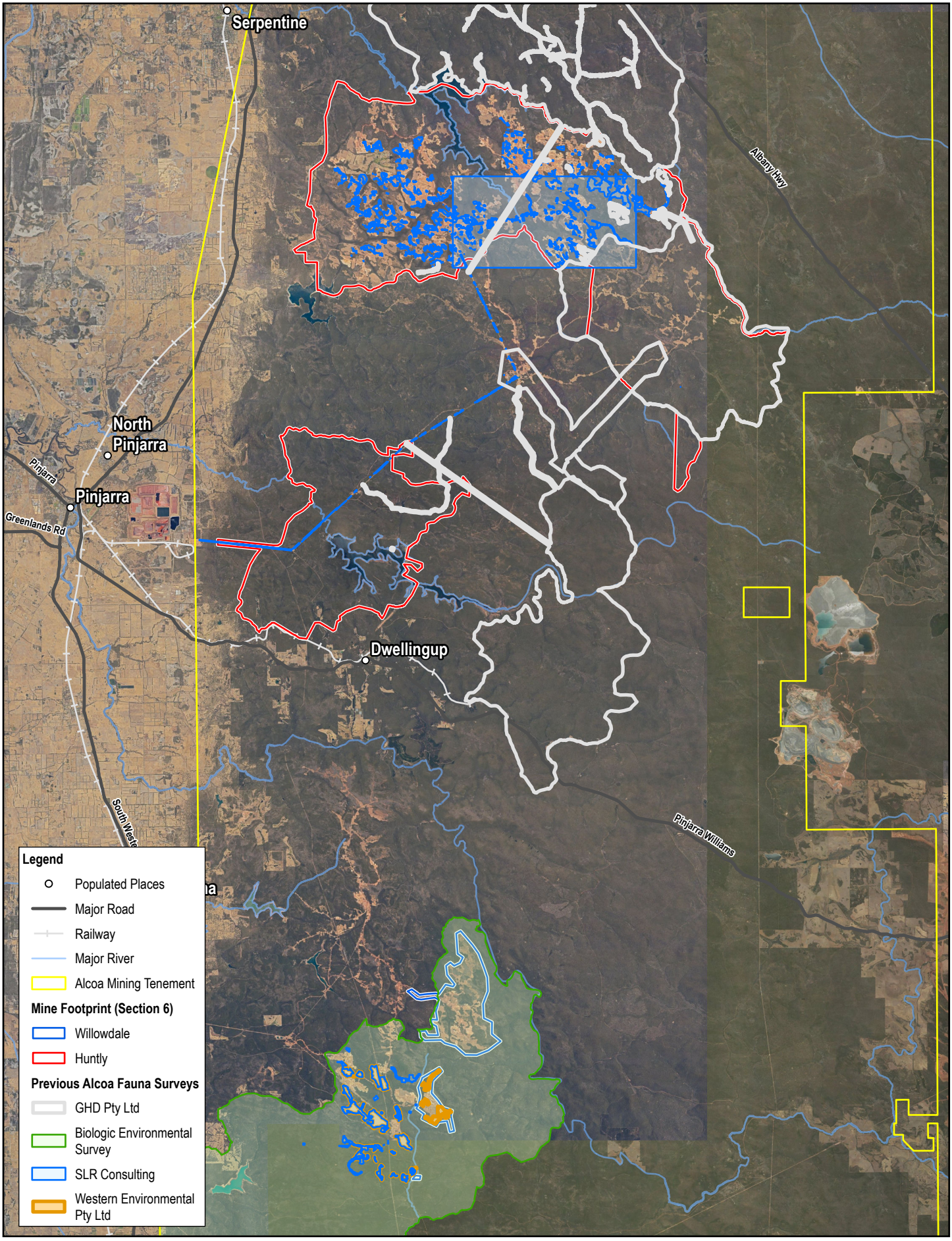
Study Area

Project No. **12565572**
Revision No. **0**
Date **04/11/2024**

FIGURE 1

G:\61\12565572\GIS\Maps\Working\12565572_HuntlyWillowdaleCompilation\12565572_HuntlyWillowdaleCompilation.aprx
Print date: 04 Nov 2024 - 08:45

Data source: WANow; World Imagery: Earthstar Geographics
World Light Gray Canvas Base: Esri, HERE, Garmin, USGS. Created by: rbrown3



Paper Size ISO A4

0 2.5 5 7.5 10

Kilometers

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

N

GHD

Alcoa
Fauna Desktop Assessment

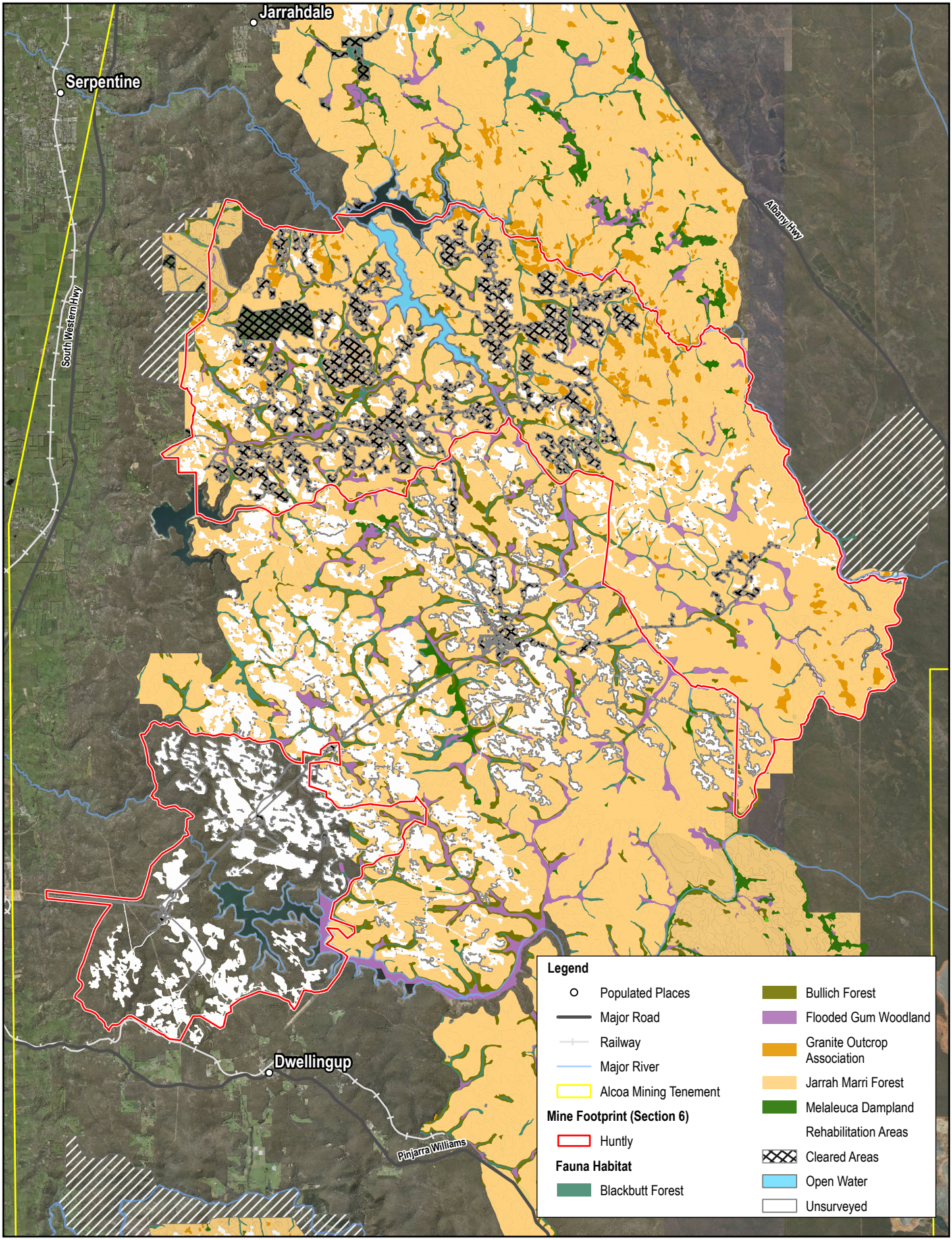
Previous GHD Survey Areas

Project No. **12565572**
Revision No. **0**
Date **04/11/2024**

FIGURE 2

G:\61\12565572\GIS\Maps\Working\12565572_HuntlyWillowdaleCompilation\12565572_HuntlyWillowdaleCompilation.aprx
Print date: 04 Nov 2024 - 08:51

Data source: WANow;
World Imagery: Earthstar Geographics. Created by: rbrown3



Paper Size ISO A4

0 1 2 3 4

Kilometers

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

N

GHD

Alcoa
Fauna Desktop Assessment

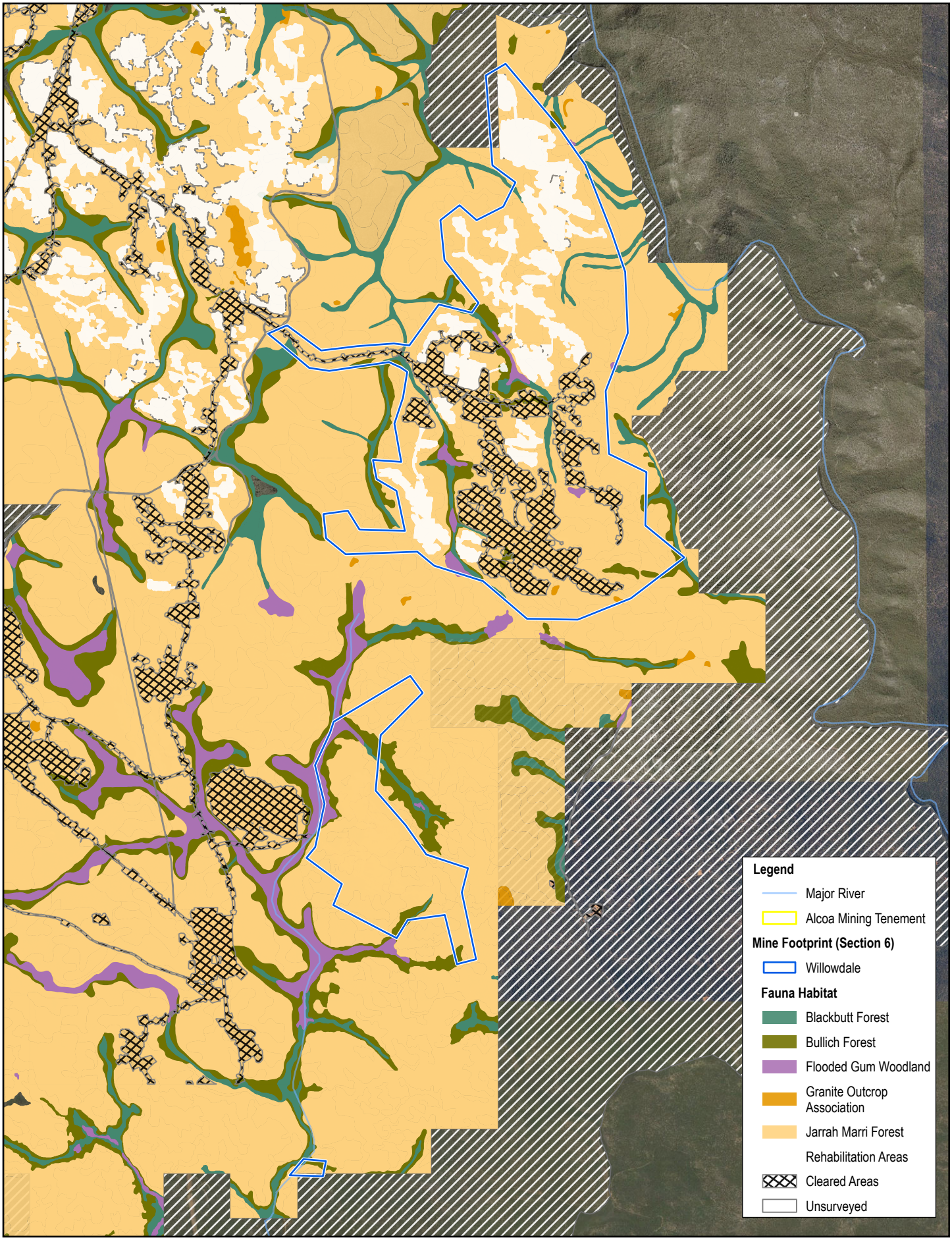
Fauna Habitat Mapping Huntly

Project No. **12565572**
Revision No. **1**
Date **20/02/2025**

FIGURE 3

G:\61\12565572\GIS\Maps\Working\12565572_HuntlyWillowdaleCompilation\12565572_HuntlyWillowdaleCompilation.aprx
Print date: 21 Feb 2025 - 13:03

Data source: WANow: . Created by: mmikkonen



Paper Size ISO A4

0 0.5 1 1.5 2

Kilometers

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

N

GHD

Alcoa
Fauna Desktop Assessment

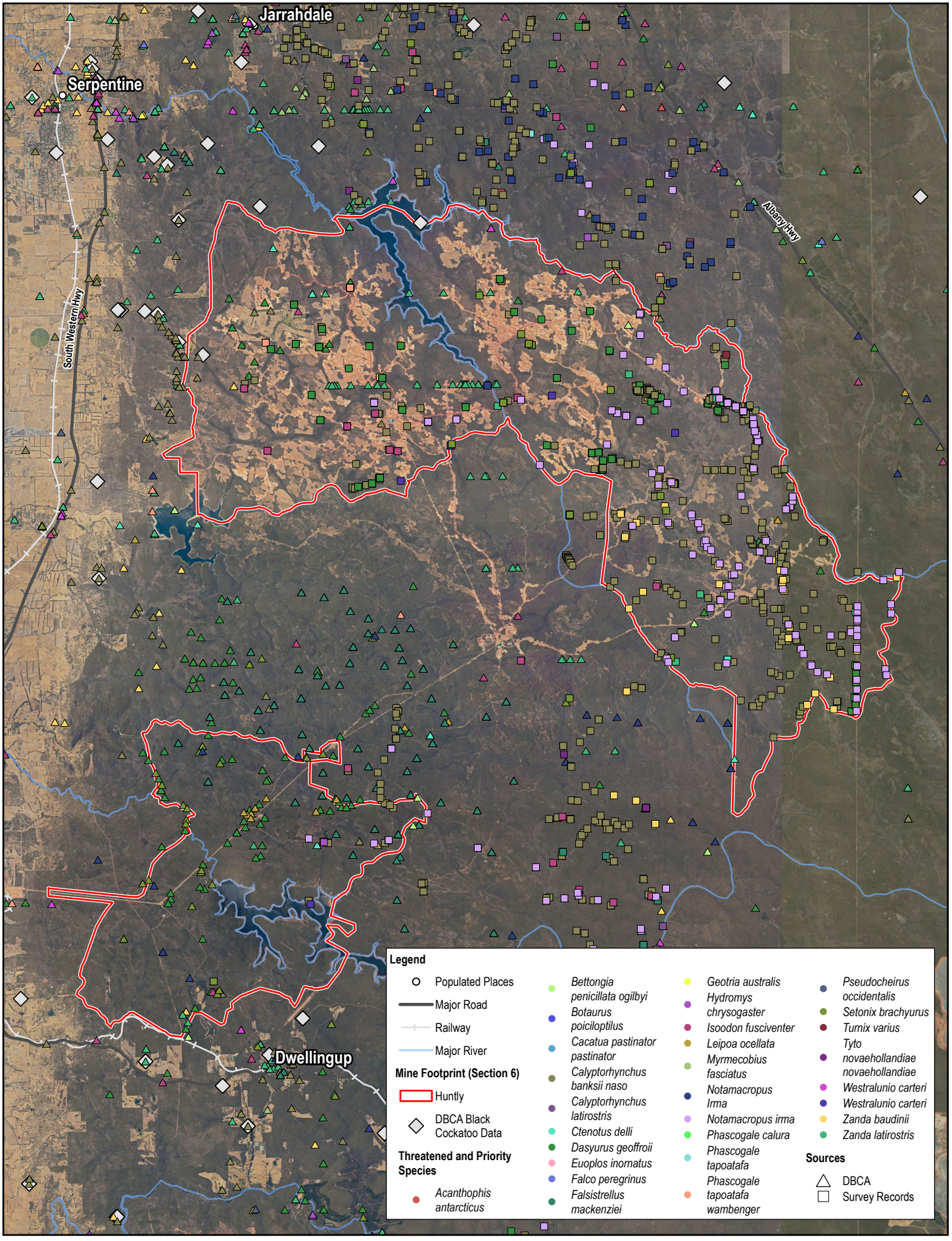
Fauna Habitat Mapping Willowdale

Project No. **12565572**
Revision No. **1**
Date **20/02/2025**

FIGURE 4

G:\61\12565572\GIS\Maps\Working\12565572_HuntlyWillowdaleCompilation\12565572_HuntlyWillowdaleCompilation.aprx
Print date: 21 Feb 2025 - 13:04

Data source: WANow: . Created by: mmikkonen



Paper Size ISO A4

0 2 4 6 8

Kilometers

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

N

GHD

Alcoa
Fauna Desktop Assessment

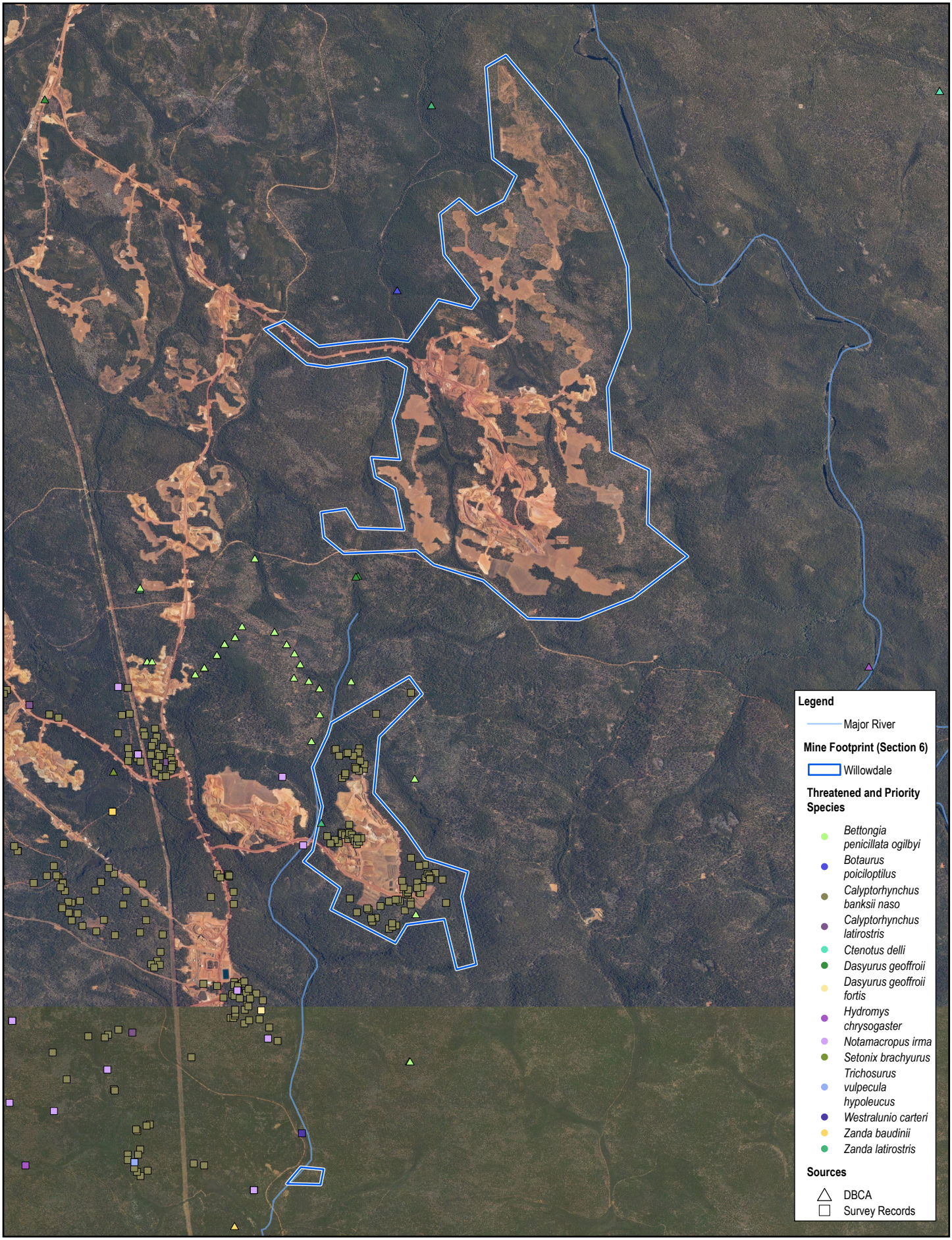
Survey Recorded Fauna – Huntly

Project No. **12565572**
Revision No. **1**
Date **04/11/2024**

FIGURE 5

G:\61\12565572\GIS\Maps\Working\12565572_HuntlyWillowdaleCompilation\12565572_HuntlyWillowdaleCompilation.aprx
Print date: 04 Nov 2024 - 13:06

Data source: WANow;
World Imagery: Earthstar Geographics. Created by: rbrown3



Paper Size ISO A4

0 0.5 1 1.5 2

Kilometers

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

N

GHD

Alcoa
Fauna Desktop Assessment

Survey Recorded Fauna – Willowdale

Project No. **12565572**
Revision No. **1**
Date **04/11/2024**

FIGURE 6

G:\61\12565572\GIS\Maps\Working\12565572_HuntlyWillowdaleCompilation\12565572_HuntlyWillowdaleCompilation.aprx
Print date: 04 Nov 2024 - 13:07

Data source: WANow:
World Imagery: Earthstar Geographics. Created by: rbrown3