Basic Vertebrate Fauna Risk Assessment

Jeffreys Find

Prepared for: Native Vegetation Solutions

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Prepared For: Native Vegetation Solutions
PO Box 41
Kalgoorlie WA 6430

Prepared By: Terrestrial Ecosystems
10 Houston Place
Mt Claremont WA 6010
Phone: 08 9385 2398, 0407 385 289
Website: www.terrestrialecosystems.com
ABN: 40921131346

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EXECUTIVE SUMMARY

Native Vegetation Solutions on behalf of Auric Mining Ltd requested that Terrestrial Ecosystems undertaken a Basic vertebrate fauna assessment for the Jeffreys Find project (project area). The project area is located ~45km east northeast of Norseman and 140km south southeast of Kalgoorlie. The total assessed project area is ~260ha with ~136ha for a proposed haul road. There are three broad fauna habitats; Eucalypt woodland over shrubs, shrubland and samphire shrubland.

There was no evidence to indicate that Malleefowl were in the project area. There is a possibility that the Peregrine Falcon (listed as other specially protected fauna), the mallee form of the Western Rosella (Priority 4) and the Central Long-eared Bat (Priority 4) may infrequently be recorded near the project area, but vegetation clearing, and development are unlikely to significantly impact on these species as they will readily move when disturbed.

Clearing native vegetation in the project area is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the vegetation clearing process, however, this loss is not likely to be significant when viewed in a bioregional context. The few larger animals, such as kangaroos, large goannas and snakes, and most of the birds will move into adjacent areas once vegetation clearing commences, so potential impacts will be low. There may be an on-going loss of small native fauna due to vehicle strikes on access tracks, but overall, this impact will be low. Forced fauna migrants resulting from vegetation clearing will increase competition for resources, which may result in the subsequent loss of migrants or local individuals. Individuals shifted out of their established activity areas are also vulnerable to predation until they have become established in their new areas.

Impacts on vertebrate fauna associated with clearing vegetation in the project area in a landscape or bioregional context are likely to be low as there are vast tracts of similar fauna habitat in adjacent areas.

Feral predators such as foxes and feral cats are likely to be present on site, and in a landscape context, will have a much larger impact on the vertebrate fauna than clearing the vegetation and developing and operating a mine in this location.

It is recommended that:

- an induction program that includes a component on managing fauna is mandatory for staff working in the project area;
- information on protecting fauna and reporting deaths and sightings of Malleefowl and other conservation significant species is incorporated into the mine's induction program;
- the impact of dust on adjacent vegetation and fauna habitat is managed against appropriate KPIs and in accordance with the clients' Construction Environmental Management Plan;
- all areas disturbed during exploration and mining are rehabilitated as soon as practical after they are no longer required;
- where possible, access routes are aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area;
- pets are not permitted on the project;
- all waste and rubbish be contained in bins and regularly removed from the project or placed in land fill and suitably covered to exclude access to predator species;
- feeding of native fauna is prohibited; and
- a log of all on-site drill holes be maintained detailing when they were capped, how and by whom.

1. INTRODUCTION

1.1 BACKGROUND

Native Vegetation Solutions on behalf of Auric Mining Ltd requested that Terrestrial Ecosystems undertaken a Basic vertebrate fauna assessment for the Jeffreys Find project (project area). The project area is located ~45km east northeast of Norseman and 140km south southeast of Kalgoorlie (Figure 1). The proposed haul road is on tenement L63/96 and the mine is on tenement M63/242. The assessed haul road is a ~13km long and joins the proposed mining location with the Eyre Highway.

1.2 PROJECT OBJECTIVES AND SCOPE OF WORKS

Terrestrial Ecosystems was commissioned by Native Vegetation Solutions on behalf of Auric Mining Ltd to undertake a Basic vertebrate fauna survey of the Jeffreys Find project area. The purpose of this fauna survey and subsequent risk assessment is to provide information on the potential impacts on the vertebrate fauna assemblage in the project area to enable the proposed development to be adequately assessed. The methodology broadly follows that described in the Environmental Protection Authority (2020) *Technical Guidance Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*.

This Basic vertebrate fauna survey involved a desktop review and an on-site assessment with the objectives to:

- provide an indication of the vertebrate fauna assemblage (reptiles, amphibians, mammals and birds) on and near the project area, so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- identify the presence and/or potential risk of impacts on species of conservation significance that are present or likely to be present in the project area;
- assess the impact and environmental risks associated with the proposed development on the vertebrate fauna assemblage;
- determine if any additional surveys are required to assess the potential impact on vertebrate fauna assemblage in the project area including impacts on species of conservation significance; and
- make recommendations that avoid, mitigate or minimise potential impacts on resident fauna.

To achieve these objectives, Terrestrial Ecosystems:

- reviewed Terrestrial Ecosystems' database [includes Atlas of Living Australia and Department of Biodiversity, Conservation and Attractions (DBCA) records in NatureMap] to identify potential vertebrate fauna within the area;
- searched the DBCA's NatureMap for Threatened and Priority Species;
- searched the Commonwealth Governments database of fauna of national environmental significance to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*) or international migratory bird agreements (JAMBA/CAMBA);
- reviewed previous fauna surveys conducted near the project area and in similar habitat;
- undertook a site visit to assess fauna habitat types and quality and to search the project area for Malleefowl, Malleefowl mounds and their tracks;
- undertook an assessment of the potential risks to the fauna associated with clearing additional areas of native vegetation;
- discussed the likelihood of *EPBC Act 1999* and *Biodiversity Conservation Act 2016* (*BC Act 2016*) listed species being present in the project area; and
- provided management recommendations to avoid, mitigate and minimise potential impacts on the fauna in the project area.

2. EXISTING ENVIRONMENT

2.1 LOCATION OF PROJECT AREA

The Jeffreys Find project area is within the Coolgardie (COO3-Eastern Goldfield) Interim Biogeographic Regionalisation of Australia (IBRA) subregion. This subregion is a gently undulating plain on the Yilgarn Craton with calcareous soil being dominant (Cowan, 2002). The subregion supports a diverse eucalypt woodland around the salt lakes, on the low ranges and in the broad valleys and mallee and Acacia thickets and shrub heaths on the plains (Cowan, 2002). The sub-region is rich in endemic Acacias (Cowan, 2002).

2.2 LAND USE HISTORY

The dominant land uses in this bioregion are unallocated crown land, pastoralism, crown reserves and mining. Mining is evident in many areas around Widgiemooltha, Kambalda, Higginsville, and Norseman with numerous small abandoned and operational mines scattered throughout the landscape (Cowan, 2002).

Many of the larger trees in the bioregion were removed decades ago to support the mining and power generation industries and these trees have often not been replaced by replanting programs.

2.3 CLIMATE

The project area is characterised as warm Mediterranean. Norseman, which is approximately 45km to the south, south-west has an annual rainfall of approximately 289mm, although this varies considerably from year-to-year. The highest mean maximum and minimum temperatures in Norseman are in January (Bureau of Meteorology 2022). The lowest mean daily maximum and minimum temperatures occur in July (Chart 1). Rainfall predominantly occurs between May and July from low pressure cells moving in an easterly direction.

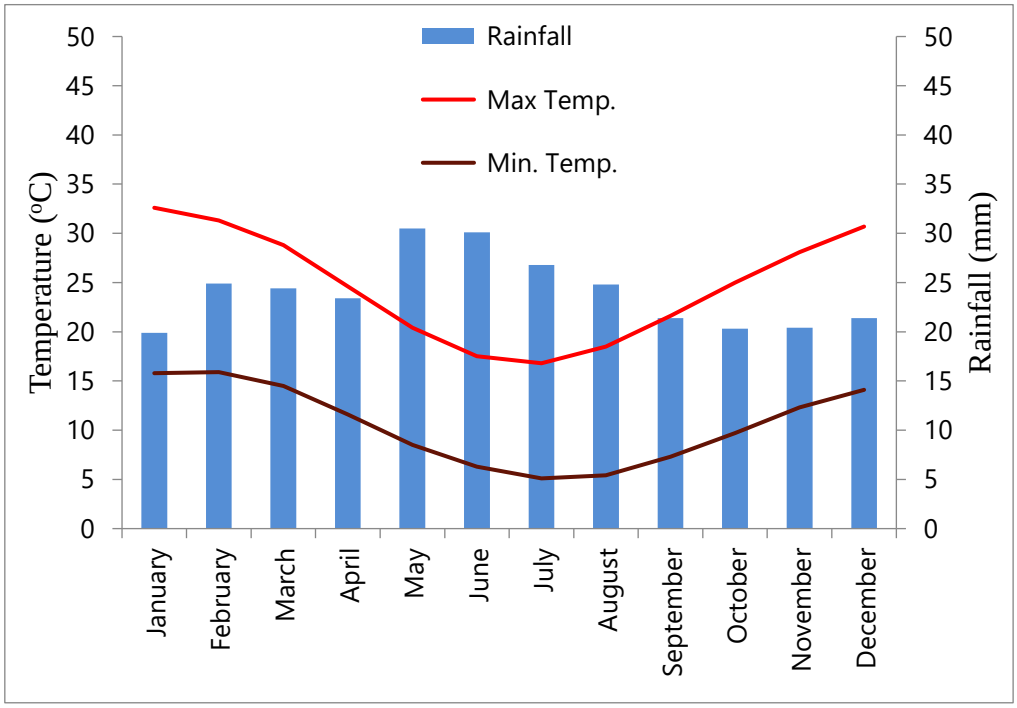

Chart 1. Climatic averages for Norseman

2.4 REGIONAL BIOLOGICAL FAUNA CONTEXT OF PROJECT AREA

The frogs, reptiles, mammals and birds in the vicinity of the project area have been surveyed for other environmental assessments and research purposes and are therefore known. Fauna surveys and assessments undertaken in the vicinity of the project area that have been reviewed for this assessment include:

- ATA Environmental (2006) *Vertebrate Fauna Assessment St Ives Gold Min*e. Unpublished report for Jim's Seeds, Weeds and Trees, Ltd, Kalgoorlie.
- Bamford Consulting Ecologists (2010) *Gold Fields St Ives Gold Mine, Kambalda. Fauna Assessment: impacts of water discharge and general mining activity on vertebrate fauna*. Unpublished report to Gold Fields St Ives Gold Mine, Perth.
- Chapman A; Kealley I; McMillan D; McMillan and Rolland; G (1991) Biological Surveys of Four Goldfields Reserves. *Landnote* 1/91;1-238
- Dames and Moore (1999) *Public Environmental Review - Gold Mine Development on Lake Lefroy*. Unpublished report for St Ives Gold Mine; Kalgoorlie.
- Dell, J. and How, R. (1984) Vertebrate fauna. In The Biological Survey of the Eastern Goldfields of Western Australia, Records of the Western Australian Museum, Supplement No 18, 57-89.
- GHD (2010) *Report for Higginsville Project Area Desktop Biological Assessment and Broad Scale Vegetation Mapping*. Unpublished report for Avoca Resources Ltd, Perth.
- GHD (2014) *Lake Cowan Project Area Desktop Assessment and Broadscale Mapping*. Unpublished report for Metals X Ltd, Perth.
- GHD (2015a) *Musket Project Area Desktop Assessment and Broad Scale Mapping*. Unpublished report for Metals X Ltd, Perth.
- GHD (2015b) *Wills Project Area Desktop Assessment and Broad Scale Mapping*. Unpublished report for Metals X Ltd, Perth.
- Halpern Glick Maunsell (1998) *Lake Lefroy Environmental Assessment. Report ES4490C*. Unpublished Report commissioned by WMC Resources Ltd.
- Handley, M.A. (1991) *The Biota of Inland Salt Lakes of the Kambalda Region, and Coastal Salt Lakes of Esperance, Western Australia. A Comparative Study*. Unpublished Honours Thesis, Curtin University of Technology.
- Keith Lindbeck and Associates (2007) *St. Ives Gold Mining Company Tailings Storage Facility (No. 4) Spring Fauna Survey*. Unpublished report for St. Ives Gold Mining Company.
- McKenzie, N.L., Rolfe, J.K., Hall, N.J. and Youngson, W.K. (1993) Vertebrate Fauna. In Hall, N.J. and McKenzie N.L. The Biological Survey of the Eastern Goldfields of Western Australia Part 9. Norseman - Balladonia. *Records of the Western Australian Museum*, Supplement No 42;33-55.
- Newby, K.R., Dell, J., How, R.A. and Hnatiuk, R.J. (1984) The Biological Survey of the Eastern Goldfields of Western Australia - Part 2: Widgiemooltha – Zanthus Study Area. *Records of the Western Australian Museum, Supplement* 18:21–158.
- Ninox Wildlife Consulting (1995a) *Assessment of the Vertebrate Fauna within Rehabilitation and a Comparison with Native Vegetation in a Range of Nickel Leases near Widgiemooltha*. Unpublished Report Commissioned by KCGM Western Mining Corporation Pty. Ltd.
- Ninox Wildlife Consulting (1995b) *Vertebrate Fauna Studies Kambalda Area (1993) Widgiemooltha Area (1994)*. Unpublished report for Western Mining Corporation (Kambalda Operations), Perth.
- Ninox Wildlife Consulting (1998) *A Vertebrate Fauna Survey of the Randell Timber Reserve (1997 & 1998)*. Unpublished report for Mt Monger Gold Project Pty Ltd, Perth.
- Ninox Wildlife Consulting (2004a) *St Ives Gold - Delta Project Vertebrate Fauna Assessment*. Unpublished report for St Ives Gold Mining Company Pty Ltd, Perth.
- Ninox Wildlife Consulting (2004b) *St Ives Gold Mine Vertebrate Fauna Assessment*. Unpublished report for St Ives Gold Mining Co Pty Ltd, Perth.
- Terrestrial Ecosystems. (2015a) Level 1 Vertebrate Fauna Risk Assessment for the Fairplay Pit and Waste Landform Expansion and Development. Unpublished report for Native Vegetation Solutions.

- Terrestrial Ecosystems. (2015b) Level 1 Vertebrate Fauna Risk Assessment for the Musket Project. Unpublished report for Native Vegetation Solutions.
- Terrestrial Ecosystems. (2015c) Level 1 Vertebrate Fauna Risk Assessment for the Wills Project. Unpublished report for Native Vegetation Solutions.
- Terrestrial Ecosystems. (2016) Rainbow Bee-eater search - Mt Henry Mine Project (CPS 6824/1). Unpublished report for Avoca Mining Pty Ltd.
- Terrestrial Ecosystems. (2017a) Level 1 Vertebrate Fauna Risk Assessment for the proposed Higginsville infrastructure corridor development. Unpublished report for Native Vegetation Solutions.
- Terrestrial Ecosystems. (2017b) Level 1 Vertebrate Fauna Risk Assessment for the proposed Higginsville powerline. Unpublished report for Native Vegetation Solutions.
- Terrestrial Ecosystems. (2017c) Level 1 Vertebrate Fauna Risk Assessment for the proposed Mitchell project area. Unpublished report for Native Vegetation Solutions.
- Terrestrial Ecosystems. (2018) Level 1 Vertebrate Fauna Risk Assessment for the Proposed Musket Pipeline Project. Unpublished report for Native Vegetation Solutions.
- Western Wildlife (2006) *St Ives Gold Fauna Survey; Spring 2005*. Unpublished report for Jim's Seeds, Weeds and Trees, Kalgoorlie.
- Western Wildlife. (2013). *Mt Henry Study Area Baseline Fauna Survey: Level 2 Fauna Survey 2012 & 2013 - Final Report*. Unpublished report for Panoramic Resources Limited, Perth.

The most relevant fauna survey data come from the Western Australian Museum (WAM)/Department of Environment Conservation (DEC) eastern Goldfields survey of the Widgiemooltha-Zanthus survey area, the ATA Environmental (2006), Bamford Consulting Ecologists (2010), Dames and Moore (1999), Keith Lindbeck and Associates (2007), Ninox Wildlife Consulting (2004b) and Western Wildlife (2006, 2013) which are reports for projects on the western side of Lake Lefroy. The McKenzie et al. (1993) report is part of the WAM/DEC's Eastern Goldfields survey undertaken in the mid 1980's and the Chapman et al. (1991) report is the results of fauna surveys of four timber reserves that are all west of Lake Lefroy. All the GHD reports are desktop assessment of the vertebrate fauna.

Data in the Atlas of Living Australia and Western Australian Museum records have also been added to the information contained in Appendix B, and the compilation of the species lists for the project area.

The trapping effort employed during many of these surveys is now considered inadequate to assess species richness or assemblage structure, however, they provide useful contextual information concerning the project area and compiling a species list.

These fauna surveys, when considered together, provide a near complete list of the vertebrate species likely to be found in the project area. The composition of vertebrate fauna assemblages varies from habitat-to-habitat and site-to-site within the bioregion, but the survey data contained in the appendices provide a good indication of the vertebrate fauna assemblage that is likely to be found in the project area. These data therefore provide a good regional context and indicate the extent of fauna assemblage variation that might be anticipated from site-to-site and temporally.

2.5 GREAT WESTERN WOODLANDS

The Jeffreys Find project is part of the Great Western Woodlands (Department of Environment and Conservation, 2013; Watson et al., 2008, pp. vi) on unallocated crown land. The Great Western Woodlands represents the largest and most intact eucalypt woodland remaining in southern Australia and one of the best examples of its type in the world. It is home to an impressive 3,000 flowering plant species, 20 per cent of Australia's known flora, as well as a diverse range of animals dependent on its varied habitats (Department of Environment and Conservation, 2010).

The Wilderness Society argued the fauna and flora diversity in the area has evolved with the landscape during an unbroken biological lineage stretching back 250 million years. Although the woodlands are not recorded as

a conservation significant area or habitat, its value is in its vastness and it being relatively undisturbed when considered in a landscape context. The conservation strategy (Department of Environment and Conservation, 2010) for the woodland as it relates to prospecting, exploration and mining is that there is an improvement in native vegetation condition and connectedness and no net-loss of native vegetation, feral animals are controlled, the WA community benefits from compatible land uses which make a positive contribution to the conservation of the area's natural values, and weeds are identified and effectively managed. Mine development and management are expected to be sympathetic to these strategies and where practical address and incorporate them into its planning and operations.

2.6 FAUNA SPECIES AT RISK

Cowan (2002) reported the fauna species at risk in the Eastern Goldfields subregion as Malleefowl (*Leipoa ocellata*), Carpet Python (*Morelia imbricata*), Peregrine Falcon (*Falco peregrinus*) Chuditch (*Dasyurus geoffroii*) and Freckled Duck (*Stictonetta naevosa*). This report assesses the potential for these species to be found in the project area and the potential impact that exploration or mining development might have on these species, and other conservation significant fauna. The Cowan (2002) report is now very dated, and the DBCA has not updated the biodiversity audit for Western Australia since that report. Since 2003, the Night Parrot (*Pezoporus occidentalis*) has been rediscovered in Western Australia and is also considered a species at risk in the has been added to the threatened species list for this bioregion.

3. METHODOLOGY

3.1 DATABASE SEARCHES

A review of the *EPBC Act 1999* list of protected species was undertaken to identify species of conservation interest to the Commonwealth Government (Appendix A). In addition, a desktop search of the Terrestrial Ecosystems' fauna survey database was used to develop an appreciation of the vertebrate fauna assemblages in relevant sections of the bioregion near the project area.

Other more general texts were also used to provide supplementary information on vertebrate fauna in the bioregion, including Tyler et al. (2000) for frogs; Storr et al. (1983, 1990, 1999, 2002) and Thompson and Thompson (2006) for reptiles; Johnstone and Storr (1998, 2004) for birds; and Van Dyck and Strahan (2008) for mammals.

Collectively these sources of information were used to create lists of species expected to utilise the project area and broader subregion. It should, however, be acknowledged that most large fauna datasets potentially include vagrants, errors (e.g. taxonomic changes, incorrect identification, incorrect coordinates) and there will be many species in these datasets found in the region that are not in the project area because of a lack of suitable habitat or have become locally extinct because of predation.

Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the project area. Also, the ecology of many of these species is often not well understood and it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the project area. Therefore, many species will be included in the lists produced from database searches but will not be present in the actual project area.

There are errors in most databases, including Atlas of Living Australia and the WAM collection. These errors occur because of a misidentification of individuals, taxonomic name changes and incorrect coordinates being entered into the database. Terrestrial Ecosystems was unable to verify the primary records, so it has used the information provided. Obvious errors have been removed but readers should appreciate that species lists, and fauna surveys reported in the appendices may include these errors.

3.2 SITE INSPECTION AND FAUNA HABITAT ASSESSMENT

A site visit was undertaken on 5 September 2022 to search for Malleefowl, Malleefowl mounds and their tracks and to assess fauna habitat types and condition in the project area. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire.

The fauna habitat assessment had two foci:

- assessing fauna habitat types and their condition; and
- assessing the possible presence of and recording evidence of conservation significant fauna.

Fauna surveyors stopped at multiple locations within the project area and recorded a suite of data about the fauna habitat and its condition. This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire. Table 1 indicates the variables recorded at each location.

Table 1. Fauna habitat assessment variables

Observer's Name:	
Coordinates of the location as UTM (GDA94):	
Fire history – options	
☐ > 5 years	
☐ 1-5 years	
☐ < 1 year	
Landform – options	
☐ Beach	☐ Lower slope
☐ Clay plain	☐ Mid slope
☐ Cliff	☐ Ridge
☐ Creek line	☐ River
☐ Dam	☐ Rocky outcrop / breakaway
☐ Drainage line	☐ Salt lake
☐ Dune crest	☐ Sand dune
☐ Dune slope	☐ Sand plain
☐ Dune swale	☐ Stony plain
☐ Escarpment	☐ Swamp
☐ Flat	☐ Undulating
☐ Gorge	☐ Upper slope
☐ Gully	☐ Wetland
☐ Intertidal / mangrove	☐ Water hole
☐ Lake / lake edge	
Habitat quality – options	
☐ *High quality fauna habitat* – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.	
☐ *Very good fauna habitat* - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.	
☐ *Good fauna habitat* – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.	
☐ *Disturbed fauna habitat*– These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, containing weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.	
☐ *Highly degraded fauna habitat* – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Fauna	

	assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.		
Habitat structure – combined into habitat description			
Upper stratum			
☐	Tall open woodland	☐	Scattered tall trees
☐	Tall woodland	☐	Scattered trees
☐	Open woodland	☐	Scattered low trees
☐	Woodland	☐	Low closed forest
☐	Open forest	☐	Low open forest
☐	Closed forest	☐	Low woodland
☐	Tall closed forest	☐	Low open woodland
☐	Tall open forest		
Middle stratum			
☐	Shrubland	☐	Open heath
☐	Tall shrubland	☐	Low closed heath
☐	Tall open shrubland	☐	Low open heath
☐	Low shrubland	☐	Tall closed scrub
☐	Scattered low shrubs	☐	Tall open scrub
☐	Low open shrubland	☐	Scattered tall shrubs
☐	Scattered tall shrubs	☐	Open shrubland
☐	Closed heath	☐	Scattered shrubs
Lower stratum			
☐	Closed hummock grassland	☐	Closed tussock grassland / sedgeland / herbland
☐	Mid-dense hummock grassland	☐	Tussock grass land / sedgeland / herbland
☐	Hummock grassland	☐	Open tussock grassland / sedgeland / herbland
☐	Open hummock grassland	☐	Scattered tussock / grasses / sedges / herbs
☐	Scattered hummock grassland	☐	Very open tussock grassland / herbland
Soil Type – options			
☐	Sand	☐	Silty loam
☐	Loamy sand	☐	Sand clay loam
☐	Clayey sand	☐	Clay
☐	Clay loam	☐	Peat / organic
☐	Silty clay loam	☐	Stony
☐	Sandy loam		
Soil colour - options			
☐	Black	☐	Red
☐	Brown	☐	White

☐	Grey	☐	Yellow
☐	Orange		
Surface stones – options			
☐	None	☐	Boulders (>250mm)
☐	Pebbles (0-50mm)	☐	Rocks
☐	Cobbles (51-250)		

3.3 SURVEY AND REPORTING STAFF

Dr Scott Thompson and Joel Wilson undertook the search for Malleefowl and their mounds, and the fauna habitat assessment. Dr Graham Thompson drafted this report and Dr Scott Thompson reviewed the report before it was sent to the client. Both senior scientists have appropriate relevant post-graduate qualifications, extensive experience in conducting fauna assessments in the Goldfields, have published research articles on biodiversity, fauna assemblages, conservation significant species, trapping techniques and temporal variations in trapped fauna assemblages and are therefore appropriately trained and experienced for the task of preparing this assessment. Both Scott and Graham have undertaken multiple assessments near Kalgoorlie, Kambalda and Norseman and are familiar with the habitat in the project area and surrounds.

3.4 TAXONOMY AND NOMENCLATURE

Taxonomy and nomenclature for fauna species used in this report are generally based on the WA Museum species lists. Terrestrial Ecosystems has presumed that the identifications referred to in the appendices or in reports used to provide local and regional comparative data are correct and it has only corrected obvious records where the nomenclature was known to be incorrect.

3.5 LIMITATIONS

Conclusions and management recommendations regarding the vertebrate fauna assemblage have been based on the data available in other fauna surveys nearby and a site visit. Lists of species potentially in and around the project area have been compiled from records in the Western Australian Museum records, Atlas of Living Australia and reports of fauna surveys undertaken nearby. Some records in the Atlas of Living Australia and the Western Australian Museum are very old and those species are no longer present in the area. Terrestrial Ecosystems has not been able to see the primary data and is therefore not able to vouch for the accuracy of these records. All of these sources of data are known to contain errors, and this should be taken into account when reading this assessment.

The *EPBC Act* online MNES database for terrestrial fauna includes historical records and places a wide buffer around previously known locations of threatened species and in its database. A search of this database will invariably include species that are either locally extinct or were never present in parts of the search area.

It is acknowledged that multiple surveys conducted in different seasons, repeated over several years are necessary to fully appreciate the fauna assemblage in a project area. The EPA (2020) *Technical Guidance Terrestrial Fauna Surveys* suggested that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 2.

Table 2. Survey limitations

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Availability of data and information	Yes, minor	There is a considerable amount of vertebrate fauna survey data available for similar habitats near the project area.
Competency/experience of the survey team, including experience in the bioregion surveyed	No	The authors of this report have appropriate post-graduate qualifications, undertaken multiple surveys and assessments in the Goldfields, have published a book and multiple refereed journal articles based on fauna surveys in the region and are familiar with the vertebrate fauna in this bioregion.
Scope of the survey, e.g. where faunal groups were excluded from the survey	N/A	
Timing, weather and season	No	Weather was suitable for a site visit.
Disturbance that may have affected results, e.g. fire, flood	No	Minor disturbances in the project area have been factored into this assessment.
The proportion of fauna identified, recorded or collected	N/A	
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	No	Basic survey requirements were met. The search for Malleefowl mounds was comprehensive.
Access problems	No	The site was accessible
Problems with data and analysis, including sampling biases	N/A	

4. RESULTS

4.1 FAUNA HABITAT

Eighty two rapid habitat assessments were completed in the project area (Appendix D). Excluding the disturbed areas (e.g. exploration drilling), there are three broad fauna habitats in the project area:

- Eucalypt woodland on over shrubs;
- Shrublands; and
- Samphire shrublands.

Plates 1-6 provide representative images of the fauna habitat types. The density of trees and shrubs varied across the project area. The fauna habitat quality varies but was generally very good except for evidence of exploration drilling and recent exploration activity. There are a few access tracks (e.g. Mount Mongers S Road) and exploration grid lines in the area, but these are narrow and mostly only wheel tracks and some earlier disturbance (Plates 7-8).

Plate 1. Eucalypt woodland on over shrubs

Plate 2. Eucalypt woodland on over shrubs

Plate 3. Shrublands

Plate 4. Shrublands

Plate 5. Samphire shrublands

Plate 6. Samphire shrublands

Plate 7. Evidence of earlier disturbance

Plate 8. Evidence of earlier disturbance

Appendix D shows the results of the rapid fauna habitat assessment for the project area.

4.2 FERAL PESTS

There was an abundance of camel tracks and scats in the project area (Plate 9).

Plate 9. Camel scats

4.3 BIOREGIONAL VERTEBRATE FAUNA ASSEMBLAGE

Appendix B provides a summary of the fauna survey data that are available near the project area. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys shown in Appendix B. These differences are partially due to the low survey effort deployed by some of the surveys and they also reflect variations in soils and vegetation as well as temporal variations in the fauna assemblages.

Tables 3-6 provide a list of vertebrate species potentially found near the project area that have been compiled based on the fauna survey report results shown in Appendix B.

Table 3. Birds potentially found near the project area

Family	Species	Common Name
Casuariidae	*Dromaius novaehollandiae*	Emu
Anatidae	*Cygnus atratus*	Black Swan
	Tadorna tadornoides	Australian Shelduck
	Chenonetta jubata	Australian Wood Duck
	Anas superciliosa	Pacific Black Duck
	Anas gracilis	Grey Teal
Megapodiidae	*Leipoa ocellata*	Malleefowl
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe
Columbidae	*Streptopelia senegalensis*	Laughing Dove
	Phaps chalcoptera	Common Bronzewing
	Ocyphaps lophotes	Crested Pigeon
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo
	Chrysococcyx osculans	Black-eared Cuckoo
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Rallidae	*Tribonyx ventralis*	Black-tailed Nativehen
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt
	Recurvirostra novaehollandiae	Red-necked Avocet
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover
	Erythrogonys cinctus	Red-kneed Dotterel
	Elseyornis melanops	Black-fronted Dotterel
	Peltohyas australis	Inland Dotterel
Scolopacidae	*Tringa nebularia*	Common Greenshank
Otididae	*Ardeotis australis*	Australian Bustard
Accipitridae	*Hieraaetus morphnoides*	Little Eagle
	Aquila audax	Wedge-tailed Eagle
	Accipiter fasciatus	Brown Goshawk
	Accipiter cirrocephalus	Collared Sparrowhawk
	Haliastur sphenurus	Whistling Kite

Family	Species	Common Name
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher
	Todiramphus sanctus	Sacred Kingfisher
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Falconidae	*Falco cenchroides*	Nankeen Kestrel
	Falco berigora	Brown Falcon
	Falco peregrinus	Peregrine Falcon
Timaliidae	*Zosterops lateralis*	Silvereye
Cacatuidae	*Eolophus roseicapilla*	Galah
Psittaculidae	*Polytelis anthopeplus*	Regent Parrot
	Neophema splendida	Scarlet-chested Parrot
	Barnardius zonarius	Australian Ringneck
	Platycercus icterotis	Western Rosella
	Psephotus varius	Mulga Parrot
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet
Climacteridae	*Climacteris rufus*	Rufous Treecreeper
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairywren
	Malurus lamberti	Variegated Fairywren
	Malurus splendens	Splendid Fairywren
	Malurus leucopterus	White-winged Fairywren
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater
	Manorina flavigula	Yellow-throated Miner
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater
	Anthochaera carunculata	Red Wattlebird
	Gavicalis virescens	Singing Honeyeater
	Ptilotula ornata	Yellow-plumed Honeyeater
	Epthianura tricolor	Crimson Chat
	Epthianura albifrons	White-fronted Chat
	Sugomel nigrum	Black Honeyeater
	Lichmera indistincta	Brown Honeyeater
	Nesoptilotis leucotis	White-eared Honeyeater
	Nesoptilotis flavicollis	Yellow-throated Honeyeater
	Melithreptus brevirostris	Brown-headed Honeyeater
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren
	Pyrrholaemus brunneus	Redthroat
	Calamanthus campestris	Rufous Fieldwren
	Hylacola cauta	Shy Heathwren
	Acanthiza apicalis	Inland Thornbill
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Acanthiza uropygialis	Chestnut-rumped Thornbill
	Acanthiza robustirostris	Slaty-backed Thornbill
	Smicrornis brevirostris	Weebill
	Gerygone fusca	Western Gerygone
	Aphelocephala leucopsis	Southern Whiteface
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler
Cinclosomatidae	*Cinclosoma castanotum*	Chestnut Quail-thrush
Campephagidae	*Coracina maxima*	Ground Cuckooshrike
	Coracina novaehollandiae	Black-faced Cuckooshrike
	Lalage tricolor	White-winged Triller
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush
	Pachycephala inornata	Gilbert's Whistler
	Pachycephala pectoralis	Golden Whistler
	Pachycephala rufiventris	Rufous Whistler
Artamidae	*Artamus personatus*	Masked Woodswallow
	Artamus cinereus	Black-faced Woodswallow
	Artamus cyanopterus	Dusky Woodswallow
	Cracticus torquatus	Grey Butcherbird
	Cracticus nigrogularis	Pied Butcherbird
	Gymnorhina tibicen	Australian Magpie
	Strepera versicolor	Grey Currawong
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
	Myiagra inquieta	Restless Flycatcher
Corvidae	*Corvus orru*	Torresian Crow
	Corvus bennetti	Little Crow
	Corvus coronoides	Australian Raven
Petroicidae	*Microeca fascinans*	Jacky Winter
	Petroica goodenovii	Red-capped Robin
	Eopsaltria griseogularis	Western Yellow Robin
	Drymodes brunneopygia	Southern Scrub-Robin

Family	Species	Common Name
Hirundinidae	*Hirundo neoxena*	Welcome Swallow
	Petrochelidon nigricans	Tree Martin
	Cheramoeca leucosterna	White-backed Swallow

Family	Species	Common Name
Zosteropidae	*Zosterops lateralis*	Silvereye
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit

Table 4. Amphibians potentially found near the project area

Family	Species	Common Name
Limnodynastidae	*Neobatrachus kunapalari*	Wheatbelt Frog
	Neobatrachus pelobatoides	Humming Frog

Family	Species	Common Name
	Neobatrachus sutor	Shoemaker Frog
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet

Table 5. Mammals potentially found near the project area

Family	Species	Common Name
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna
Bovidae	*Capra hircus*	Goat
	Ovis aries	Sheep
Camelidae	*Camelius dromedarius*	Camel
Canidae	*Canis lupus*	Dingo
	Vulpes vulpes	Red Fox
Felidae	*Felis catus*	Cat
Molossidae	*Austronomus australis*	White-striped Freetail Bat
	Mormopterus planiceps	Southern Free-tail Bat
Vespertilionidae	*Nyctophilus* sp.	Long-eared Bat Sp.
	Chalinolobus gouldii	Gould's Wattled Bat
	Chalinolobus morio	Chocolate Wattled Bat
	Mormopterus sp.	Free-tail Bat Sp.
	Scotorepens balstoni	Inland Broad-nosed Bat
	Vespadelus regulus	Southern Forest Bat
Dasyuridae	*Ningaui* sp.	Ningaui Sp.
	Dasyurus geoffroii	Chuditch

Family	Species	Common Name
	Ningaui ridei	Wongai Ningaui
	Ningaui yvonneae	Mallee Ningaui
	Sminthopsis crassicaudata	Fat-tailed Dunnart
	Sminthopsis dolichura	Little Long-tailed Dunnart
	Sminthopsis gilberti	Gilbert's Dunnart
	Sminthopsis ooldea	Ooldea Dunnart
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo
	Osphranter robustus	Euro
	Osphranter rufus	Red Kangaroo
Leporidae	*Oryctolagus cuniculus*	Rabbit
Muridae	*Mus musculus*	House Mouse
	Notomys alexis	Spinifex Hopping Mouse
	Notomys mitchellii	Mitchell's Hopping Mouse
	Pseudomys bolami	Bolam's Mouse
	Pseudomys hermannsburgensis	Sandy Inland Mouse

Table 6. Reptiles potentially found near the project area

Family	Species	Common Name
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon
	Ctenophorus cristatus	Crested Dragon
	Ctenophorus fordi	Mallee Dragon
	Ctenophorus isolepis	Central Military Dragon
	Ctenophorus maculatus	Spotted Dragon
	Ctenophorus ornatus	Ornate Crevice Dragon

Family	Species	Common Name
	Ctenophorus reticulatus	Western Netted Dragon
	Ctenophorus salinarum	Saltpan Dragon
	Ctenophorus scutulatus	Lozenge-marked Dragon
	Moloch horridus	Thorny Devil
	Pogona minor	Western Bearded Dragon

Family	Species	Common Name
	Tympanocryptis cephalus	Pebble Dragon
Carphodactylidae	*Nephrurus laevissimus*	Smooth Knob-tail
	Nephrurus vertebralis	Midline Knob-tail
	Underwoodisaurus milii	Barking Gecko
Diplodactylidae	*Amalosia reticulata*	Reticulated Velvet Gecko
	Crenadactylus ocellatus	Clawless Gecko
	Diplodactylus granariensis	Wheatbelt Stone Gecko
	Diplodactylus pulcher	Beautiful Gecko
	Lucasium maini	Main's Ground Gecko
	Rhynchoedura ornata	Beaked Gecko
	Strophurus assimilis	Goldfields Spiny-tailed Gecko
	Strophurus elderi	Jewelled Gecko
Elapidae	*Brachyurophis fasciolatus*	Narrow-banded Burrowing Snake
	Brachyurophis semifasciata	Half-girdled Snake
	Demansia psammophis	Yellow-faced Whipsnake
	Furina ornata	Orange-naped Snake
	Suta gouldii	Gould's Snake
	Suta monachus	Hooded Snake
	Suta nigriceps	Short-tailed Snake
	Pseudechis australis	Mulga Snake
	Pseudonaja affinis	Dugite
	Pseudonaja mengdeni	Western Brown Snake
	Pseudonaja modesta	Ringed Brown Snake
	Simoselaps bertholdi	Jan's Banded Snake
	Suta fasciata	Rosen's Snake
Gekkonidae	*Christinus marmoratus*	Marbled Gecko
	Gehyra purpurascens	Purplish Dtella
	Gehyra variegata	Variegated Gehyra
	Heteronotia binoei	Bynoe's Gecko
Pygopodidae	*Delma australis*	Marble-faced Delma
	Delma butleri	Unbanded Delma
	Delma fraseri	Fraser's Delma

Family	Species	Common Name
	Lialis burtonis	Burton's Legless Lizard
	Pygopus lepidopodus	Common Scaly-foot
Pythonidae	*Morelia spilota*	Carpet Python
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink
	Ctenotus atlas	Southern Mallee Ctenotus
	Ctenotus leonhardii	Leonhardi's Ctenotus
	Ctenotus mimetes	Checker-sided Ctenotus
	Ctenotus schomburgkii	Barred Wedgesnout Ctenotus
	Ctenotus severus	Stern Ctenotus
	Ctenotus uber	Spotted Ctenotus
	Cyclodomorphus melanops	Spinifex Slender Blue-tongue
	Egernia depressa	Southern Pygmy Spiny-tailed Skink
	Egernia formosa	Goldfields Crevice Skink
	Egernia multiscutata	Southern Sand-skink
	Eremiascincus richardsonii	Broad-banded Sand-swimmer
	Hemiergis initialis	South-western Earless Skink
	Hemiergis peronii	Lowlands Earless Skink
	Lerista distinguenda	South-western Orange-tailed Slider
	Lerista kingi	King's Slider
	Lerista picturata	Southern Robust Slider
	Lerista taeniata	Ribbon Slider
	Lerista timida	Timid Slider
	Lerista tridactyla	Dark-backed Mulch Slider
	Liopholis inornata	Desert Skink
	Liopholis multiscutata	Bull Skink
	Menetia greyii	Common Dwarf Skink
	Morethia adelaidensis	Saltbush Morethia Skink
	Morethia butleri	Woodland Morethia Skink
	Morethia obscura	Shrubland Pale-flecked Morethia
	Tiliqua occipitalis	Western Blue-tongued Lizard

Family	Species	Common Name
	Tiliqua rugosa	Bobtail
Typhlopidae	*Anilios australis*	Austral Blind Snake
	Anilios bicolor	Dark-spined Blind Snake
	Anilios bituberculatus	Prong-snouted Blind Snake

Family	Species	Common Name
	Anilios hamatus	Pale-headed Blind Snake
Varanidae	*Varanus caudolineatus*	Stripe-tailed Monitor
	Varanus gouldii	Gould's Goanna
	Varanus tristis	Black-headed Monitor

4.4 CONSERVATION SIGNIFICANT FAUNA

Conservation significant fauna are protected by the Commonwealth *EPBC Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the Western Australia (WA) *BC Act 2016*. The *BC Act 2016* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, DBCA maintains a list of fauna that require monitoring under four priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *BC Act 2016* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, other than the DBCA wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *BC Act 2016* are provided in Appendix C.

One bird and one migratory bird were identified under the *EPBC Act 1999,* and another bird was identified under the *BC Act* and two priority species potentially occur in the project area or surrounds. The following is an assessment of the likelihood of each of the species listed in Table 7 being found in the project area.

Results of the Commonwealth *EPBC Act 1999* protected matters database search is provided in Appendix A.

Table 7. Assessment of the potential presence of a conservation significant fauna species in the project area

Species	DBCA Schedule / Priority	Status under Commonwealth EPBC Act	Comment on the potential presence of a species
Calidris ferruginea Curlew Sandpiper	Critically Endangered; migratory	Critically Endangered; migratory	Highly unlikely to be present in the project area due to an absence of lakes and water courses.
Pezoporus occidentalis Night Parrot	Critically Endangered	Endangered	Not recorded in other surveys in the area and there is no suitable habitat; it is highly unlikely to be in the project area.
Falco hypoleucos Grey Falcon	Vulnerable	Vulnerable	Not recorded in other surveys in the area, so it is highly unlikely to be in the project area, and if it was disturbed by vegetation clearing or mining activity it would readily move to an adjacent area.
Leipoa ocellata Malleefowl	Vulnerable	Vulnerable	Not present in the project area.
Dasyurus geoffroii Chuditch	Vulnerable	Vulnerable	This dasyurid has not recently been recorded in the vicinity of the project area, so it is highly unlikely to be in the project area.

Species	DBCA Schedule / Priority	Status under Commonwealth EPBC Act	Comment on the potential presence of a species
Apus pacificus Fork-tailed Swift	Migratory	Migratory	Infrequent visitor to the general area. Vegetation clearing and mining are highly unlikely to impact on this essentially aerial species if it was present in the project area.
Motacilla cinerea Grey Wagtail	Migratory	Migratory	Suitable habitat is not present in the project area, so it is highly unlikely to be present.
Actitis hypoleucos Common Sandpiper	Migratory	Migratory	Highly unlikely to be present in the project area due to an absence of lakes and water courses.
Calidris acuminata Sharp-tailed Sandpiper	Migratory	Migratory	Highly unlikely to be present in the project area due to an absence of lakes and water courses.
Calidris melanotos Pectoral Sandpiper	Migratory	Migratory	Highly unlikely to be present in the project area due to an absence of lakes and water courses.
Tyto novaehollandiae Masked Owl	P3		Not previously recorded in the project area or nearby areas. It is therefore highly unlikely to be present, but if disturbed by vegetation clearing or mining activity it would readily move to an adjacent area.
Northiella narethae Naretha Blue Bonnet	P4		Not previously recorded in the project area, so it is highly unlikely to be present, and if disturbed by vegetation clearing or mining activity it would readily move to an adjacent area.
Falco peregrinus Peregrine Falcon	OS		May infrequently be seen in the project area, and if disturbed by vegetation clearing or mining activity it would readily move to an adjacent area.
Platycercus icterotis xanthogenys Western Rosella (inland)	P4		May infrequently be seen in the project area, and if disturbed by vegetation clearing or mining activity it would readily move to an adjacent area.
Acanthophis antarcticus Southern Death Adder	P3		Not previously recorded in other surveys in the vicinity of the project area and is rarely recorded across the region.
Aspidites ramsayi Woma	P1		Not previously recorded in other surveys in the vicinity of the project area and is rarely recorded across the region.
Nyctophilus major tor Central Long-eared Bat	P4		Potentially in the project area.

Results of the Commonwealth *EPBC Act 1999* protected matters database search are provided in Appendix A.

Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered under the *EPBC Act 1999* and *BC Act 2016*; migratory under both Acts

Curlew Sandpipers occur around the coasts and are also quite widespread inland. In Western Australia they were widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division, but are more sparsely distributed between Carnarvon and Dampier Archipelago. They occur in large numbers, at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod. In the last two decades there has been a significant reduction in their abundance. It breeds in Siberia in the northern hemisphere summer and winters in Australia.

Habitat preferences include intertidal mudflats in estuaries, bays, inlets and lagoons, non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.

There are no lakes or water courses in the project area, so it is highly unlikely to be present or impacted.

Night Parrot (*Pezoporus occidentalis*) – Critically endangered under the *BC Act 2016* and Endangered under the *EPBC Act 1999*

The Night Parrot is a small, arid-adapted, nocturnal, ground-feeding parrot (Johnstone & Storr, 1998; Threatened Species Scientific Committee, 2016). Its length is 22-25cm with a body mass of approximately 104g (Threatened Species Scientific Committee, 2016), although it was suggested that they were semi-nomadic, the Night Parrots in south-western Queensland appear to be sedentary (Murphy, 2015).

The Night Parrot was probably originally distributed over much of semi-arid and arid Australia (Garnett et al., 1993; Threatened Species Scientific Committee, 2016). Records in north-west and western Queensland in the early 1990-2000s were in a broad cross section of the habitats available (Boles et al., 2016; Cupitt & Cupitt, 2008; Garnett et al., 1993). There have been recent sightings in the Pilbara in 1980, 2005 and 2017, central WA in 1979, north-eastern South Australia in 1979, western Queensland (including Pullen-Pullen-Mt Windsor-Diamantina population) in 1980, 1990, 1993, 2006 and 2013-17 (AG staff, 2017, 2018; Charalambous, 2016; Davis & Metcalf, 2008; Garnett et al., 2011; Palaszxzuk & Miles, 2017; Pickrell, 2016; Rykers, 2017), Pilbara in 2017 (Jones, 2017) and the northern Goldfields (Jackett et al., 2017). Garnett et al. (2011) suggested that there were between 50-250 mature individuals in less than 5% of its previous range.

Wilson's (1937) summary of observations provided information on the early records of Night Parrots' preferred habitat and breeding sites. Recent information indicates its preferred habitat appears to be in Triodia grasslands, chenopod shrublands, shrubby samphire and floristically diverse habitats dominated by large-seeded species (McCarthy, 2017; Murphy, Silcock, et al., 2017; Threatened Species Scientific Committee, 2016). At Pullen Pullen Reserve it nests in large, more or less ring-shaped Triodia, and the nest consists of a tunnel (25-30º and 0º to the ground; 20-33cm long) through an apron of dead spinifex leaves that leads to a chamber under a live hummock, with a shallow depression (3-4cm) excavated into the gravelly/sandy soil (Murphy, Austin, et al., 2017). In the northern Goldfields the nest was again in a spinifex hummock, it was circular, with an excavated depression (~1.5-2.0cm) in sandy substrate (Hamilton et al., 2017; Jackett et al., 2017). The entrance tunnel was 62cm long, and was downward sloping (27º) with the entrance 28cm above the ground (Hamilton et al., 2017). It has clutches of two to four sub-elliptical, white eggs with a lustrous appearance (Murphy, Austin, et al., 2017). Breeding followed significant rains in March for the observations in Pullen-Pullen Reserve and in April in the northern Goldfields (Hamilton et al., 2017; Murphy, Austin, et al., 2017), but it is thought that breeding generally occurs between April and October (Murphy, Austin, et al., 2017).

Murphy et al. (2017) placed a GPS tag on Night Parrots and reported that the two birds called at dusk from their diurnal roosts among spinifex hummocks and then flew to more floristically diverse habitats dominated by large-seeded, prolifically seeding species to feed.

The project area is in the medium priority area for Night Parrots based on the Department of Parks and Wildlife (Department of Parks and Wildlife, 2017) assessment of where they might be found (Plate 10).

There are no old, large spinifex hummocks in the project area, which could provide roosting and nesting sites for this species and there are no recent Night Parrot records near the project area, so it is highly unlikely to be present in the project area.

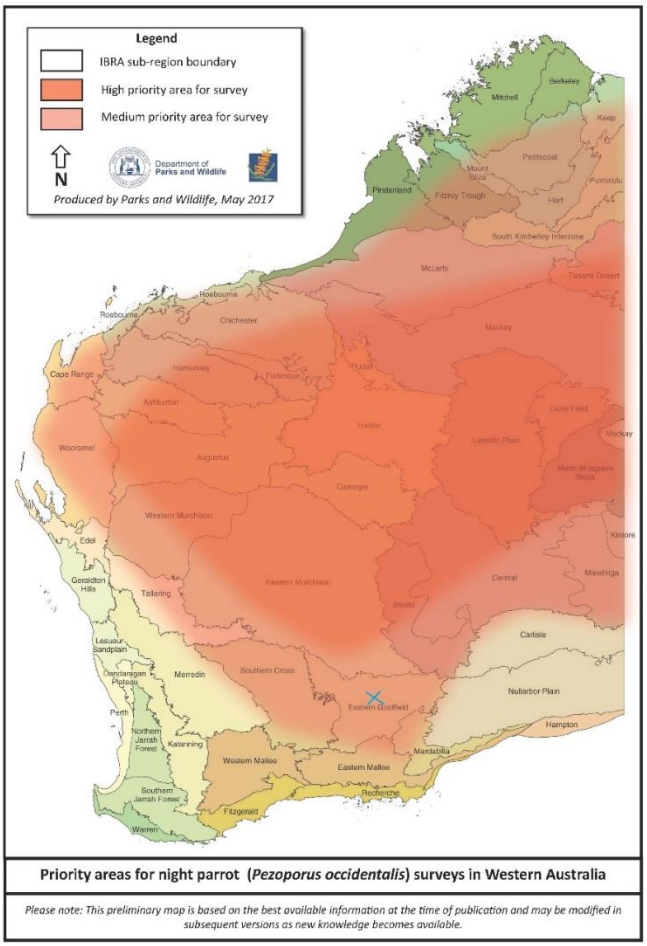

Plate 10. Department of Parks and Wildlife's assessment of areas where the Night Parrot could be found

Grey Falcon (*Falco hypoleucos*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

The Grey Falcon occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia (Threatened Species Scientific Committee, 2020) where it frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses, but has been seen in in treeless areas and frequents tussock grassland and open woodland.

There are no records for the Grey Falcon in other surveys in the vicinity of the project area, so it is unlikely to be present.

Malleefowl (*Leipoa ocellata)* – Vulnerable under the *BC Act* 2016 and *EPBC Act 1999*

Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed or are perching for the night. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Prior to vegetation clearing for agriculture, Malleefowl were abundant in the WA Wheatbelt. Vegetation clearing for agriculture also opened adjacent bushland to predators, and in the south-west of WA, Malleefowl often only persist in isolated remnant patches of native vegetation. Sheep and other herbivores (e.g. goats, kangaroos) grazing in remnant vegetation removes or thins the undergrowth, and they also compete with Malleefowl for herbaceous foods and can cause changes to the structure and floristic diversity of foraging habitats (Benshemesh, 2007).

Malleefowl and their eggs are vulnerable to predation by foxes, and newly hatched chicks are vulnerable to foxes, cats and raptors (Benshemesh, 2007; Benshemesh & Burton, 1999; Lewis & Hines, 2014; Priddel & Wheeler, 1990, 1997). Their abundance in the Goldfields is low and they are sparsely distributed, favouring those areas that are more densely vegetated. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but can span more than five metres and may be up to one metre high. Malleefowl are generally monogamous and once breeding commences they pair for life. The presence of nest mounds provides an indication of the presence of Malleefowl in the area.

Malleefowl have been observed in the bioregion, but there was no evidence to indicated that they were still present in the project area. Open fauna habitat and the presence of feral and pest species (e.g. foxes and cats) would have significantly reduce the probability of Malleefowl utilising the project area. It is unlikely that Malleefowl will be significantly impacted by any development or mining operations.

Chuditch (*Dasyurus geoffroii*) – Vulnerable under the *BC Act 2016* and *EPBC Act 1999*.

The Chuditch is the largest extant carnivorous marsupial in WA. It is usually active from dusk to dawn. Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west WA and other isolated areas. Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc. and have also been recorded in tree hollows and rock cavities. Chuditch are opportunistic feeders, and forage primarily on the ground at night. Their diet can include other mammals, birds, lizards, bird and reptile eggs but the majority is a mixture of large invertebrates (e.g. spiders, scorpions and crickets).

How *et al*. (1988) reported Chuditch being found near the Norseman-Lake King Road and near Mount Holland. DBCA records show that one specimen was recorded in 1974 in Kambalda East. There are records south of Southern Cross and Marvel Loch and there have been other old sightings east of Kambalda and near Norseman, but none recently. As the project area is outside of its current known extant geographic distribution it is unlikely that the Chuditch would be found in the project area. It is highly unlikely that Chuditch are in the project area and be significantly impacted by the proposed development and mining operations.

Fork-tailed Swift (*Apus pacificus*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This species breeds in the northeast and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara in November and in the southwest land division in mid-December, and leaving by late April. The Fork-tailed Swift is an almost exclusively aerial species, foraging and sleeping on the wing. It rarely comes to ground, usually only for breeding. It is common in the Kimberley, uncommon to moderately common near northwest, west and southeast coasts and rare to scarce elsewhere. It is rarely seen in the Goldfields (Plate 11).

The Fork-tailed Swift may infrequently be seen in the project area, however, the proposed development and mining operations are unlikely to significantly impact on this species as it will move away to other areas if it is disturbed, and it is essentially an aerial species.

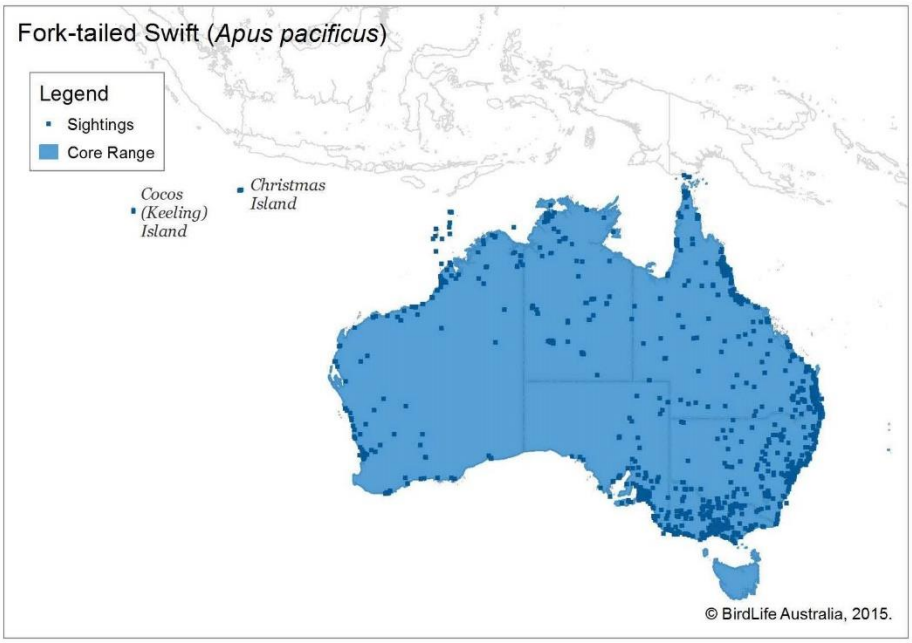

Plate 11. Range and actual reported sightings of the Fork-tailed Swift

(taken from http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds)

Grey Wagtail (*Motacilla cinerea*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

The Grey Wagtail is a small yellow breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species as breeding in Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water including rivers, streams and creeks where it feeds on insects. The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project area (Plate 12).

The Grey Wagtail is highly unlikely to be seen in the project area due to a lack of records and suitable habitat.

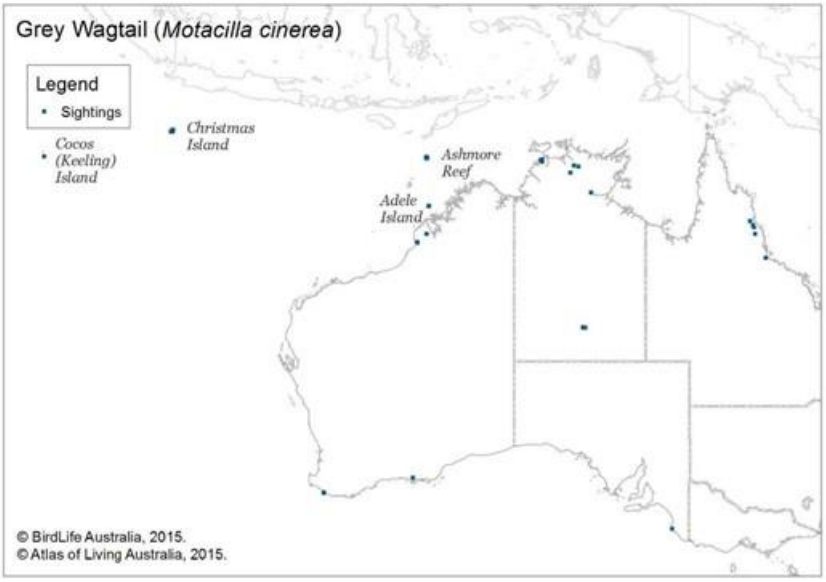

Plate 12. Reported sightings of the Grey Wagtail

(taken from http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds)

Common Sandpiper (*Actitis hypoleucos*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This small sandpiper is found along all coastlines of Australia and in many areas inland. It breeds in parts of Europe and Asia, and occasionally Africa and the population that migrates to Australia breeds in the Russian far east in the northern hemisphere summer.

The population when in Australia is concentrated in northern and western Australia including Nuytsland Nature Reserve, and Roebuck Bay, Western Australia. This species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. It is mostly found around muddy margins or rocky shores, estuaries, lakes, pools, billabongs, reservoirs, dams and claypans.

The Common Sandpiper is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Sharp-tailed Sandpiper (*Calidris acuminata*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

They arrive in Australia having bred in the northern hemisphere in August and September. In Western Australia, it is widespread in coastal areas from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division. Inland, it is widespread from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra.

It prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation feeding on seeds, worms, molluscs, crustaceans and insects.

The Sharp-tailed Sandpiper is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Pectoral Sandpiper (*Calidris melanotos*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This species is rarely recorded in Western Australia. It breeds in the northern hemisphere summer in Russia and north America and flies to the southern hemisphere to avoid the northern hemisphere winters. Its preferred

habitat includes coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands where it forages for algae, seeds, crustaceans, arachnids and insects.

The Pectoral Sandpiper is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Common Greenshank (*Tringa nebularia*) – Marine and migratory species under the *EPBC Act 1999* and *BC Act 2016*

It breeds in the northern hemisphere and visits Australia during the northern hemisphere winters, typically arriving from August.

Common Greenshank occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west foraging in inland wetlands and sheltered coastal habitats of varying salinity, including permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and salt flats.

The Common Greenshank is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Masked Owl (*Tyto novaehollandiae*) - Priority 3 species with DBCA

The Masked Owl is found in the south-west of WA, from Yanchep to east of Yealering, Gnowangerup and Albany (Johnstone & Storr, 1998), but not as far east as the project area. It is therefore highly unlikely to be found in the project area.

Sanderling (*Calidris alba*) – Marine and migratory species under the *EPBC Act 1999* and *BC Act 2016*

The Sanderling is seen along the coast from Eyre to Derby, and also around Wyndham. It breeds in the northern hemisphere and visits Australia during the northern hemisphere winters, typically arriving from August.

It is found on open sandy beaches exposed to open sea-swell, hypersaline lakes, salt ponds and samphire flats and feeds on plants, seeds, worms, crustaceans, spiders, insects, and occasionally on medusae, fish and larger molluscs and crustaceans taken as carrion.

The Sanderling is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Red-necked Stint (*Calidris ruficollis*) – Marine and Migratory species under the *EPBC Act 1999* and *BC Act 2016*

It breeds in the northern hemisphere and visits Australia during the northern hemisphere winters, typically arriving from August.

It is typically found in coastal areas, including inlets, bays, lagoons and estuaries with intertidal mudflats, stony or rocky shores, reefs or shoals, saltworks, sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland and flooded paddocks or damp grasslands.

The Red-necked Stint is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Long-toed Stint (*Calidris subminuta*) – Marine and Migratory species under the *EPBC Act 1999* and *BC Act 2016*

It breeds in the northern hemisphere and visits Australia during the northern hemisphere winters, typically arriving from August.

The Long-toed Stint occurs in a variety of terrestrial wetlands, including shallow freshwater or brackish lakes, swamps, river floodplains, streams, lagoons and sewage ponds.

The Long-toed Stint is unlikely to be impacted by the proposed development as there are no lakes or water courses present.

Naretha Blue Bonnet (*Northiella narethae*) - Priority 4 species with DBCA

The Atlas of Living Australia indicates this parrot is found in eastern southern Australia, east of the project area in the Nullarbor region in Myall woodlands, which is predominantly Acacia species.

It is highly improbable the Naretha Blue Bonnet is present in the project area and therefore impacted by the proposed development.

Peregrine Falcon (*Falco peregrinus*) - Otherwise specially protected under the *BC Act 2016*

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It shows habitat preference for areas near cliffs along coastlines, rivers and ranges and within woodlands along watercourses and around lakes. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years.

The Peregrine Falcon may infrequently be seen in the project area, however, the proposed development and mining operations are unlikely to have a significant impact on this species as it will readily move away from disturbance and there are abundant areas of similar habitat in the region.

Western Rosella (*Platycercus icterotis xanthogenys*) – Priority 4 with the DBCA

The mallee form of the Western Rosella is found mostly in eucalypt and *Casuarina* woodland and shrub lands, especially Wandoo, Flooded Gums and Salmon Gums. This species was sighted by Dames and Moore (1999) around Lake Lefroy, Outback Ecology Services (2009) at Randalls and it was reported by Dell and How (1984) in the biological survey of Widgiemooltha. A search of NatureMap indicated that they have been recorded on the western side of Lake Cowan.

It is possible that this species could be infrequently seen in the project area. However, given that the project area represents a small fraction of similar habitat in adjacent areas, vegetation clearing in the project area and mining operations are unlikely to have a significant impact on this species, as it will readily move to adjacent areas if disturbed.

Southern Death Adder (*Acanthophis antarcticus*) - Priority 3 species with DBCA

The Southern Death Adder is found in variety of habitat from rainforest, shrublands and heaths. The distribution map in the Atlas of Living Australia indicates that it has been recorded south of the project area.

Therefore, it is a low probability that the Southern Death Adder is present in the project area as it is typically in low abundance and very patchy.

Woma (*Aspidites ramsayi*) - Priority 1 species with DBCA

The southern Woma python was once recorded in a crescent shaped geographic distribution from Shark Bay to Kitchener in WA. However, it is now mostly only found on the two extremes of this distribution with a small population east of the wheatbelt in relatively dense shrubs on a sandy substrate.

In Western Australia the Woma is found in arid woodland or shrubland areas, typically on sand plains. It has not been recorded recently near the project area, so it is highly improbable the Woma python is present in the project area and therefore impacted by the proposed development.

Central Long-eared Bat (*Nyctophilus major tor*) – Priority 4 with the DBCA

This species is probably the species referred to by Churchill (2008) as the Central Long-eared Bat (*Nyctophilus major tor*). Records in the Atlas of Living Australia indicated this species has been found around Lake Cowan. It roosts in tree cavities, foliage and under loose bark.

Given that project area represents a small fraction of similar habitat in the general area, it is Terrestrial Ecosystems' assessment that vegetation clearing in the project area is unlikely to have a significant impact on this species.

5. DISCUSSION

5.1 ADEQUACY OF THE FAUNA SURVEY DATA FOR FAUNA HABITATS REPRESENTED IN THE PROJECT AREA

The EPA's (2020) *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* indicated that the level of fauna assessment should be determined considering the following criteria:

- level of existing regional knowledge;
- type and comprehensiveness of recent local surveys;
- degree of existing disturbance or fragmentation at the regional scale;
- extent, distribution and significance of habitats;
- significance of species likely to be present;
- sensitivity of the environment to the proposed activities; and
- scale and nature of impact.

There are multiple Detailed (i.e. Level 2) vertebrate fauna surveys in the vicinity of the project area that include fauna habitats similar to that in the project area.

Fauna habitat around Lake Cowan has been disturbed by feral fauna (e.g. camels, and probably foxes, cats) and the proposed disturbance area, relative to the availability of similar habitat in adjacent areas, is very small. It is improbable that the proposed vegetation clearing, mine development and mining operations will significantly impact on a conservation significant species.

A Detailed or further Targeted surveys of the project area are unlikely to record vertebrate fauna that have not already been identified as being present in the project area or conservation significant species that could be significantly impacted by the proposed development; therefore the time and cost associated with these surveys is not justified or warranted.

5.1.1 Amphibians

Amphibians typically found in eucalypt woodlands in the Goldfields are listed in Table 4. Frogs are normally only detected immediately after rainfall or around semi-permanent pools. It is likely that *Neobatrachus sutor*, *N. pelobatoides*, *Pseudophryne occidentalis* and *Neobatrachus kunapalari* could be found in the general area. These species, other than *P. occidentalis*, burrow into the ground and aestivate between rainfall events. *Pseudophryne occidentalis* find shelter under rocks and in crevices during the dry periods and enter temporary ponds to breed after major rainfall events. All four species have a wide-spread distribution and are abundant. Development of the project area is likely to result in a loss of individuals within the disturbed area, however, is unlikely to have a significant impact on these species when assessed in a regional context.

There are no conservation significant amphibians in the Goldfields.

5.1.2 Reptiles

Reptile species richness in the project area will be comparable with similar eucalypt woodlands elsewhere in the bioregion. The list provided in Table 6 represents species likely to be found over a large area of diverse habitat types. Eucalypt woodlands would typically support up to 40 species of reptiles, but many of these would be in low abundance. There are no characteristics of the reptile assemblage anticipated to be in the project area that indicated that there are reptiles of conservation significance or different to that in the neighbouring

areas are present and given that there were large expanses of similar habitat in adjacent areas, development of the project area is unlikely to have significant impact on reptiles when assessed in a regional context.

Fauna habitats in the project area are likely to be similar to that in the adjacent areas, so the loss of reptiles during vegetation clearing is unlikely to be significant in a bioregional context.

Terrestrial Ecosystems' view is that the proposed clearing of the project area is unlikely to significantly impact on the reptile fauna of the bioregion.

5.1.3 Birds

Avian species richness in the Goldfields is influenced by rainfall (Craig & Chapman, 2003) and is generally higher in woodlands compared with chenopod shrublands and more sparsely vegetated areas. The list provided in Table 3 represents species likely to be found over a large area of diverse habitat types. Eucalypt woodlands would typically support up to 50-70 species of birds, but many of these would be in very low numbers. Semi-arid and arid areas of inland Australia support a diverse range of transient and nomadic species that move through large areas in search of available resources. Heavy rain that is followed by flowering and seeding of many plant species is often sufficient to draw many of these nomadic species to the general area. These species move on to other areas once the resource is depleted or better resources are available in adjacent areas. Birds typically move from an area once vegetation clearing commences, so the impact is relatively low if the area is small. However, eggs and chicks in nests are often lost during the clearing process.

Shorebirds and waders recorded in the EPBC MNES search for the general area are only likely to be found in regional lake systems. After a major rainfall event when Lake Cowan contains a substantial volume of water, there is a possibility that some of the migratory species may be seen in or near the project area. However, these birds will not be residing in the project area and if disturbed, they will readily move to adjacent areas and would not be significantly impacted. The project area is likely to support a similar avifauna assemblage to that present in the adjacent areas. There are no bird species of conservation significance likely to be significantly impacted in the project area, as the Western Rosella and Peregrine Falcon, if present, would move to adjacent areas if disturbed and there was no evidence of Malleefowl in the project area. Development of the project area, particularly when similar habitat exists in the adjacent areas, is unlikely to significantly impact on any conservation significant species of bird. All birds will readily shift to other areas when there is a disturbance.

Predation by feral cats and foxes has significantly reduced the abundance of Malleefowl in the Goldfields and there are a few remaining small populations, mostly in areas of dense shrubland, as the dense vegetation provides the adult birds with some protection from predators. There was no evidence to indicate that Malleefowl were present in the project area.

The proposed development and mining operations are unlikely to significantly impact on the avian fauna of the bioregion.

5.1.4 Mammals

None of the mammals potentially found in the project area are of conservation significance and the loss of small mammals during vegetation clearing is unlikely to be significant in a bioregional context.

It was noted during the site visit that camels and rabbits are in the project area and surrounds. It is also likely that wild dog and foxes are present.

Terrestrial Ecosystems' view is that the development of the project area is unlikely to significantly impact on the mammal fauna of the bioregion.

5.2 BIODIVERSITY VALUE

An ecological assessment of a site should consider its biodiversity value at the genetic, species and ecosystem levels, and its ecological functional value at the ecosystem level. There are inadequate data to assess the ecological value at the genetic level, however, this is not an issue as there are no conservation significant species potentially in the project area that require this level of analysis.

Fauna habitat represented in the project area is abundant and in similar condition in adjacent areas. Therefore, the fauna assemblage that is present in the project area will also be present in adjacent areas. The available fauna survey data Appendix B provides an indication of the vertebrate fauna that are potentially in the project area.

5.2.1 Ecological functional value at the ecosystem level

Small sections of the project area have been disturbed by exploration drilling activity, with the consequence that these areas will have a depleted vertebrate fauna assemblage. Other than these small areas of disturbance, the most significant impact on vertebrate fauna in the project area and surrounds will have been feral cats and foxes.

This site is unlikely to support conservation significant fauna or a conservation significant ecosystem.

5.2.2 Maintenance of threatened ecological communities

No threatened ecological fauna communities were identified in the project area.

5.2.3 Condition of fauna habitat

Some of the project area has been disturbed due to historical and current exploration activity. There is also evidence of disturbance by camels and rabbits in the project area. The uncleared fauna habitat present in the project area are generally in good to excellent condition and similar to many square kilometres of adjacent habitat. The clearing of vegetation is therefore unlikely to have a significant impact on the vertebrate fauna when considered in a bioregional context.

5.2.4 Ecological linkages

The project area does not provide an important ecological linkage or fauna movement corridor.

5.2.5 Size and scale of the proposed disturbance

The project area is a relatively small proportion of similar fauna habitat found in the adjacent areas and bioregion. Given the available fauna survey data for these habitat types, no additional surveys are recommended.

5.2.6 Abundance and distribution of similar habitat in the adjacent areas

Fauna habitats present in the project area are abundant in adjacent areas. It is therefore likely that the fauna assemblage in the project area is like the many square kilometres of similar habitat in adjacent areas and the bioregion.

5.2.7 Potential impacts on ecosystem function

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the clearing process. The few larger animals, such as kangaroos and large goannas, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a short period until a balance is restored.

Impacts associated with clearing vegetation and development in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is small relative to the quantity of similar habitat in the bioregion.

6. POTENTIAL ENVIRONMENTAL IMPACTS

Development of the area will potentially affect vertebrate fauna in numerous ways, including death/injury of fauna during vegetation clearing, impacts with vehicles and the loss of habitat.

Although there are anticipated short term impacts on fauna, they are not likely to result in significant impacts on fauna habitat and fauna assemblages in the long term. The overall impact on fauna species and species of conservation significance will be minimal provided the recommended management procedures are implemented and adhered to.

6.1 DIRECT IMPACTS

6.1.1 Animal deaths during the clearing process and displacement of fauna

Clearing vegetation and activities associated with the development will result in the loss of some small fauna that retreat to burrows, such as reptiles and mammals. Nocturnal species are unlikely to be active when most of the land clearing and construction work is taking place which may result in these individuals being adversely impacted when they attempt to escape. This loss of vegetation is unlikely to have a significant impact on the vertebrate fauna assemblage when considered in a bioregional context. Larger terrestrial animals and avian species will most often move to adjacent areas. These species will be required to establish new activity areas and home ranges, and this could result in the temporary displacement of resident species.

6.1.2 Reduction or loss of activity areas and closure of burrows

Clearing vegetation and associated development activities are likely to destroy reptile and mammal burrows or foraging habitat that are currently in use or could be used again. Clearing vegetation that forms part of the activity area of individuals has the potential to force these animals into adjacent areas. These areas may offer fewer resources placing individuals under survival pressure. It could also cause individuals to move into the territories of other individuals increasing competition for resources. Forced relocations could increase the possibility of predation.

6.2 INDIRECT IMPACTS

6.2.1 Edge effects

Clearing linear corridors and other large areas increases fauna habitat edges. Small mammals can respond both positively and negatively to edges depending on their ecological traits (Goosem, 2000; Goosem & Marsh, 1997; Laurance, 1991, 1994). Edge and disturbance effects can lead to altered and most often higher levels of predation, restricting or increasing fauna movements and altering assemblage structure (Baker et al., 1998; Goosem et al., 2001; Luck et al., 1999; Oxley et al., 1974; Paton, 1994; Temple, 1998). Goldingay and Whelan (1997) and Clarke and Oldland (2007) reported that edge effects can extend up to 150-200m from the edge for some species, meaning the impact area on vertebrate fauna is likely to be larger than the cleared footprint.

Edge effects can lead to the disruption of ecological processes such as predation and dispersal, animal movements and can change assemblage structure. The consequence is that the impact area will always be much larger than the cleared area.

Given the small size of the project area, and the narrowness of the proposed haul road, edge effects are unlikely to be significant.

6.2.2 Habitat fragmentation

In addition to direct impacts of vegetation clearing, infrastructure including tracks, has the potential to fragment habitat. Cleared linear tracks of land are 'unnatural' in much of the habitat. These linear structures that partition existing activity areas, isolate sections of established communities and may alter long and medium-term patterns of movement around established home ranges particularly for small mammals and reptiles. A reduction in the population because of this development would be difficult to detect given our current knowledge of the spatial ecology for most of the small mammals known to be in the area.

Given the small size of the project area, and the narrowness of the proposed haul road, clearing vegetation and mining operations are unlikely to fragment the available fauna habitats in the project area.

6.2.3 Introduced fauna and weeds

Increased habitat fragmentation and human activity often results in an increase in the abundance of introduced species such as the house mice (*Mus musculus*), feral cats (*Felis catus*) and wild dogs (*Canis lupus*). This increase may be due to a decline in habitat health, increased road kills, poor disposal of waste and easier access to areas via tracks.

House mice, feral cats, foxes and wild dogs are known to be established in the area. In many situations they have become a 'naturalised' species in the Australian bush. Increases in wild dog or cat numbers can have a detrimental impact on native fauna because they predate on and compete with native species, severely disrupting the natural balance. The feral cat is a particularly damaging predator on native fauna and any increase in their numbers could have a detrimental effect on local native fauna (Bamford, 1995; Kinnear, 1993; Murphy et al., 2019; Woinarski et al., 2017; Woinarski et al., 2018); hence it is important to ensure that populations of the feral predators, such as cats are under control.

Infrastructure known to support feral species, such as rubbish disposal sites and bins, and permanent water should be managed to minimise increases in these populations.

Introduced plant species can successfully and rapidly invade areas of cleared native vegetation or otherwise disturbed by humans. Introduced plant species may replace native species that provide shelter or foraging areas for native fauna. Major changes to the structure of vegetation will alter the fauna habitat and consequently may influence fauna species composition. Preparing and implementing a weed management plan will largely reduce their threat to native fauna species.

6.2.4 Road fauna deaths

An increase in road fauna deaths is likely to occur where new roads / tracks are constructed or upgraded, in particular, affecting kangaroos, nocturnal birds and ground dwelling large carnivorous predators. Species such as goannas and raptors are attracted to carrion on road verges and therefore, there is an increased propensity for these species to be killed by vehicles. Given the size of the project area, the impacts of road fauna deaths are likely to be low.

6.2.5 Fire

Increased human activity is often associated with an altered fire regime which leads to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some conservation significant species as numerous small mammal and bird species rely on long unburnt vegetation.

6.2.6 Anthropogenic activity

Unnatural noises, vibrations, artificial light sources, and vehicle and human movement in an area may be sufficient to force individuals or fauna species to move from adjacent areas or alter their activity periods. This form of disturbance is likely to occur during the initial vegetation clearing and when development activity commences. The overall impact is likely to be confined to a relatively small area and is unlikely to be a significant impact.

6.2.7 Dust

Dust generated from shifting topsoil and increased vehicle traffic can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas may potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising impacts on fauna in areas adjacent to the mine. An effective dust management and monitoring program is required.

6.2.8 Risk assessment

Fauna surveys to support Environmental Impact Assessments (EIA) are part of the environmental risk assessment undertaken to consider what potential impacts a development might have on the biodiversity on a particular area and region. Potential impacts on fauna from the proposed development are identified and briefly described above. Tables 8, 9 and 10 provide a summary of the risk assessment associated with this project.

Any risk assessment is a product of the likelihood of an impact occurring and the consequences of that impact. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood x consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risk associated with each of the impacts. Disturbances and vegetation clearing have an impact on the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 10.

Table 8. Fauna impact risk assessment descriptors

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur, or one or more conservation significant species may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur, or one or more conservation significant species could be present at some time.
C	Moderate	The environmental event should occur, or one or more conservation significant species should be present at some time.
D	Likely	The environmental event will probably occur, or one or more conservation significant species will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur, or one or more conservation significant species is expected be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	Impact on fauna localised and no significant impact on species of conservation significance in the project area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the project area.
4	Major	Significant impact on conservation significant fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as 'vulnerable' or 'endangered' under the EPBC Act (1999) at a regional scale.
Acceptability of Risk		
Level of risk	Management Action Required	
Low	No action required.	
Moderate	Avoid if possible, routine management with internal audit and review of monitoring results annually.	
High	Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. May a referral to the Commonwealth under the EPBC Act 1999.	
Extreme	Unacceptable, project should be redesigned or not proceed.	

Table 9. Levels of acceptable risk

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequence	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

Table 10. A risk assessment of the impact of ground disturbance activity on fauna

			Before management				With management		
	Potential impacts		**Inherent risk**			**Risk controls**	**Residual risk**		
Factor			Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Fauna survey data	Inadequate survey data to adequately assess the risks	Unknown loss of fauna, fauna of conservation significance, and fauna assemblages, and an incomplete fauna assessment.	B	2	Low				
	Inadequacy of comparative data	Limits on the availability of comparative data reduced the capacity to assess the uniqueness of the fauna assemblages in the project area.	B	2	Low				
Clearing vegetation	Loss of fauna habitat – local scale	Loss of terrestrial fauna in the project area.	E	2	Mod	Where possible, reduce the extent of clearing and leave large Eucalypt trees.	E	1	Low
	Loss of fauna habitat – landscape scale	Loss of some fauna during vegetation clearing.	B	1	Low				
	Loss of fauna habitat – regional scale	Small loss of some fauna from the region.	B	1	Low				
	Loss of a threatened ecological fauna community	Loss of an undetected threatened ecological fauna community.	A	3	Low				
	Habitat fragmentation	Fauna movement restricted resulting in the death of fauna and a loss of biodiversity.	A	2	Low				
Death or loss of conservation significant fauna	Loss of a unique terrestrial fauna ecosystem	Loss of an ecosystem containing fauna with high species richness, high abundance and numerous top of the food chain predators.	A	2	Low				
	Malleefowl	Loss of a Malleefowl or small population of Malleefowl	A	2	Low				
	Chuditch	Loss of a Chuditch or small population of Chuditch	A	2	Low				
	Western Rosella	Loss of a Western Rosella or small population of Western Rosella	A	2	Low				
	Central Long-eared Bat	Loss of a Central Long-eared Bat or small population of Central Long-eared Bat	B	2	Low				

			Before management				With management		
	Fork-tailed Swift	Loss of a Fork-tailed Swift or small population of Fork-tailed Swift	A	2	Low				
	Peregrine Falcon	Loss of a Peregrine Falcon or small population of Peregrine Falcon	A	2	Low				
Human impacts	Increase or spread of weeds	Changed vegetation and a resulting loss of fauna habitat.	E	2	Mod	Implementation of a weed management plan.	D	2	Low
	Road kills	Animals being killed by vehicles as they cross roads	E	1	Low	Limiting speeds	E	1	Low
	Increase in feral fauna; specifically the fox, wild dog and cat	Increased predation on the native fauna	C	3	Mod	Implementation of a feral animal control program(s)	C	2	Low
	Dust	Increased potential for dust	E	2	Mod	Implementation of a dust management plan.	C	2	Low

6.3 NATIVE VEGETATION CLEARING PRINCIPLES AS THEY PERTAIN TO VERTEBRATE FAUNA

The *Environmental Protection Act (1986)* outlines 10 principles that are to be used in the assessment of native vegetation clearing permit applications which are also applicable for other assessments and approvals (Table 11). Where possible, native vegetation should not be cleared if any of the following principles are comprised.

Table 11. Assessment of impact using the native vegetation clearing principles

Principle	Response
It comprises a high level of biological diversity.	Clearing vegetation will not comprise a high level of biodiversity.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Although vegetation clearing for a mining operation would result in the loss of fauna habitat, this loss would not be significant when viewed in a bioregional context because of its abundance in adjacent areas.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The area does not contain a threatened ecological fauna community.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The area is not a remnant.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	The proposed haul road will cross an ephemeral creek line that joins two salt lakes, with the larger one on the western side eventually joining Lake Cowan. The proposed haul road crossing of this ephemeral creek is unlikely to have a significant impact on a watercourse or a wetland, due to the rarity of such events.
The clearing of the vegetation is likely to cause appreciable land degradation.	N/A
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing of vegetation is unlikely to impact on the environmental values of the bioregion.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	N/A

6.4 REFERRAL UNDER THE EPBC ACT

It is improbable that the proposed development and mining operations will significantly impact on a conservation significant vertebrate fauna species, so no referral under the *EPBC Act 1999* is recommended.

7. SUMMARY

The total assessed project area is ~260ha with ~136ha for a proposed haul road. There are three broad fauna habitats: Eucalypt woodland over shrubs, shrubland and samphire shrubland.

There was no evidence to indicate that Malleefowl were in the project area. There is a possibility that the Peregrine Falcon (listed as other specially protected fauna), the mallee form of the Western Rosella (Priority 4) and the Central Long-eared Bat (Priority 4) may infrequently be seen in the project area, but vegetation clearing, and mining activities are unlikely to significantly impact on these species as they will readily move once vegetation clearing commences.

Clearing native vegetation in the project area is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the clearing process, however, this loss is not likely to be significant when viewed in a bioregional context. The few larger animals, such as kangaroos, large goannas and snakes, and most of the birds will move into adjacent areas once vegetation clearing commences, so potential impacts will be low. There may be an on-going loss of small native fauna due to vehicle strikes on access tracks, but overall, this impact will be low. Forced fauna migrants resulting from vegetation clearing will increase competition for resources, which may result in the subsequent loss of migrants or local individuals. Individuals shifted out of their established activity areas are also vulnerable to predation until they have become established in their new areas.

Impacts on vertebrate fauna associated with clearing vegetation in the project area in a landscape or bioregional context are likely to be low as there are vast tracts of similar fauna habitat in adjacent areas.

Feral predators such as foxes and feral cats are likely to be present on site, and in a landscape context, will have a much larger impact on the vertebrate fauna than clearing the vegetation and developing and operating a mine in this location.

8. MANAGEMENT STRATEGIES

The purpose of this section is to identify generic management and mitigation strategies to address the potential impacts of development in the project area. Specific management and mitigation strategies to address potential impacts should be addressed in the recommended Vertebrate Fauna Management Plan and Construction Environmental Management Plan.

8.1 INDUCTION AND AWARENESS

All contractors and staff involved in vegetation clearing, development and ongoing operations in the project area should be made aware of the possible presence and issues associated with terrestrial fauna in the area through the induction process.

Recommendation 1: an induction program that includes a component on managing fauna is mandatory for staff working in the project area.

Recommendation 2: Information on protecting fauna and reporting deaths and sightings of Malleefowl and other conservation significant species is incorporated into the induction program.

8.2 DUST

Dust generated from vegetation clearing and development could potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas will potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising mining impacts on fauna during the construction program.

Recommendation 3: The impact of dust on adjacent vegetation and fauna habitat is managed against appropriate KPIs and in accordance with the clients' Construction Environmental Management Plan.

8.3 MINIMISING HABITAT FRAGMENTATION

Loss of vegetation and habitat may contribute to the decline in the number of fauna on and in the vicinity of project area. Where possible, access routes should be aligned to existing tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area to minimise the impact on the terrestrial fauna, which are often dependent upon specific habitat types. Clearing should be minimised and fragmentation of remnant vegetation should be avoided wherever possible. Once areas are no longer required then they should be rehabilitated.

Recommendation 4: All areas disturbed during exploration and mining are rehabilitated as soon as practical after they are no longer required.

Recommendation 5: Where possible, access routes are aligned to existing roads, tracks and other barriers or follow the boundaries of broad-scale vegetation associations in the area.

8.4 MINIMISING SECONDARY IMPACTS TO FAUNA AND FAUNA HABITAT

Pets and feral animals have the potential to impact on fauna. Pets should not be permitted on site and feral and pest fauna numbers monitored and controlled. All rubbish likely to attract animals should be suitably contained and disposed of so as not to encourage the feeding of fauna around the site.

Based on feral cat tracks and scats recorded during the site assessment, the project area currently supports a population of feral and pest species. Reducing the impacts of feral cats will reduce the stress on fauna and fauna assemblages in the area. Increased activity will result in increased traffic and a consequential increase in the fauna deaths on tracks. Limiting vehicle speed on mine roads can reduce collisions with fauna, particularly larger animals such as kangaroos and emus. Dead animals on the road also have the propensity to attract raptors, goannas and even cattle, which are then likely to be killed.

Recommendation 6: Pets are not permitted on the project.

Recommendation 7: All waste and rubbish be contained in bins and regularly removed from the project or placed in land fill and suitably covered to exclude access to predator species.

Recommendation 8: Feeding of native fauna is prohibited.

8.5 UNCAPPED DRILL HOLES

Uncapped drill holes can pose a serious threat to small animals, including ground dwelling reptiles, frogs and small mammals (Plate 13). A log of all on-site drill holes should be maintained detailing when they were capped, how and by whom. All drill holes should be temporarily capped on completion of drilling and permanently capped or closed as soon as possible after exploration activities have ceased.

Recommendation 9: A log of all on-site drill holes be maintained detailing when they were capped, how and by whom.

Plate 13. Uncapped drill hole that would catch vertebrate fauna

9. REFERENCES

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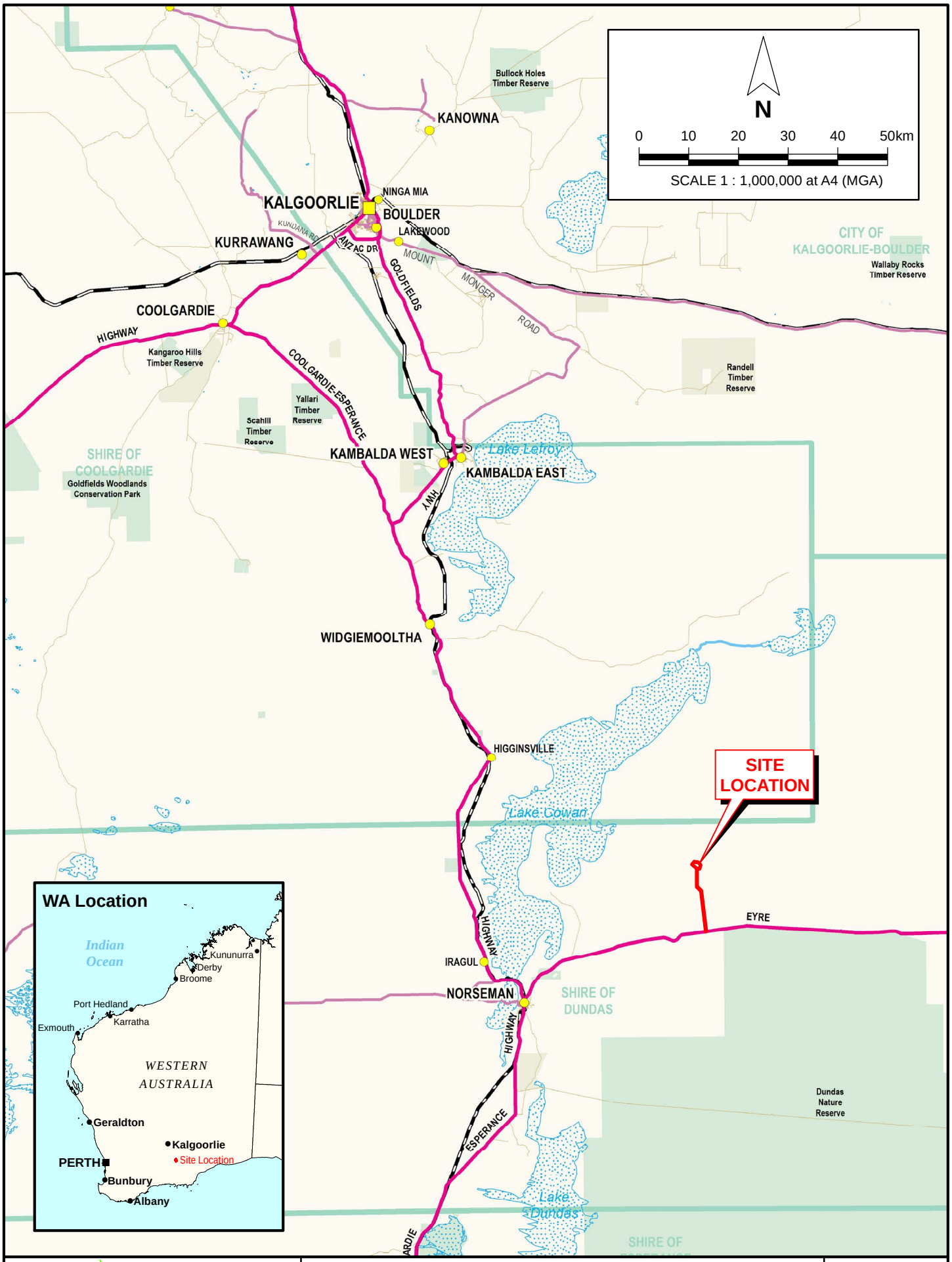
Figures

Basic Vertebrate Fauna Risk Assessment
Jeffreys Find



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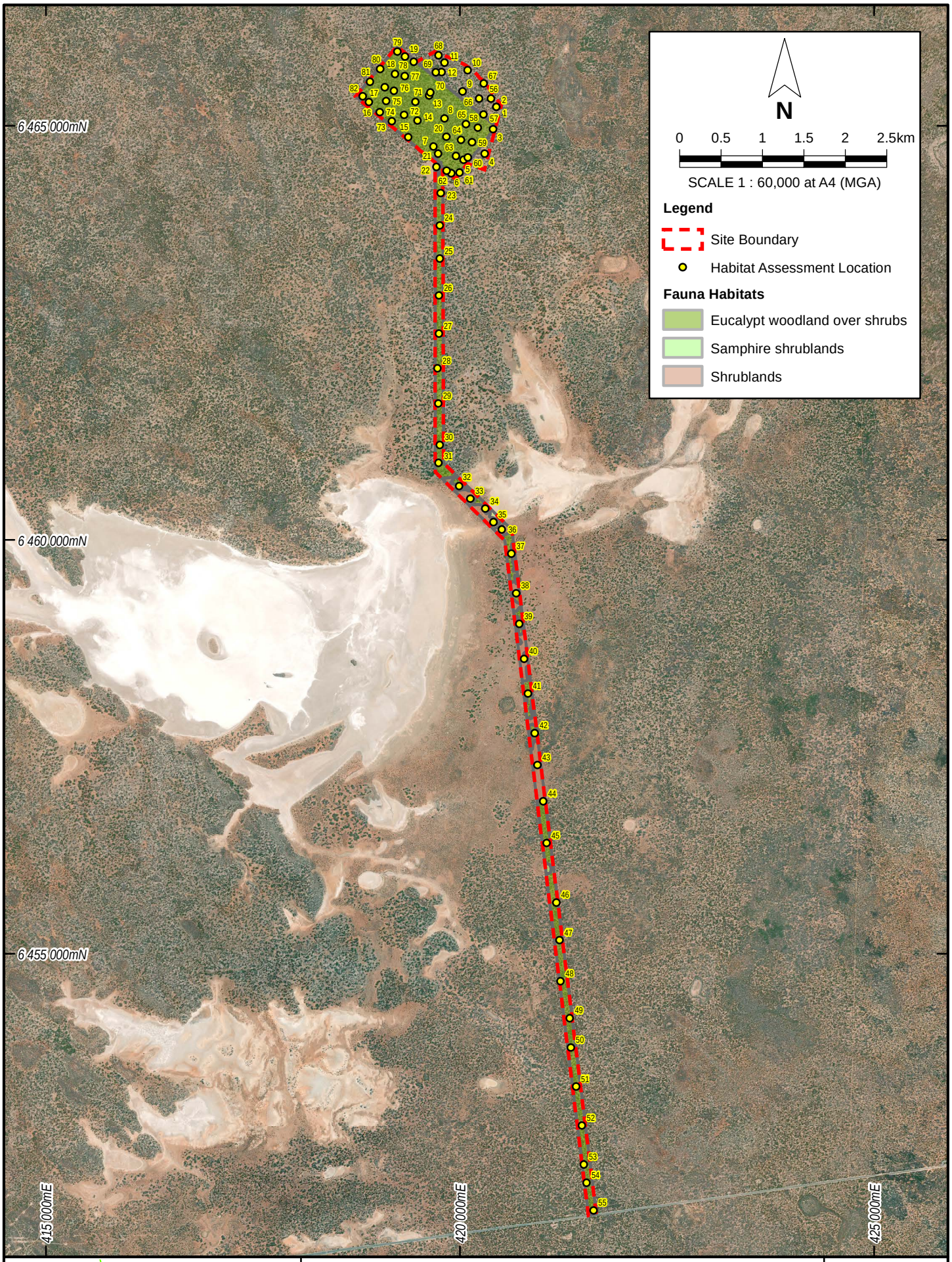
TERRESTRIAL ECOSYSTEMS

Native Vegetation Solutions
BASIC VERTEBRATE FAUNA RISK ASSESSMENT
JEFFREYS FIND

Figure 1

REGIONAL LOCATION

Drawn: G. Thompson | Date: 22 Sep 2022 | Job: 2022-0058



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TERRESTRIAL ECOSYSTEMS

Native Vegetation Solutions
BASIC VERTEBRATE FAUNA RISK ASSESSMENT
JEFFREYS FIND

FAUNA HABITATS AND RAPID HABITAT ASSESSMENT POINTS

Figure 2

Drawn: G. Thompson | Date: 22 Sep 2022 | Job: 2022-0058

Appendix A.

Results of the *EPBC Act* Protected Matters Search

Basic Vertebrate Fauna Risk Assessment
Jeffreys Find

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 11-Sep-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	10
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	11
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	5
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
MAMMAL		

Scientific Name	Threatened Category	Presence Text
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
PLANT		
Daviesia microcarpa Norseman Pea [56766]	Endangered	Species or species habitat known to occur within area
Eremophila denticulata subsp. trisulcata Cumquat Eremophila [64570]	Endangered	Species or species habitat may occur within area
Eucalyptus platydisca Jimberlana Mallee [64575]	Vulnerable	Species or species habitat known to occur within area
Tecticornia flabelliformis Bead Glasswort [82664]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State
Unknown	
Commonwealth Land - [52243]	WA
Commonwealth Land - [52244]	WA
Commonwealth Land - [52247]	WA
Commonwealth Land - [52246]	WA
Commonwealth Land - [50330]	WA
Commonwealth Land - [52187]	WA
Commonwealth Land - [52188]	WA
Commonwealth Land - [52233]	WA
Commonwealth Land - [51802]	WA
Commonwealth Land - [51800]	WA
Commonwealth Land - [51801]	WA

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Binaronca	Nature Reserve	WA
Dordie Rocks	Nature Reserve	WA
Dundas	Nature Reserve	WA
Kambalda	Nature Reserve	WA
Unnamed WA06043	Nature Reserve	WA
Unnamed WA08029	Nature Reserve	WA
Unnamed WA42943	Nature Reserve	WA

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Gold Mining Developments on Lake Lefroy	2010/5402	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Medcalf mining project, Bremer Range, WA	2017/8113	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix B.

Vertebrate Fauna Recorded in Biological Surveys in the Region

Basic Vertebrate Fauna Risk Assessment
Jeffreys Find

B.1 VERTEBRATE FAUNA ASSESSMENTS

		Surveys	A	B	C										D			E														
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
Amphibians																																
Limnodynastidae	*Limnodynastes dorsalis*	Western Banjo Frog	X																													
	Neobatrachus albipes	White-footed Trilling Frog	X																													
	Neobatrachus aquilonius	Northern Trilling Frog	X																													
	Neobatrachus kunapalari	Wheatbelt Frog	X	1	1	1	1	1	1						1	1																
	Neobatrachus pelobatoides	Humming Frog	X	1												1																
	Neobatrachus sudelli	Sudell's Frog																1	1													
	Neobatrachus sutor	Shoemaker Frog	X	1											1				1													
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet	X	1		2											1	3	1	4	2											
Reptiles																																
Agamidae	*Ctenophorus chapmani*	Chapman's Dragon	X																													
	Ctenophorus cristatus	Crested Dragon	X	1	1	1				1								1	1	1	1	2	3	6	1							
	Ctenophorus fordi	Mallee Dragon	X	1	2		1									1																
	Ctenophorus graafi	Ring-tailed Dragon	X																													
	Ctenophorus ornatus	Ornate Crevice Dragon	X																													
	Ctenophorus reticulatus	Western Netted Dragon	X	1																												
	Ctenophorus salinarum	Saltpan Dragon	X	1			4	1			9					1	1								4							
	Ctenophorus scutulatus	Lozenge-marked Dragon	X									2																				
	Moloch horridus	Thorny Devil	X	1								1						1	1					1								
	Pogona minor	Western Bearded Dragon	X	1		1		1	1	1			1			1			1					2	3							
	Tympanocryptis cephalus	Pebble Dragon	X	1																												
Carphodactylidae	*Nephrurus laevissimus*	Smooth Knob-tail	X	1	5	3	1			1	2			2		1																
	Underwoodisaurus milii	Barking Gecko	X	1							4							5			1	2			3							
Diplodactylidae	*Amalosia reticulata*	Reticulated Velvet Gecko		1																				21								
	Crenadactylus ocellatus	Clawless Gecko	X	1																												
	Diplodactylus granariensis	Wheatbelt Stone Gecko		1														5						3								
	Diplodactylus granariensis	Wheatbelt Stone Gecko	X																													

		Surveys	A	B	C										D			E											
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
	Diplodactylus pulcher	Beautiful Gecko	X	1														1		2	1		1							
	Hesperoedura reticulata	Reticulated Velvet Gecko	X																											
	Lucasium maini	Main's Ground Gecko	X	1											1			26		3			1							
	Strophurus assimilis	Goldfields Spiny-tailed Gecko	X			1	3				1			1																
	Strophurus elderi	Jewelled Gecko	X				1						1																	
	Strophurus intermedius	Southern Spiny-tailed Gecko																1												
	Strophurus strophurus	Western Spiny-tailed Gecko	X																											
Elapidae	*Brachyurophis fasciolatus*	Narrow-banded Burrowing Snake	X	1																										
	Brachyurophis semifasciata	Half-girdled Snake	X										1							1										
	Demansia psammophis	Yellow-faced Whipsnake	X	1																										
	Furina ornata	Orange-naped Snake	X																											
	Suta gouldii	Gould's Snake	X	1															1	1		3	1							
	Suta monachus	Hooded Snake	X	1																										
	Pseudechis australis	Mulga Snake	X																											
	Pseudonaja affinis	Dugite	X																											
	Pseudonaja mengdeni	Western Brown Snake	X	1										1																
	Pseudonaja modesta	Ringed Brown Snake	X																											
	Simoselaps bertholdi	Jan's Banded Snake	X	1																			1							
	Suta fasciata	Rosen's Snake	X																											
Gekkonidae	*Christinus marmoratus*	Marbled Gecko	X																											
	Gehyra purpurascens	Purplish Dtella	X	1									1																	
	Gehyra variegata	Variegated Gehyra	X	1				2	2				1	1		1	1	25	1	7			3	10	3		3			
	Heteronotia binoei	Bynoe's Gecko	X	1	1			1						2		1	1	4	2	2	1	19	4		6					
Pygopodidae	*Delma australis*	Marble-faced Delma	X		2																									
	Delma butleri	Unbanded Delma	X	1												1														
	Delma fraseri	Fraser's Delma	X	1																		1								
	Delma nasuta	Sharp-snouted Delma																						3						
	Lialis burtonis	Burton's Legless Lizard	X	1									1											1						
	Pygopus lepidopodus	Common Scaly-foot	X	1															1											

		Surveys	A	B	C											D			E												
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
Pythonidae	*Morelia spilota*	Carpet Python	X																												
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink	X	1															2			1	1	1	2						
	Ctenotus atlas	Southern Mallee Ctenotus	X	1	6	4	5		1	7			10	1		1	1	5						6							
	Ctenotus leonhardii	Leonhardi's Ctenotus		1				4																							
	Ctenotus schomburgkii	Barred Wedgesnout Ctenotus	X	1			4								1				1		1	4		4	1						
	Ctenotus severus	Stern Ctenotus	X																												
	Ctenotus uber	Spotted Ctenotus	X	1																											
	Cyclodomorphus branchialis	Common Slender Bluetongue																	2						1						
	Cyclodomorphus melanops	Spinifex Slender Blue-tongue	X																												
	Egernia depressa	Southern Pygmy Spiny-tailed Skink	X																												
	Egernia formosa	Goldfields Crevice Skink	X	1																											
	Egernia multiscutata	Southern Sand-skink		1														1	1				1								
	Egernia richardi	Bright Crevice-skink	X															1	3		1		1								
	Eremiascincus richardsonii	Broad-banded Sand-swimmer	X																												
	Hemiergis initialis	South-western Earless Skink	X	1															2				3	5	1						
	Hemiergis millewae	Triodia Earless Skink	X																						2						
	Hemiergis peronii	Lowlands Earless Skink	X																												
	Lerista distinguenda	South-western Orange-tailed Slider			1					3			1																		
	Lerista dorsalis	Southern Slider	X																												
	Lerista kingi	King's Slider	X																												
	Lerista muelleri	Wood Mulch-slider	X	1											1																
	Lerista picturata	Southern Robust Slider	X	1																			3	1							
	Lerista taeniata	Ribbon Slider	X																												
	Lerista terdigitata	Robust Mulch Slider																							1						
	Lerista timida	Timid Slider	X																												
	Lerista tridactyla	Dark-backed Mulch Slider	X																												
	Liopholis inornata	Desert Skink	X		1	1	2																								
	Liopholis multiscutata	Bull Skink	X																												

		Surveys	A	B	C											D			E												
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
	Menetia greyii	Common Dwarf Skink	X	1				1	2	2	3		2		1	1		1	1	3	1				3					
	Morethia adelaidensis	Saltbush Morethia Skink	X												1															
	Morethia butleri	Woodland Morethia Skink	X	1														4		1	1	2			1		1			
	Morethia obscura	Shrubland Pale-flecked Morethia	X		4																	1			1					
	Tiliqua occipitalis	Western Blue-tongued Lizard	X	1																										
	Tiliqua rugosa	Bobtail	X	1												1						1		1		3				
Typhlopidae	*Anilios australis*	Austral Blind Snake	X	1	1																									
	Anilios bicolor	Dark-spined Blind Snake								2																				
	Anilios bituberculatus	Prong-snouted Blind Snake		1																1										
Varanidae	*Varanus giganteus*	Perentie	X																											
	Varanus gouldii	Gould's Goanna	X	1				2																	1					
	Varanus tristis	Black-headed Monitor	X																											
Birds																														
Casuariidae	*Dromaius novaehollandiae*	Emu		1												1	1		2		9									
Anatidae	*Tadorna tadornoides*	Australian Shelduck		1																										
Columbidae	*Phaps chalcoptera*	Common Bronzewing		1		10						1									36							1		
	Ocyphaps lophotes	Crested Pigeon		1				3	1					2																
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo		1		1							1						1		1	2		1				3	3	
Cuculidae	*Chrysococcyx osculans*	Black-eared Cuckoo		1															3	2	1	2						1	2	
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar		1									1															1	1	
Podargidae	*Podargus strigoides*	Tawny Frogmouth		1																									1	
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar																										1		
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt		1																										
	Recurvirostra novaehollandiae	Red-necked Avocet		1																										
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover		1																										
Accipitridae	*Lophoictinia isura*	Square-tailed Kite																				2	1						1	
	Hieraaetus morphnoides	Little Eagle		1																				1				2	1	
	Aquila audax	Wedge-tailed Eagle		1							2	1												1						
	Accipiter fasciatus	Brown Goshawk		1						1																				
	Accipiter cirrocephalus	Collared Sparrowhawk		1																	2				1		3			

		Surveys	A	B	C										D			E											
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
	Haliastur sphenurus	Whistling Kite		1											1															
Cuculidae	*Heteroscenes pallidus*	Pallid Cuckoo		1												1				2			3		2			1		
Strigidae	*Ninox boobook*	Southern Boobook																										9		
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher		1																										
	Todiramphus sanctus	Sacred Kingfisher		1																										
Meropidae	*Merops ornatus*	Rainbow Bee-eater		1			1	1	1				1									2	2		1					
Falconidae	*Falco cenchroides*	Nankeen Kestrel		1																			1							
	Falco berigora	Brown Falcon		1			2																	1				2	1	
	Falco peregrinus	Peregrine Falcon		1											1						1									
Timaliidae	*Zosterops lateralis*	Silvereye		1						1		1									3		3							
Psittaculidae	*Polytelis anthopeplus*	Regent Parrot		1			1												2			2						26		
	Neophema splendida	Scarlet-chested Parrot					1																							
	Barnardius zonarius	Australian Ringneck		1		2		1	19				5		1		1		1		15	3		5				27	2	
	Platycercus icterotis	Western Rosella																											2	
	Psephotus varius	Mulga Parrot											1																	
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet		1			1					1			1				7	7	13	41	54	9	2			78	13	
Climacteridae	*Climacteris rufus*	Rufous Treecreeper	X	1						1		1	1		1	1						3	1	2	3			7		
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairywren	X	1															22			3								
	Malurus lamberti	Variegated Fairywren	X																											
	Malurus splendens	Splendid Fairywren	X																											
	Malurus leucopterus	White-winged Fairywren	X	1		4	40			1																				
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater	X	1		61	3	3		1			6	2	1	1	1		8			3	1	1						
	Manorina flavigula	Yellow-throated Miner	X	1		4	7	2	7	3	1		8	18		1	1					6		6			4	2		
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	X	1		20	9	1		1			1			1	1											1		
	Anthochaera carunculata	Red Wattlebird	X	1		7	2	1	1	1			1		1	1				2	26	24	28	5	3			82	4	4
	Gavicalis virescens	Singing Honeyeater	X	1		1	12	10			6		5	1		1	1					1								
	Ptilotula ornata	Yellow-plumed Honeyeater	X	1		1						1	2		1				186	7		86	81	4				256	47	
	Epthianura tricolor	Crimson Chat													1															
	Epthianura albifrons	White-fronted Chat	X	1																	2									

		Surveys	A	B	C										D			E											
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
	Lichmera indistincta	Brown Honeyeater	X	1		1				4									46	23	23		4					21		
	Nesoptilotis leucotis	White-eared Honeyeater	X	1											1				11	1	1	4	8	8	3			3	3	2
	Melithreptus brevirostris	Brown-headed Honeyeater	X	1		1						1			1				8		1	4		9	6			2	2	
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	X																											
	Pardalotus striatus	Striated Pardalote	X	1		1	1		2	1			4	2	1	1	1		4			30	14	23	4			25	29	7
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	X																											
	Pyrrholaemus brunneus	Redthroat	X	1		1	1			1		1							21	1	18	9	5	3				3	10	
	Hylacola cauta	Shy Heathwren		1		1				1		1																		
	Acanthiza apicalis	Inland Thornbill	X	1		10	1			5		1				1	1		25		19	21	10	15				4	33	
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X	1																										
	Acanthiza uropygialis	Chestnut-rumped Thornbill	X	1		2	1			1		1	8			1	1				7		5	13				6		
	Smicrornis brevirostris	Weebill	X	1		14	14		3	6			10	4		1	1		6	3		62	72	131	13			38	73	11
	Gerygone fusca	Western Gerygone	X	1																										
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	X	1																		5			7					
Cinclosomatidae	*Cinclosoma castanotum*	Chestnut Quail-thrush	X	1															2			1	5							
Campephagidae	*Coracina maxima*	Ground Cuckooshrike		1											1															
	Coracina novaehollandiae	Black-faced Cuckooshrike	X	1		7	2	7	1				1		1	1			1		2	1	1	1				3	1	
	Lalage tricolor	White-winged Triller	X																											
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	X	1		2																	8	9						
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird	X	1		2		1	1				1	1	1	1			2		2	5	1	5	1	1		4	4	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush	X	1		1		1		1		1			1	1			6			1	5	6				3	3	
	Pachycephala inornata	Gilbert's Whistler	X																	1			1							
	Pachycephala pectoralis	Golden Whistler	X																19			1	3	4					2	
	Pachycephala rufiventris	Rufous Whistler	X	1																										
Artamidae	*Artamus personatus*	Masked Woodswallow											1			1	1											12		
	Artamus cinereus	Black-faced Woodswallow	X	1													1													
	Artamus cyanopterus	Dusky Woodswallow	X	1		2						1										13	2	1				6	1	2
	Cracticus torquatus	Grey Butcherbird	X	1					4	2			1		1	1			2				3	5				7	2	
	Cracticus nigrogularis	Pied Butcherbird	X	1															1		2							23		

		Surveys	A	B	C										D			E												
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
	Gymnorhina tibicen	Australian Magpie	X	1									1																	
	Strepera versicolor	Grey Currawong	X	1		3				1												3	2	15				5		
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	X	1				1	1				1	1	1	1					1				1			1		1
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	X	1																										
	Myiagra inquieta	Restless Flycatcher	X																											
Corvidae	*Corvus orru*	Torresian Crow		1																										
	Corvus bennetti	Little Crow	X	1												1							25							
	Corvus coronoides	Australian Raven	X	1			2	1	1					1		1														
Petroicidae	*Microeca fascinans*	Jacky Winter	X	1											1				1				8	1			2	1	2
	Petroica goodenovii	Red-capped Robin	X	1							1	1				1					4		1	1				1	2	
	Melanodryas cucullata	Hooded Robin	X																											
	Eopsaltria australis	Eastern Yellow Robin																				4								
	Eopsaltria griseogularis	Western Yellow Robin	X	1																										
	Drymodes brunneopygia	Southern Scrub-Robin	X																											
Locustellidae	*Cincloramphus mathewsi*	Rufous Songlark	X																											
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	X																											
	Petrochelidon ariel	Fairy Martin	X																											
	Petrochelidon nigricans	Tree Martin	X	1										4													14			
	Cheramoeca leucosterna	White-backed Swallow	X	1		1	4	1		1			3	3		1														
Zosteropidae	*Zosterops lateralis*	Silvereye	X																											
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	X	1						1												1						6	1	
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit	X	1																					9					
Mammals																														
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	X	1																		1	1							
Canidae	*Canis lupus*	Dingo	X					1																						
	Vulpes vulpes	Red Fox	X												1															
	Felis catus	Cat												2																
Molossidae	*Austronomus australis*	White-striped Freetail Bat	X															1							2					1
Vespertilionidae	*Nyctophilus sp.*	Long-eared Bat sp.																							1					
	Chalinolobus gouldii	Gould's Wattled Bat	X															3							4					1

		Surveys	A	B	C										D			E												
Family	Species	Common name		St Ives	Junction Discharge	Junction Reference	Arao Discharge	Beta Hunt	Neptune Reference	West Dunes	Thunderer	Opportunistic	Thunderer Reference	Neptune	OM/T	LF	LS	WZ18	WZ6	WZ3	WZ7	WZ23	WZ22	WZ25	WZ26	WZ16	WZ2	WZ18a	WZ40	WZ27
	Chalinolobus morio	Chocolate Wattled Bat	X															1												
	Mormopterus sp.	Free-tail Bat Sp.																												
	Nyctophilus geoffroyi	Lesser Long-eared Bat	X															1												
	Scotorepens balstoni	Inland Broad-nosed Bat																												
	Vespadelus regulus	Southern Forest Bat	X															1	1						5	1				
Dasyuridae	*Dasyurus geoffroii*	Chuditch																												
	Ningaui ridei	Wongai Ningaui																												
	Ningaui yvonneae	Mallee Ningaui	X	1	1	2	2		1	1			1		1	1														
	Sminthopsis crassicaudata	Fat-tailed Dunnart	X	1															1						1	1				
	Sminthopsis dolichura	Little Long-tailed Dunnart	X	1												1														
	Sminthopsis murina	Slender-tailed Dunnart	X																											
	Sminthopsis ooldea	Ooldea Dunnart	X																											
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum	X	1	3	1				1						1														
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	X	1				1				1						1		1		1	1		1	1				
	Notamacropus eugenii	Tammar Wallaby	X																											
	Osphranter robustus	Euro	X	1														1			1									
	Osphranter rufus	Red Kangaroo		1																										
Leporidae	*Oryctolagus cuniculus*	Rabbit	X					1							1	1		1			1				1	1				
Muridae	*Mus musculus*	House Mouse	X		1	3	2	1		2	10		7	4	1	1	1	1												
	Notomys mitchellii	Mitchell's Hopping Mouse	X			1																								
	Pseudomys bolami	Bolam's Mouse	X	1	1	2	2			5	1																			
	Pseudomys hermannsburgensis	Sandy Inland Mouse	X	1																										
	Rattus rattus	Black Rat	X																											

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B Ninox Wildlife Consulting (2004b) *St Ives Gold Mine Vertebrate Fauna Assessment*. Unpublished report for St Ives Gold Mining Co Pty Ltd, Perth.

C Bamford Consulting Ecologists (2010) *Gold Fields St Ives Gold Mine, Kambalda. Fauna Assessment: impacts of water discharge and general mining activity on vertebrate fauna*. Unpublished report to Gold Fields St Ives Gold Mine, Perth.

D Dames and Moore (1999) *Public Environmental Review - Gold Mine Development on Lake Lefroy*. Unpublished report for St Ives Gold Mine; Kalgoorlie.

E Dell, J. and How, R. (1984) Vertebrate fauna. In The Biological Survey of the Eastern Goldfields of Western Australia, Records of the Western Australian Museum, Supplement No 18, 57-89.

		Survey	A																										
Family	Species	Common name	KFS2	KFS4	KFS5	KFS6	KFS7	KFS24	KFS3	KFS13a	KFS14	KFS17	KFS18	KFS19	KFS1	KFS12	KFS20	KFS21a	KFS23	KFS25	KFS26b	KFS26a	KFS15	KFS16	KFS13b	KFS21b	Kam Opp	KFS11
Amphibians																													
Limnodynastidae	*Neobatrachus kunapalari*	Wheatbelt Frog	1	1	1	1	2																						
	Neobatrachus pelobatoides	Humming Frog	2				2																						
	Neobatrachus sutor	Shoemaker Frog		1		1	1																						
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet					3	1	1																				
Reptiles																													
Agamidae	*Ctenophorus cristatus*	Crested Dragon								5	1	1	1	2															
	Ctenophorus fordi	Mallee Dragon	4																										
	Ctenophorus reticulatus	Western Netted Dragon					1																						
	Ctenophorus salinarum	Saltpan Dragon							17			4			1														
	Pogona minor	Western Bearded Dragon	1													1													
	Tympanocryptis cephalus	Pebble Dragon													1														
Carphodactylidae	*Nephrurus laevissimus*	Smooth Knob-tail	1																										
	Underwoodisaurus milii	Barking Gecko					3							1		1	2	1	2	2	1								
Diplodactylidae	*Diplodactylus pulcher*	Beautiful Gecko					5	3																					
	Lucasium maini	Main's Ground Gecko		2		1	7			2											1	1							
Elapidae	*Demansia psammophis*	Yellow-faced Whipsnake			2																								
	Simoselaps bertholdi	Jan's Banded Snake					1																						
Gekkonidae	*Gehyra purpurascens*	Purplish Dtella	2						1																				
	Gehyra variegata	Variegated Gehyra			3								1	1									5	1					
	Heteronotia binoei	Bynoe's Gecko		6	7		8		2				3	4	3	3	1					2	6	2	1				
Pygopodidae	*Delma butleri*	Unbanded Delma													1									1					
	Pygopus lepidopodus	Common Scaly-foot																1			2								
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink	3		2											1													
	Ctenotus atlas	Southern Mallee Ctenotus	2						1						2									5					
	Ctenotus leonhardii	Leonhardi's Ctenotus												3															
	Ctenotus schomburgkii	Barred Wedgesnout Ctenotus		3	1	6				1														1					
	Egernia formosa	Goldfields Crevice Skink						1																					
	Lerista kingi	King's Slider		1	5	2	3			4	1	1		1							3	1				2			
	Lerista picturata	Southern Robust Slider					4																						
	Menetia greyii	Common Dwarf Skink			4	3	4	1		1	4		1		1	1			3					1					
	Morethia butleri	Woodland Morethia Skink			2	1	2	1					1	3				1		1	2	1							
	Tiliqua rugosa	Bobtail	1	1	1	1	1				1	1	2					2		4			1		2	1			

		Survey	A																									
Family	Species	Common name	KFS2	KFS4	KFS5	KFS6	KFS7	KFS24	KFS3	KFS13a	KFS14	KFS17	KFS18	KFS19	KFS1	KFS12	KFS20	KFS21a	KFS23	KFS25	KFS26b	KFS26a	KFS15	KFS16	KFS13b	KFS21b	Kam Opp	KFS11
Typhlopidae	*Anilios australis*	Austral Blind Snake																1					1					
	Anilios bituberculatus	Prong-snouted Blind Snake																					2					
Varanidae	*Varanus gouldii*	Gould's Goanna																					1					
Birds																												
Casuariidae	*Dromaius novaehollandiae*	Emu	2	3	1		1		1														6				1	
Anatidae	*Tadorna tadornoides*	Australian Shelduck																									1	
Columbidae	*Streptopelia senegalensis*	Laughing Dove			1																							
	Phaps chalcoptera	Common Bronzewing																			1	2						
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo	1	1	1						1														1		1	
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar				1																						
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt																									1	
	Recurvirostra novaehollandiae	Red-necked Avocet																									1	
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover																									1	
Accipitridae	*Hieraaetus morphnoides*	Little Eagle									1																	
	Aquila audax	Wedge-tailed Eagle					1																					
	Accipiter cirrocephalus	Collared Sparrowhawk									2																	
	Haliastur sphenurus	Whistling Kite				1																						
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher									1																	
Meropidae	*Merops ornatus*	Rainbow Bee-eater								3	14											5						3
Falconidae	*Falco cenchroides*	Nankeen Kestrel																									1	
	Falco berigora	Brown Falcon			1												1										1	
	Falco peregrinus	Peregrine Falcon				1																	1					
Timaliidae	*Zosterops lateralis*	Silvereye			4																							
Psittaculidae	*Barnardius zonarius*	Australian Ringneck	2	12		3									1													
	Platycercus icterotis	Western Rosella																										
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet			6	12															2	3						
Climacteridae	*Climacteris rufus*	Rufous Treecreeper	3			7																4						
Maluridae	*Malurus lamberti*	Variegated Fairywren												9														
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater	24	5	1	6	1		18	1	4		6	3		1		1			2	1		3	3			
	Manorina flavigula	Yellow-throated Miner	13	9	20				2		12				63								20	2				
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	3	9	7		10		4		1			1		1		2			6	1	2	4	1	1		
	Anthochaera carunculata	Red Wattlebird	2	8	2	6	1				1		1									9		1	3			
	Gavicalis virescens	Singing Honeyeater	1	3	20		1		9		1					1	8		1				2			2	1	
	Ptilotula ornata	Yellow-plumed Honeyeater		1		49	1														13	27						

		Survey	A																										
Family	Species	Common name	KFS2	KFS4	KFS5	KFS6	KFS7	KFS24	KFS3	KFS13a	KFS14	KFS17	KFS18	KFS19	KFS1	KFS12	KFS20	KFS21a	KFS23	KFS25	KFS26b	KFS26a	KFS15	KFS16	KFS13b	KFS21b	Kam Opp	KFS11
	Epthianura albifrons	White-fronted Chat							8																			
	Lichmera indistincta	Brown Honeyeater			7	2	1	1		10	1		2	2		3	2	7		6	1	1			5	1		1
	Nesoptilotis leucotis	White-eared Honeyeater		1		1	3			6	6		2	3				2		1	2	1			2	2		1
	Melithreptus brevirostris	Brown-headed Honeyeater			6	23					11											12			4			
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	9	18	1	26	3		2	2	9	1		4								3	5	6	6	1		1
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat		1	2		10																			1		
	Acanthiza apicalis	Inland Thornbill	1	4	2		4		1				1				1	2										
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			2																							
	Acanthiza uropygialis	Chestnut-rumped Thornbill	2	22	15		22	4	10												1							
	Smicrornis brevirostris	Weebill	8	14	22		10	1	3	11	15	3	5	8		13	1	4		3				13	13	7		1
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler			13																	1						
Cinclosomatidae	*Cinclosoma castanotum*	Chestnut Quail-thrush			1		1																					
Campephagidae	*Coracina maxima*	Ground Cuckooshrike				6																						
	Coracina novaehollandiae	Black-faced Cuckooshrike	4		4	6	1			2				1				2					1					
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella																			10							
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird	1	3	1	3	6															1						
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush	1		6	3				2	1		2	2							1	2						1
	Pachycephala rufiventris	Rufous Whistler			1				1																			
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	6						4																			
	Artamus cyanopterus	Dusky Woodswallow		8		6			8																			
	Cracticus torquatus	Grey Butcherbird	6	3	1	2	5			1		1			8									2		1	1	
	Cracticus nigrogularis	Pied Butcherbird				2																					1	
	Gymnorhina tibicen	Australian Magpie				13																					1	
	Strepera versicolor	Grey Currawong			2	5												1				1		1		1		
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	2	3	1	6			5																			
Corvidae	*Corvus orru*	Torresian Crow			1																		5					
	Corvus bennetti	Little Crow	13																									
	Corvus coronoides	Australian Raven													2									1				
Petroicidae	*Microeca fascinans*	Jacky Winter		4		6																1						
	Petroica goodenovii	Red-capped Robin	1		2		4		1																			
Hirundinidae	*Petrochelidon nigricans*	Tree Martin		6					1																			
	Cheramoeca leucosterna	White-backed Swallow	2		3				20		1				1												1	
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit															3		1								1	3
Mammals																												

		Survey	A																									
Family	Species	Common name	KFS2	KFS4	KFS5	KFS6	KFS7	KFS24	KFS3	KFS13a	KFS14	KFS17	KFS18	KFS19	KFS1	KFS12	KFS20	KFS21a	KFS23	KFS25	KFS26b	KFS26a	KFS15	KFS16	KFS13b	KFS21b	Kam Opp	KFS11
Dasyuridae	*Sminthopsis crassicaudata*	Fat-tailed Dunnart																					1					
	Sminthopsis dolichura	Little Long-tailed Dunnart															2											
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum								3	1					3						2						
Leporidae	*Oryctolagus cuniculus*	Rabbit		1																			2					
Muridae	*Mus musculus*	House Mouse	6	2	6	7	8		6				2	1	7	7	1		2	4								10

A Ninox Wildlife Consulting (1995b) *Vertebrate Fauna Studies Kambalda Area (1993) Widgiemooltha Area (1994)*. Unpublished report for Western Mining Corporation (Kambalda Operations), Perth.

		Surveys	A																						B									
Family	Species	Common name	Site 3	Site 7	Site 2	Site 15	Site 5	Site 4	Site 8	Site 9	Site 17	Site 11	Site 6	Site 18	Site 19	Site 14	Lake Finn Rd	Opportunistic	Site 10	Site 16	Site 1	Site 13	Site 20	Site 12	Opportunistic	Site 1c	Site 2b	Site 2d	Site 1b	Site 1d	Site 2c	Site 1a	Site 2a	Site 3
Amphibians																																		
Limnodynastidae	*Neobatrachus sutor*	Shoemaker Frog	1	1	1	1																												
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet					2	5																										
Reptiles																																		
Agamidae	*Ctenophorus cristatus*	Crested Dragon	2				1	1	4	2	1	7	1	2	7	1	8	1							1	1	1	4						
	Ctenophorus fordi	Mallee Dragon								1					1		1		3															
	Ctenophorus isolepis	Central Military Dragon																											1					
	Ctenophorus ornatus	Ornate Crevice Dragon																							1	1			1					
	Ctenophorus salinarum	Saltpan Dragon																							1									
	Ctenophorus scutulatus	Lozenge-marked Dragon													1					3									1					
	Moloch horridus	Thorny Devil								1				2																				
	Pogona minor	Western Bearded Dragon					1									3	1		1	2	2	1			1									
	Tympanocryptis cephalus	Pebble Dragon																		1														
Carphodactylidae	*Nephrurus laevissimus*	Smooth Knob-tail			1														1															
Carphodactylidae	*Nephrurus vertebralis*	Midline Knob-tail																1																
	Underwoodisaurus milii	Barking Gecko											3		2								4	1					2					
Diplodactylidae	*Amalosia reticulata*	Reticulated Velvet Gecko																								1								
	Diplodactylus granariensis	Wheatbelt Stone Gecko	1				2																1											
	Diplodactylus pulcher	Beautiful Gecko						1																					1	4				
	Hesperoedura reticulata	Reticulated Velvet Gecko																																
	Lucasium maini	Main's Ground Gecko	1													2										3		1	9	3	1	2	1	1
	Strophurus assimilis	Goldfields Spiny-tailed Gecko																													1			
	Strophurus elderi	Jewelled Gecko																																5
Elapidae	*Brachyurophis semifasciata*	Half-girdled Snake																																1
	Suta monachus	Hooded Snake													1																			
	Pseudechis australis	Mulga Snake									1												1		1									
Gekkonidae	*Christinus marmoratus*	Marbled Gecko																														1		
	Gehyra purpurascens	Purplish Dtella																										1						
	Gehyra variegata	Variegated Gehyra										1		1		2				1	2										1			
	Heteronotia binoei	Bynoe's Gecko	2	1							1	2	2		1				1						1									1
Pygopodidae	*Delma australis*	Marble-faced Delma																																1
	Lialis burtonis	Burton's Legless Lizard																																5

		Surveys	A																						B									
Family	Species	Common name	Site 3	Site 7	Site 2	Site 15	Site 5	Site 4	Site 8	Site 9	Site 17	Site 11	Site 6	Site 18	Site 19	Site 14	Lake Finn Rd	Opportunistic	Site 10	Site 16	Site 1	Site 13	Site 20	Site 12	Opportunistic	Site 1c	Site 2b	Site 2d	Site 1b	Site 1d	Site 2c	Site 1a	Site 2a	Site 3
	Pygopus lepidopodus	Common Scaly-foot								1	1																							
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink																													1			
	Cryptoblepharus sp.												1	1																				
	Ctenotus atlas	Southern Mallee Ctenotus			4					4				4					13	1						1		2					2	23
	Ctenotus schomburgkii	Barred Wedgesnout Ctenotus	2			1			1					2	1																			
	Ctenotus severus	Stern Ctenotus																										2					1	
	Ctenotus uber	Spotted Ctenotus		1	1		1			1	1	1	4		6						1													
	Cyclodomorphus melanops	Spinifex Slender Blue-tongue																								1								
	Egernia depressa	Southern Pygmy Spiny-tailed Skink		1																														
	Egernia formosa	Goldfields Crevice Skink											1										1											
	Hemiergis initialis	South-western Earless Skink		1																				1										
	Liopholis inornata	Desert Skink														1																	1	
	Liopholis multiscutata	Bull Skink																																
	Menetia greyii	Common Dwarf Skink			2			1						2									1			2								
	Morethia adelaidensis	Saltbush Morethia Skink																				4												
	Morethia butleri	Woodland Morethia Skink	1			1			1		1	1		1		3						1		2										
	Morethia obscura	Shrubland Pale-flecked Morethia																						1										
	Tiliqua rugosa	Bobtail										1	1	1		2		1	1				1		1			1		1		1		
Typhlopidae	*Anilios hamatus*	Pale-headed Blind Snake																																1
Varanidae	*Varanus gouldii*	Gould's Goanna			2	1																			1		1					1	
	Varanus tristis	Black-headed Monitor	1																															
Birds																																		
Casuariidae	*Dromaius novaehollandiae*	Emu																							1									
Anatidae	*Anas superciliosa*	Pacific Black Duck																							1					1				
Columbidae	*Phaps chalcoptera*	Common Bronzewing																								1		2	1	2				
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo																																1
Accipitridae	*Aquila audax*	Wedge-tailed Eagle																															2	1
	Accipiter fasciatus	Brown Goshawk																							1									
	Accipiter cirrocephalus	Collared Sparrowhawk																																1
Meropidae	*Merops ornatus*	Rainbow Bee-eater																							1		2							
Psittaculidae	*Polytelis anthopeplus*	Regent Parrot																							1					1				
	Barnardius zonarius	Australian Ringneck																							1	3	5	4		3	4	2	4	

		Surveys	A																						B								
Family	Species	Common name	Site 3	Site 7	Site 2	Site 15	Site 5	Site 4	Site 8	Site 9	Site 17	Site 11	Site 6	Site 18	Site 19	Site 14	Lake Finn Rd	Opportunistic	Site 10	Site 16	Site 1	Site 13	Site 20	Site 12	Opportunistic	Site 1c	Site 2b	Site 2d	Site 1b	Site 1d	Site 2c	Site 1a	Site 2a	Site 3
Climacteridae	*Climacteris rufus*	Rufous Treecreeper																										1						
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater																							1	2			3			1		
	Manorina flavigula	Yellow-throated Miner																							1	2				9			2	
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater																							1					4				1
	Anthochaera carunculata	Red Wattlebird																							1	2		1	4	8	1		1	
	Gavicalis virescens	Singing Honeyeater																							1									1
	Gavicalis virescens	Singing Honeyeater																																
	Ptilotula ornata	Yellow-plumed Honeyeater																							1	1		25		4	11		12	1
	Melithreptus brevirostris	Brown-headed Honeyeater																							1				3	11				
Pardalotidae	*Pardalotus striatus*	Striated Pardalote																							1	8	7	1	1	4	1	4	2	11
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat																																2
	Acanthiza apicalis	Inland Thornbill																								1					4			
	Acanthiza uropygialis	Chestnut-rumped Thornbill																							1	2	3		3		14	9		4
	Smicrornis brevirostris	Weebill																							1	16	32	8	15	6	8	13	9	19
	Gerygone fusca	Western Gerygone																								1								
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler																								1		1						
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike																								1	2			1	1		1	2
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella																																5
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird																																1
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush																							1		1	3		1	2		2	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow																										3						
	Cracticus torquatus	Grey Butcherbird																										1						
	Cracticus nigrogularis	Pied Butcherbird																							1					4				2
	Gymnorhina tibicen	Australian Magpie																								2			1	2				
	Strepera versicolor	Grey Currawong																							1		1		1		1	3	1	
Corvidae	*Corvus coronoides*	Australian Raven																							1	2	3				2		1	1
	Corvus coronoides	Australian Raven																																
Petroicidae	*Petroica goodenovii*	Red-capped Robin																										1				1		
Hirundinidae	*Petrochelidon nigricans*	Tree Martin																															2	
Mammals																																		
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna																							1									
Felidae	*Felis catus*	Cat																			1								1					
	Ningaui yvonneae	Mallee Ningaui																								3	1	2				3		3

		Surveys	A																						B									
Family	Species	Common name	Site 3	Site 7	Site 2	Site 15	Site 5	Site 4	Site 8	Site 9	Site 17	Site 11	Site 6	Site 18	Site 19	Site 14	Lake Finn Rd	Opportunistic	Site 10	Site 16	Site 1	Site 13	Site 20	Site 12	Opportunistic	Site 1c	Site 2b	Site 2d	Site 1b	Site 1d	Site 2c	Site 1a	Site 2a	Site 3
	Sminthopsis crassicaudata	Fat-tailed Dunnart																		1		3												
	Sminthopsis dolichura	Little Long-tailed Dunnart							1											2											1			
	Sminthopsis gilberti	Gilbert's Dunnart		1							1												1	1										
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum	4	1			1		1	3	3	1								1						1	1							
Muridae	*Mus musculus*	House Mouse											2			1			1	1									1			4		
	Notomys alexis	Spinifex Hopping Mouse				1																												
	Notomys mitchellii	Mitchell's Hopping Mouse			1	1					1								2															
	Pseudomys bolami	Bolam's Mouse									1																							
	Pseudomys hermannsburgensis	Sandy Inland Mouse											3			1				1														

A ATA Environmental (2006) *Vertebrate Fauna Assessment St Ives Gold Mine*. Unpublished report for Jim's Seeds, Weeds and Trees, Ltd, Kalgoorlie.

B Keith Lindbeck and Associates (2007) *St. Ives Gold Mining Company Tailings Storage Facility (No. 4) Spring Fauna Survey*. Unpublished report for St. Ives Gold Mining Company, Perth.

		Surveys	A																				B								
Family	Species	Common name	Site 20	Site 5	Site 19	Site 8	Site 9	Site 14	Site 12	Site 18	Site 17	Site 10	Site 1	Site 2	Site 13	Site 16	Site 4	Site 6	Site 15	Site 7	Site 3	Site 11	DI2	DI1A	DI3	DI4A	DI1B	DI4B	DI1	DI4	Opportunis
Amphibians																															
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet	1	1																											
Reptiles																															
Agamidae	*Ctenophorus cristatus*	Crested Dragon	1		1	1	1	1	1	1	1																				
	Ctenophorus fordi	Mallee Dragon				2	1			1		3	1	1																	
	Ctenophorus salinarum	Saltpan Dragon													2								1	1							
	Ctenophorus scutulatus	Lozenge-marked Dragon			1											1															
	Pogona minor	Western Bearded Dragon						1	1				1		1		1														
	Pogona minor	Western Bearded Dragon																							1	1					
Carphodactylidae	*Nephrurus laevissimus*	Smooth Knob-tail				3						2	1	5																	
	Underwoodisaurus milii	Barking Gecko	8	62	1				1		1					2	2														
Diplodactylidae	*Amalosia reticulata*	Reticulated Velvet Gecko					1					1						1													
	Crenadactylus ocellatus	Clawless Gecko															3		1												
	Diplodactylus granariensis	Wheatbelt Stone Gecko	1	2	1			2						1			3		3	2	1										
	Diplodactylus pulcher	Beautiful Gecko		3	4						2					1		7		1		4									
	Lucasium maini	Main's Ground Gecko		2	4	1												1			9										
	Strophurus assimilis	Goldfields Spiny-tailed Gecko				1							1		1				3												
	Strophurus elderi	Jewelled Gecko				1						1		3																	
Elapidae	*Brachyurophis semifasciata*	Half-girdled Snake												2		1			1												
	Demansia psammophis	Yellow-faced Whipsnake	1																												
	Suta gouldii	Gould's Snake							1																						
	Suta monachus	Hooded Snake									1																				
	Pseudechis australis	Mulga Snake	1																												
	Pseudonaja mengdeni	Western Brown Snake																					1	1	1	2	3				
	Pseudonaja modesta	Ringed Brown Snake							1																						
	Simoselaps bertholdi	Jan's Banded Snake							1					1			1														
Gekkonidae	*Christinus marmoratus*	Marbled Gecko										1																			
	Gehyra variegata	Variegated Gehyra	1					1	1	2			3	1				1	1		1		1	4	4		1				
	Heteronotia binoei	Bynoe's Gecko		1	6			1			1		2		2						2		2								
Pygopodidae	*Delma australis*	Marble-faced Delma	1											1							1										
	Delma butleri	Unbanded Delma												2					2				8	5		4	5	4			

		Surveys	A																					B								
Family	Species	Common name	Site 20	Site 5	Site 19	Site 8	Site 9	Site 14	Site 12	Site 18	Site 17	Site 10	Site 1	Site 2	Site 13	Site 16	Site 4	Site 6	Site 15	Site 7	Site 3	Site 11	DI2	DI1A	DI3	DI4A	DI1B	DI4B	DI1	DI4	Opportunis
	Delma fraseri	Fraser's Delma												3			1														
	Lialis burtonis	Burton's Legless Lizard					1			3				2					1							1	1				
	Pygopus lepidopodus	Common Scaly-foot								1																					
Scincidae	*Cryptoblepharus buchananii*	Buchanan's Snake-eyed Skink						1	2										2	2	4	1									
	Ctenotus atlas	Southern Mallee Ctenotus				3						11		6									14	12	1	23	11	9			
	Ctenotus schomburgkii	Barred Wedgesnout Ctenotus			5			3		1									1		1										
	Ctenotus uber	Spotted Ctenotus			1	1				1	1					1		2													
	Cyclodomorphus melanops	Spinifex Slender Blue-tongue											1																		
	Egernia formosa	Goldfields Crevice Skink																4				1									
	Eremiascincus richardsonii	Broad-banded Sand-swimmer																4													
	Hemiergis initialis	South-western Earless Skink	1														1					1									
	Lerista distinguenda	South-western Orange-tailed Slider				1							1	4																	
	Lerista picturata	Southern Robust Slider	2		1	1	3	1	2	3	3	1	1							5	1	1									
	Lerista sp.			2	4			1	2	2	3				5	5	4		3	4	4	2									
	Liopholis inornata	Desert Skink				1							1	1																	
	Menetia greyii	Common Dwarf Skink			2	1		1		3	4								1			1			1			1			
	Morethia butleri	Woodland Morethia Skink		2	2	1					1									1	2	2									
	Morethia obscura	Shrubland Pale-flecked Morethia							2										1			2									
	Tiliqua occipitalis	Western Blue-tongued Lizard																							1						
	Tiliqua rugosa	Bobtail	1																2												
Typhlopidae	*Anilios australis*	Austral Blind Snake		2		1								1			1			1	1										
Varanidae	*Varanus gouldii*	Gould's Goanna												2									1								
Birds																															
Casuariidae	*Dromaius novaehollandiae*	Emu																							1				1		
Columbidae	*Phaps chalcoptera*	Common Bronzewing	1					1				1	1						1												
	Ocyphaps lophotes	Crested Pigeon	1																												
Accipitridae	*Accipiter fasciatus*	Brown Goshawk			1	1						1																		1	
	Haliastur sphenurus	Whistling Kite					1																								
Alcedinidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher										1								1											
Meropidae	*Merops ornatus*	Rainbow Bee-eater			1		1		1	1		1		1		1															
Falconidae	*Falco berigora*	Brown Falcon		1																										1	
Timaliidae	*Zosterops lateralis*	Silvereye								1																					

		Surveys	A																				B								
Family	Species	Common name	Site 20	Site 5	Site 19	Site 8	Site 9	Site 14	Site 12	Site 18	Site 17	Site 10	Site 1	Site 2	Site 13	Site 16	Site 4	Site 6	Site 15	Site 7	Site 3	Site 11	DI2	DI1A	DI3	DI4A	DI1B	DI4B	DI1	DI4	Opportunis
Psittaculidae	*Barnardius zonarius*	Australian Ringneck	1	1		1	1		1			1		1			1		1	1	1	1	1		1				3	2	
	Glossopsitta porphyrocephala	Purple-crowned Lorikeet		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1									
Climacteridae	*Climacteris rufus*	Rufous Treecreeper		1		1	1		1	1										1											
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairywren															1														
	Malurus leucopterus	White-winged Fairywren													1																
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater			1			1						1		1		1		1											
	Manorina flavigula	Yellow-throated Miner	1		1				1	1	1								1				2		6				10	7	
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	1	1	1			1	1			1				1			1			1									
	Anthochaera carunculata	Red Wattlebird	1	1	1	1	1		1	1	1	1		1		1	1	1	1	1	1	1									
	Gavicalis virescens	Singing Honeyeater						1						1		1		1													
	Ptilotula ornata	Yellow-plumed Honeyeater	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1		1									
	Lichmera indistincta	Brown Honeyeater			1	1		1	1	1	1	1	1	1		1		1	1	1		1									
	Nesoptilotis leucotis	White-eared Honeyeater		1				1				1				1		1													
	Nesoptilotis flavicollis	Yellow-throated Honeyeater		1													1			1	1										
	Melithreptus brevirostris	Brown-headed Honeyeater																1													
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1									
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat		1	1			1		1						1	1			1		1									
	Calamanthus campestris	Rufous Fieldwren															1														
	Acanthiza apicalis	Inland Thornbill		1	1			1					1			1	1					1									
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	1		1				1																						
	Acanthiza uropygialis	Chestnut-rumped Thornbill	1		1			1								1						1									
	Smicrornis brevirostris	Weebill	1	1	1	1	1	1	1	1	1	1		1		1	1		1	1	1	1									
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler														1			1												
Cinclosomatidae	*Cinclosoma castanotum*	Chestnut Quail-thrush														1	1	1	1	1											
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike	1		1	1				1	1	1						1	1	1	1	1									
	Lalage tricolor	White-winged Triller								1																					
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella																	1												
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird	1		1	1	1	1		1		1				1			1			1									
Pachycephalidae	*Colluricincla harmonica*	Grey Shrikethrush	1	1	1	1	1	1	1	1		1		1		1	1		1	1											
Artamidae	*Artamus cinereus*	Black-faced Woodswallow				1							1					1		1											
	Artamus cyanopterus	Dusky Woodswallow				1	1		1											1											
	Cracticus torquatus	Grey Butcherbird	1	1	1	1	1		1	1	1	1		1	1		1	1	1	1	1	1	1		1				4	1	
	Cracticus nigrogularis	Pied Butcherbird									1																				

		Surveys	A																				B								
Family	Species	Common name	Site 20	Site 5	Site 19	Site 8	Site 9	Site 14	Site 12	Site 18	Site 17	Site 10	Site 1	Site 2	Site 13	Site 16	Site 4	Site 6	Site 15	Site 7	Site 3	Site 11	DI2	DI1A	DI3	DI4A	DI1B	DI4B	DI1	DI4	Opportunis
	Gymnorhina tibicen	Australian Magpie	1							1	1																				
	Strepera versicolor	Grey Currawong	1				1					1				1		1		1	1										
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail					1			1																					
Monarchidae	*Grallina cyanoleuca*	Magpie-lark								1																					
	Myiagra inquieta	Restless Flycatcher					1																								
Corvidae	*Corvus coronoides*	Australian Raven	1	1						1	1					1			1			1							4	2	
Petroicidae	*Microeca fascinans*	Jacky Winter					1	1		1		1																			
	Petroica goodenovii	Red-capped Robin	1		1			1								1									2						
Hirundinidae	*Hirundo neoxena*	Welcome Swallow								1																					
	Cheramoeca leucosterna	White-backed Swallow										1																			
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird									1																				
Mammals																															
Canidae	*Canis sp.*																								1						
Felidae	*Felis catus*	Cat																							1		1				
Dasyuridae	*Ningaui ridei*	Wongai Ningaui										1		4																	
	Ningaui yvonneae	Mallee Ningaui				1																									
	Sminthopsis crassicaudata	Fat-tailed Dunnart		2											3																
	Sminthopsis dolichura	Little Long-tailed Dunnart	2						1							1															
Burramyidae	*Cercartetus concinnus*	Southwestern Pygmy Possum				1	3		3	2				1		1	1	2	2	3	2	4									
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo																													X
Leporidae	*Oryctolagus cuniculus*	Rabbit																						1	1		1				
Muridae	*Mus musculus*	House Mouse													4									3	3						
	Notomys mitchellii	Mitchell's Hopping Mouse						1				1	1	12																	
	Pseudomys bolami	Bolam's Mouse																1				1									

A Western Wildlife (2006) *St Ives Gold Fauna Survey; Spring 2005*. Unpublished report for Jim's Seeds, Weeds and Trees, Perth.

B Ninox Wildlife Consulting (2004b) *St Ives Gold - Delta Project Vertebrate Fauna Assessment*. Unpublished report for St Ives Gold Mining Company Pty Ltd, Perth.

Appendix C. Definitions of Significant Fauna under the WA Biodiversity Conservation Act 2016 and Priority Species

Basic Vertebrate Fauna Risk Assessment
Jeffreys Find

DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE WA BIODIVERSITY CONSERVATION ACT 2016

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*. Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened Species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*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 the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

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. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

[1] The definition of flora includes algae, fungi and lichens

[2] Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

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. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*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).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that "*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the pwild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially Protected Species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory birds protected under an international agreement

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the

migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependant fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

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

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

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

P1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

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.

Appendix D. Rapid Habitat Assessment Results

Basic Vertebrate Fauna Risk Assessment
Jeffreys Find

Date: 4/09/2022 | Habitat Assessment #: 1 | Observer: Joel Wilson

Zone: 51 | Easting: 420440 mE | Northing: 6465228 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 2 | Observer: Joel Wilson

Zone: 51 | Easting: 420440 mE | Northing: 6465228 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 3 | Observer: Joel Wilson

Zone: 51 | Easting: 420399 mE | Northing: 6464958 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 4 | Observer: Joel Wilson

Zone: 51 | Easting: 420297 mE | Northing: 6464663 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 5 | Observer: Joel Wilson

Zone: 51 | Easting: 420045 mE | Northing: 6464591 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 6 | Observer: Joel Wilson

Zone: 51 | Easting: 419894 mE | Northing: 6464428 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 7 | Observer: Joel Wilson

Zone: 51 | Easting: 419682 mE | Northing: 6464750 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 8 | Observer: Joel Wilson

Zone: 51 | Easting: 419813 mE | Northing: 6465088 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 9 | Observer: Joel Wilson

Zone: 51 | Easting: 420032 mE | Northing: 6465415 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 10 | Observer: Joel Wilson

Zone: 51 | Easting: 420091 mE | Northing: 6465672 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 11 | Observer: Joel Wilson

Zone: 51 | Easting: 419812 mE | Northing: 6465763 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 12 | Observer: Joel Wilson

Zone: 51 | Easting: 419777 mE | Northing: 6465648 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 13 | Observer: Joel Wilson

Zone: 51 | Easting: 419627 mE | Northing: 6465366 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 14 | Observer: Joel Wilson

Zone: 51 | Easting: 419487 mE | Northing: 6465063 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 15 | Observer: Joel Wilson

Zone: 51 | Easting: 419376 mE | Northing: 6464863 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 16 | Observer: Joel Wilson

Zone: 51 | Easting: 418902 mE | Northing: 6465286 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 17 | Observer: Joel Wilson

Zone: 51 | Easting: 419091 mE | Northing: 6465465 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 18 | Observer: Joel Wilson

Zone: 51 | Easting: 419216 mE | Northing: 6465626 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 19 | Observer: Joel Wilson

Zone: 51 | Easting: 419335 mE | Northing: 6465836 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 20 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419835 mE | Northing: 6464866 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 21 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419736 mE | Northing: 6464663 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022

Habitat Assessment #: 22

Observer: Dr Scott Thompson

Zone: 51

Easting: 419716 mE

Northing: 6464503 mN

Fire History: > 5 years

Landform: Flat/undulating

Soil Type: Sandy clay

Habitat Structure: Shrublands

Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 23 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419768 mE | Northing: 6464187 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 24 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419756 mE | Northing: 6463795 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

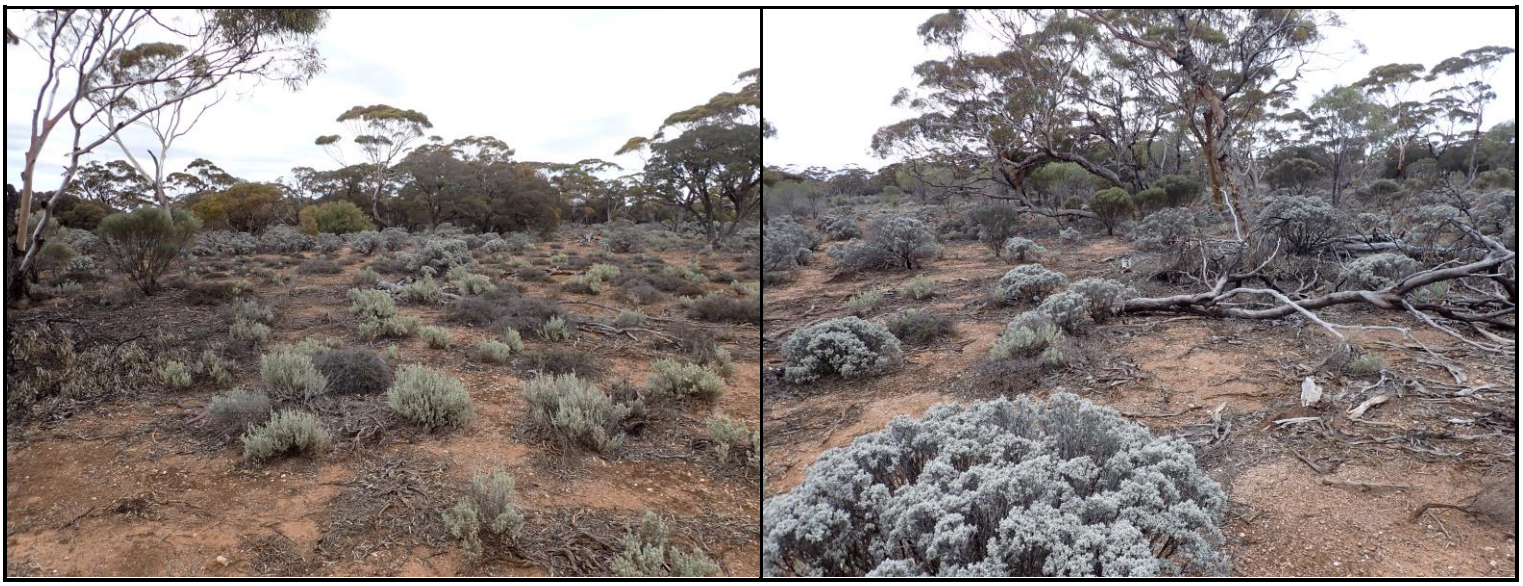
Date: 4/09/2022 | Habitat Assessment #: 25 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419756 mE | Northing: 6463397 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good



TERRESTRIAL ECOSYSTEMS

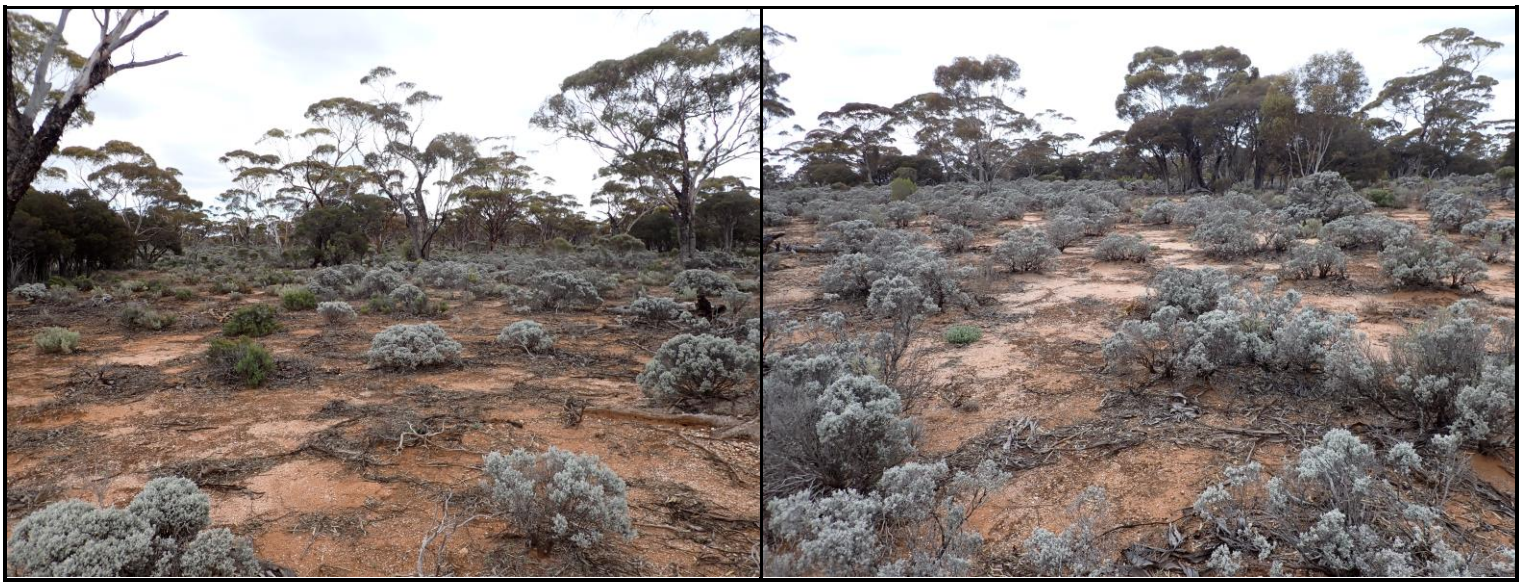
Date: 4/09/2022 | Habitat Assessment #: 26 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419748 mE | Northing: 6462950 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good



TERRESTRIAL ECOSYSTEMS

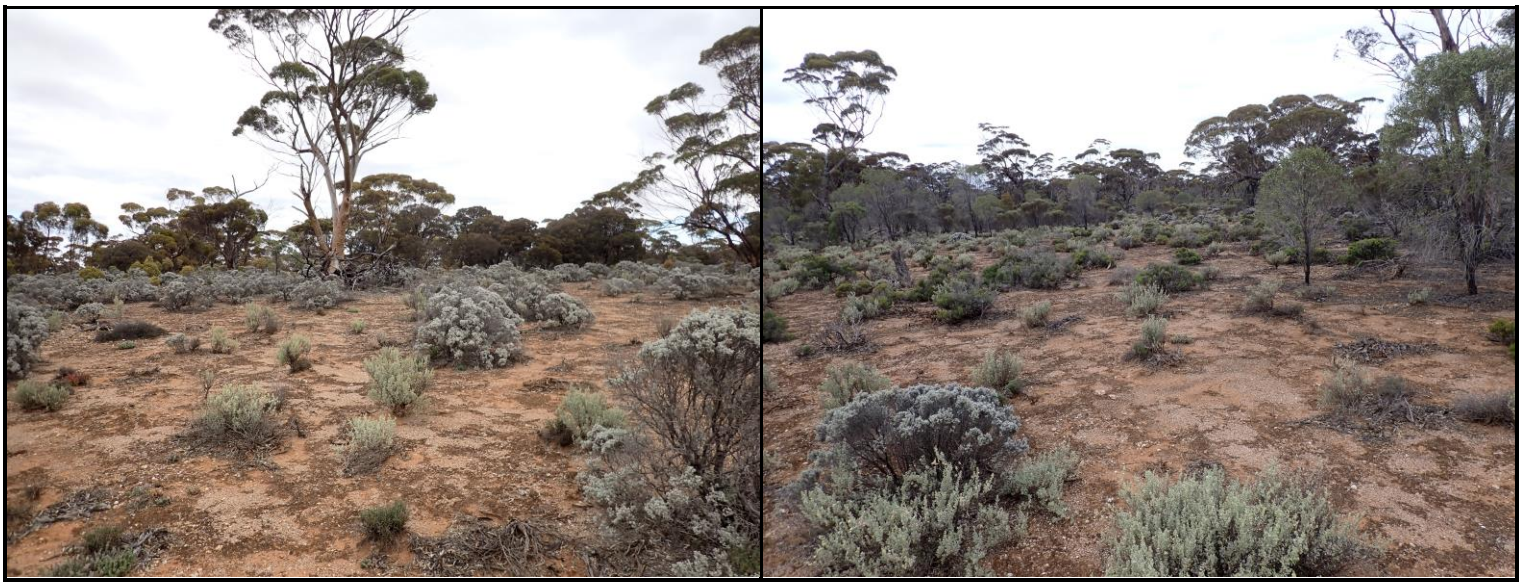
Date: 4/09/2022 | Habitat Assessment #: 27 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419746 mE | Northing: 6462490 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good



TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 28 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419730 mE | Northing: 6462071 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 29 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419739 mE | Northing: 6461644 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 30 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419758 mE | Northing: 6461144 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 31 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419741 mE | Northing: 6460928 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 32 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419991 mE | Northing: 6460648 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 33 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420126 mE | Northing: 6460496 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 34 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420306 mE | Northing: 6460375 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Samphire shrublands | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022

Habitat Assessment #: 35

Observer: Dr Scott Thompson

Zone: 51

Easting: 420404 mE

Northing: 6460212 mN

Fire History: > 5 years

Landform: Flat/undulating

Soil Type: Sandy clay

Habitat Structure: Shrublands

Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022

Habitat Assessment #: 36

Observer: Dr Scott Thompson

Zone: 51

Easting: 420506 mE

Northing: 6460125 mN

Fire History: > 5 years

Landform: Flat/undulating

Soil Type: Sandy clay

Habitat Structure: Shrublands

Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

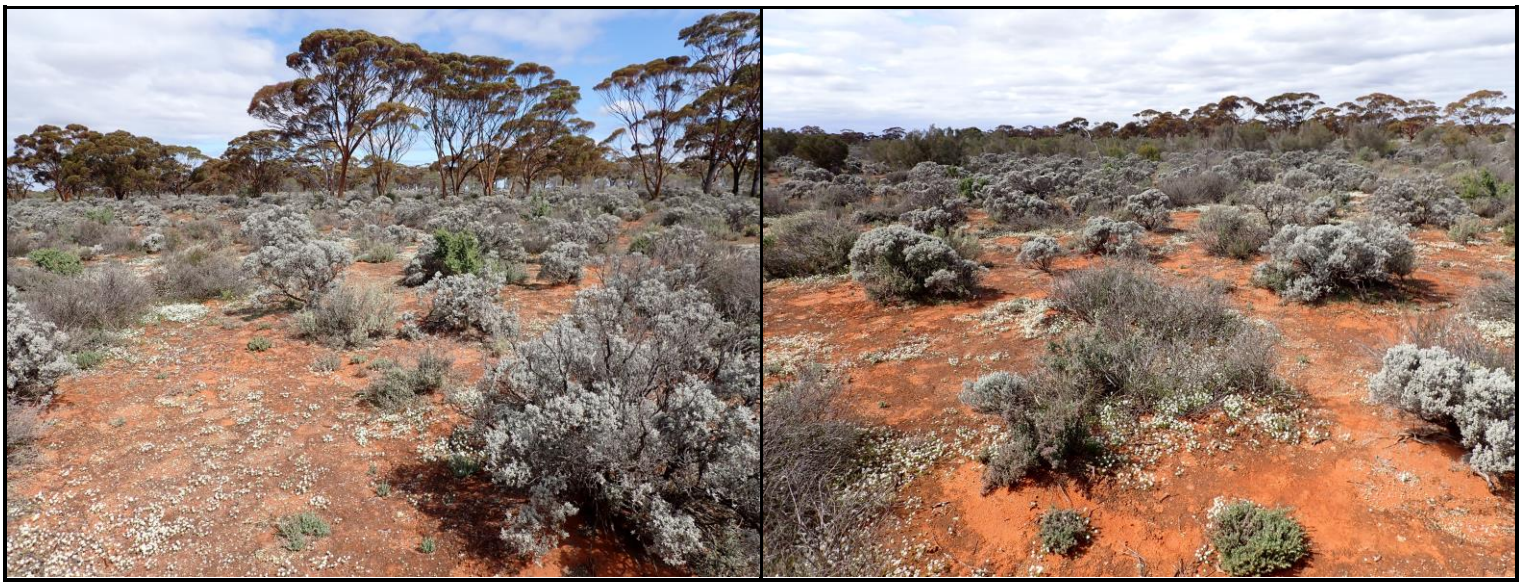
Date: 4/09/2022 | Habitat Assessment #: 37 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420621 mE | Northing: 6459831 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good



TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 38 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420679 mE | Northing: 6459352 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 39 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420718 mE | Northing: 6458984 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 40 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420776 mE | Northing: 6458559 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 41 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420821 mE | Northing: 6458141 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 42 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420903 mE | Northing: 6457665 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022

Habitat Assessment #: 43

Observer: Dr Scott Thompson

Zone: 51

Easting: 420935 mE

Northing: 6457278 mN

Fire History: > 5 years

Landform: Flat/undulating

Soil Type: Sandy clay

Habitat Structure: Shrublands

Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 44 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421005 mE | Northing: 6456840 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 45 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421047 mE | Northing: 6456336 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 46 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421164 mE | Northing: 6455618 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 47 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421201 mE | Northing: 6455163 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 48 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421215 mE | Northing: 6454668 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 49 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421327 mE | Northing: 6454221 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 50 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421340 mE | Northing: 6453866 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 51 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421403 mE | Northing: 6453396 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 52 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421473 mE | Northing: 6452923 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

Date: 4/09/2022 | Habitat Assessment #: 53 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421497 mE | Northing: 6452453 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 54 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421529 mE | Northing: 6452232 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

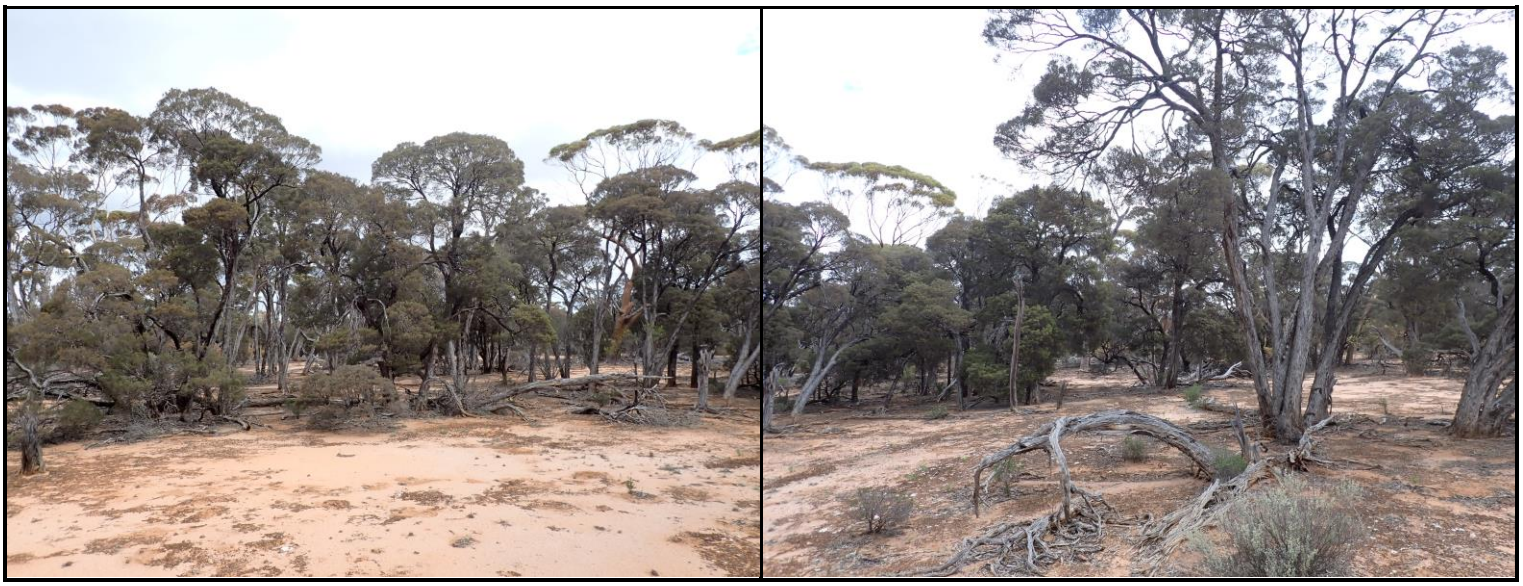
Date: 4/09/2022 | Habitat Assessment #: 55 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 421612 mE | Northing: 6451899 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good



TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 56 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420375 mE | Northing: 6465330 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 57 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420286 mE | Northing: 6465135 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 58 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420217 mE | Northing: 6464977 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 59 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420146 mE | Northing: 6464800 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 60 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420096 mE | Northing: 6464618 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 61 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419996 mE | Northing: 6464436 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

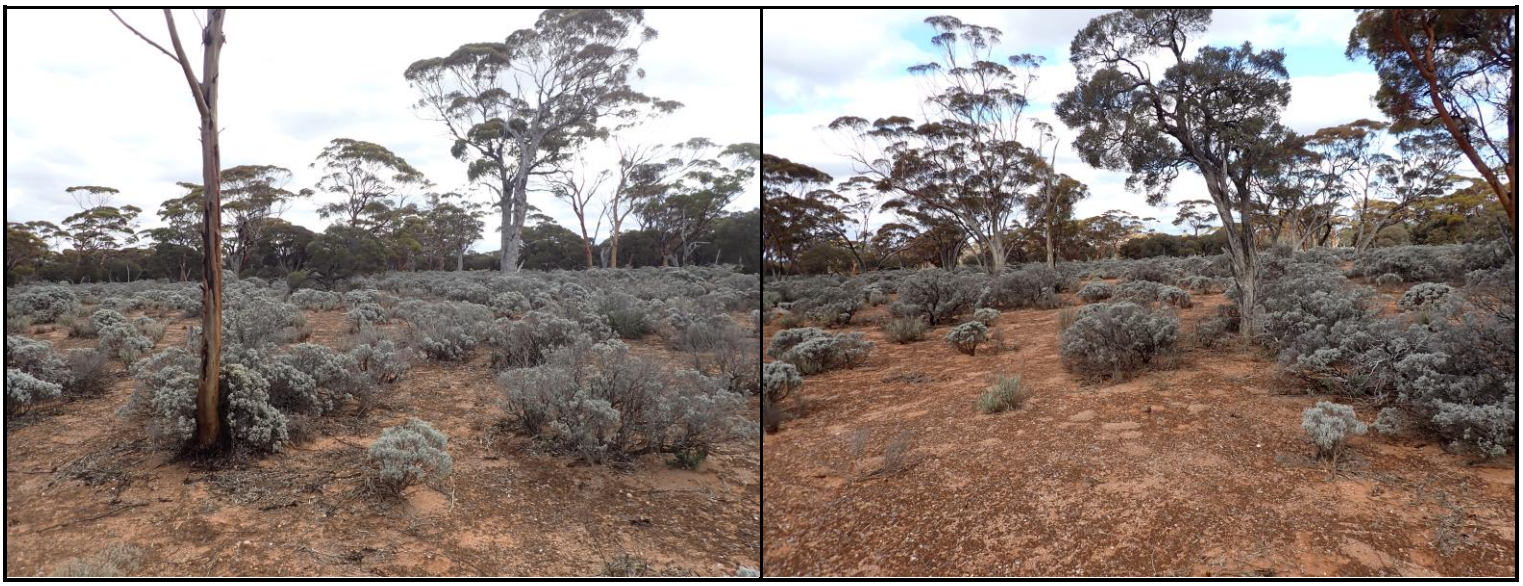
Date: 4/09/2022 | Habitat Assessment #: 62 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419839 mE | Northing: 6464459 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good



TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 63 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419953 mE | Northing: 6464635 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 64 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420014 mE | Northing: 6464829 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

Date: 4/09/2022 | Habitat Assessment #: 65 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420072 mE | Northing: 6465018 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 66 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420231 mE | Northing: 6465328 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 67 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 420288 mE | Northing: 6465513 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 68 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419742 mE | Northing: 6465852 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 69 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419709 mE | Northing: 6465646 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 70 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419644 mE | Northing: 6465402 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 71 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419463 mE | Northing: 6465289 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 72 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419326 mE | Northing: 6465131 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 73 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419177 mE | Northing: 6465055 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 74 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419032 mE | Northing: 6465163 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 75 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419109 mE | Northing: 6465299 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 76 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419204 mE | Northing: 6465424 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 77 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419332 mE | Northing: 6465601 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 78 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419443 mE | Northing: 6465774 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 79 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419244 mE | Northing: 6465894 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 80 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 419037 mE | Northing: 6465686 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 81 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 418914 mE | Northing: 6465531 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS

Date: 4/09/2022 | Habitat Assessment #: 82 | Observer: Dr Scott Thompson

Zone: 51 | Easting: 418826 mE | Northing: 6465358 mN

Fire History: > 5 years | Landform: Flat/undulating | Soil Type: Sandy clay

Habitat Structure: Eucalypt woodland on over shrubs | Surface:

Habitat Quality: Very good

TERRESTRIAL ECOSYSTEMS