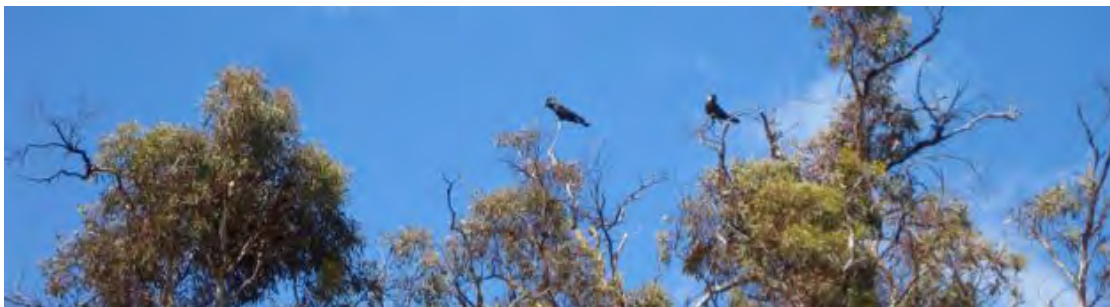


Katanning Gold Project:

Level 1 Vertebrate Fauna Survey and Carnaby's Black-Cockatoo Habitat Survey, October 2017



Study area

Prepared for: Ausgold Exploration Pty Ltd

Prepared by: Western Wildlife
8 Ridgeway Pl
Mahogany Creek WA 6072
Ph: 0427 510 934



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Executive Summary

Introduction

Ausgold Exploration Pty Ltd (Ausgold) operates the Katanning Gold Project (the Project), located approximately 35 km east-north-east of Katanning, in the southern wheatbelt region of Western Australia. Ausgold commissioned Western Wildlife to carry out a Level 1 vertebrate fauna survey of two reserves adjacent to its Dingo mine site (the 'study area'). The Level 1 assessment involved a desktop assessment and field study to inventory the fauna habitats present in the project area and make opportunistic observations of fauna.

The objectives of the Level 1 vertebrate fauna survey and literature review were to:

- Identify the fauna habitats present in the study area.
- List the vertebrate fauna that were recorded in the study area and/or have the potential to occur in the study area.
- Identify species of conservation significance, or habitats of particular importance for fauna, that may occur in the study area.
- Comment on the potential impacts the proposed exploration may have on fauna, particularly on fauna of conservation significance.

This report details the findings of the fauna survey conducted in October 2017.

Methods

The Level 1 fauna survey was undertaken in accordance with the *Statement of environmental principles, factors and objectives* (Environmental Protection Authority (EPA) 2016a), *Environmental factor guideline – terrestrial fauna* (EPA 2016b), *Technical guidance – terrestrial fauna surveys* (EPA 2016c), *Technical Guide: terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA and DEC 2010), *EPBC Act Referral Guidelines for three threatened black cockatoos: Carnaby's Cockatoo, Baudin's Cockatoo and Forest Red-tailed Black-Cockatoo* (DSEWPac 2012) and *Revised Draft EPBC Act Referral Guidelines for three threatened black cockatoos: Carnaby's Cockatoo, Baudin's Cockatoo and Forest Red-tailed Black-Cockatoo* (DEE 2017).

The field survey was carried out by two zoologists between the 17th and 18th October 2017. The field study included the identification of fauna habitats, opportunistic records of fauna and targeted search for evidence of any conservation significant species, particularly habitat for Carnaby's Black-Cockatoo

Species of conservation significance were classified as: Conservation Significance 1 (CS1) if listed under *The Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *The Western Australian Wildlife Conservation Act 1950* (WC Act); Conservation Significance 2 (CS2) if listed as a Priority species by the Department of Biodiversity, Conservation and Attractions; or Conservation Significance 3 (CS3) if a locally significant species.

Results and Discussion

Four fauna habitats were identified across the study area:

- Wandoo woodland
- York Gum woodland
- Mallet woodland
- Banksia heath

The study area has the potential to support up to nine frog, 43 reptile, 119 bird and 24 mammal (19 native mammals) species. During the site visit three reptiles, 42 birds and three mammals were recorded opportunistically. A total of 27 fauna species of conservation significance have the potential to occur in the study area, six of CS1, two of CS2 and 19 of CS3. One of the conservation significant species is migratory (Mig.)

The six species of CS1 that may occur are the:

- Malleefowl (*Leipoa ocellata*) - EPBC Act (Vulnerable), WC Act (Schedule 3)
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) - EPBC Act (Endangered), WC Act (Schedule 2)
- Fork-tailed Swift (*Apus pacificus*) – EPBC Act (Mig.), WC Act (Schedule 5)
- Peregrine Falcon (*Falco peregrinus*) – WC Act (Schedule 7)
- Chuditch (*Dasyurus geoffroii*) - - EPBC Act (Vulnerable), WC Act (Schedule 3)
- Red-tailed Phascogale (*Phascogale calura*) - EPBC Act (Vulnerable), WC Act (Schedule 3)

Of these, Carnaby's Black-Cockatoo was recorded breeding and foraging in the study area during the site visit. The Wandoo woodland is potential breeding habitat, and birds may also nest in Red Morrel or York Gum trees. Banksia heath is foraging habitat, and its close proximity to breeding habitat is important for the support of successful breeding. Carnaby's Black-Cockatoo are also known to breed nearby, in native vegetation 3.5 km to the south of the study area.

The Red-tailed Phascogale potentially occurs in the Wandoo woodland and York Gum habitats, where there is an understorey of Rock Sheoak. This species is known to occur in the area, occurring in small isolated populations throughout its range. The Peregrine Falcon may forage over the study area and adjacent farmland, potentially breeding in old open pits or tall trees. The Fork-tailed Swift may overfly the study area on occasion, but unlikely to be affected by changes to study area habitats. Although they may possibly occur, both the Chuditch and Malleefowl are unlikely to be breeding residents in the area. These species may be represented by the occasional dispersing individual.

The two species of CS2 that may occur are the:

- Inland Western Rosella (*Platycercus icterotis xanthogenys*) – Priority 4
- Western Brush Wallaby (*Macropus irma*) – Priority 4

Of these, the Inland Western Rosella may occur in woodlands, potentially nesting in tree hollows. The Western Brush Wallaby is only represented by a few records in the region, and has a low likelihood of occurring.

There are 19 species of Conservation Significance 3 potentially present, comprising 2 reptiles, twelve birds and five mammals. Many of these, though common in other parts of their range, have declined in the wheatbelt, and may be vulnerable to further decline where habitats are further fragmented.

It is understood that Ausgold is proposing to undertake exploration on disturbed and/or clear areas within the study area, to avoid physical disturbance to fauna habitat. Potential impacts were identified for both this scenario, and a more typical exploration scenario requiring some clearing for access.

Potential impacts typically associated with exploration include direct mortality of fauna when clearing tracks and drill pads, habitat loss and fragmentation, disturbance to fauna, disturbance to adjacent habitats (increase in feral fauna, weeds or pathogens) and increased risk of fire. It is considered unlikely that the proposed exploration will result in impacts to the status of most fauna species, and that impacts are likely to be very low in the scenario where no habitat is cleared.

Recommendations have been provided with the aim of minimising or mitigating impacts for both a scenario with no clearing of fauna habitat, and a more typical exploration scenario:

- Plan track layout to minimise total area to be disturbed.
- Situate tracks and drill pads in open areas where possible.
- Avoid any clearing in the Banksia heath habitat where possible.
- Ensure that clearing occurs in designated areas only, with no disturbance to adjacent vegetation.
- Retain and avoid root disturbance to all mature eucalypts, particularly those with hollows or with a diameter at breast height of 30cm or more.
- Avoid operating during the breeding season for Carnaby's Black-Cockatoo (July to December). If operating during the breeding season, breeding trees must be identified and protected from disturbance with a buffer of at least 50m.
- Induction training to include awareness of fauna on site, appropriate responses to fauna related incidents and reporting requirements.
- Develop and implement a procedure to deal with disturbed or injured fauna.
- Implement low speed limits for all vehicles driving in the reserves.
- Prohibit off-road driving outside approved areas.
- Limit vehicle movements between dusk and dawn.
- If work must be undertaken at night, direct lights on to work area only and away from surrounding vegetation.
- Develop and implement a fire prevention and control strategy.
- Prohibit feeding of fauna.
- Dispose of food waste appropriately to avoid attracting feral fauna.
- Ensure all drill holes are securely capped.
- Develop and implement a procedure to ensure that pathogens and weeds are not introduced to the site, including contingency measures to deal with outbreaks.
- Rehabilitate tracks as soon as practicable after the cessation of activities.

The majority of fauna species are unlikely to be significantly impacted by exploration. However, of key concern are Carnaby's Black-Cockatoo and the Red-tailed Phascogale, both threatened species listed under the EPBC Act. The study area contains:

- Potential habitat for the Red-tailed Phascogale (Wandoo and York Gum woodland with a Sheoak understorey). This species may be impacted by loss, degradation or fragmentation of their habitat, and fire can potentially cause their local extinction within an isolated patch of vegetation.
- Confirmed breeding habitat (Wandoo woodland) with a known nesting tree and foraging habitat (Banksia heath) within close proximity to breeding habitat for Carnaby's Black-Cockatoo. This species may be impacted by loss, degradation or fragmentation of their breeding or foraging habitat, and disturbance to nesting sites.

If exploration requires disturbance to vegetation that is habitat for these two species, it is recommended that the Project is referred under the EPBC Act.

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1. Introduction

Ausgold Exploration Pty Ltd (Ausgold) operates the Katanning Gold Project (the Project), located approximately 35 km east-north-east of Katanning, in the southern wheatbelt region of Western Australia (Figure 1). Ausgold commissioned Western Wildlife to carry out a Level 1 vertebrate fauna survey of two reserves adjacent to its Dingo mine site (the 'study area'). The Level 1 assessment involved a desktop assessment and field study to inventory the fauna habitats present in the project area and make opportunistic observations of fauna.

The objectives of the Level 1 vertebrate fauna survey and literature review were to:

- Identify the fauna habitats present in the study area.
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- Identify species of conservation significance, or habitats of particular importance for fauna, that may occur in the study area.
- Comment on the potential impacts the proposed development may have on fauna, particularly on fauna of conservation significance.

This report details the findings of the fauna survey conducted in October 2017.

2. Background

2.1 Regional Context

The Katanning Gold Project is located about 35 km east-north-east of Katanning, in the Shire of Katanning (Figure 1). Mining has previously been conducted on the Jinkas Hill and Dingo Mine sites, although both are currently on care and maintenance.

The Project falls within the Interim Biogeographic Regionalisation of Australia ('IBRA') Bioregion Avon Wheatbelt 2 – Rejuvenated Drainage Subregion (DEWHA 2004, Beecham 2001). The subregion has a semi-arid (dry) Warm Mediterranean climate, and the primary land-uses are dryland agriculture and grazing on improved pastures, with smaller areas of conservation, Crown reserves and rural residential (Beecham 2001). The vegetation in the subregion consists of woodlands of Wandoo (*Eucalyptus wandoo*), York Gum (*Eucalyptus loxophleba*) and Salmon Gum (*Eucalyptus salmonophloia*) with Jam (*Acacia acuminata*) and Rock Sheoak (*Allocasuarina huegeliana*), and proteaceous scrub-heaths on the residual lateritic uplands (Beecham 2001).

The Shire of Katanning is largely cleared, with only about 16.47% of the original extent of native vegetation remaining (DoE 2015b), in a combination of nature reserves, other reserves, private land and roadside corridors. The project area overlaps Woorgabup Nature Reserve and the Rifle Range Bushland (C Class Reserve 12423). Nearby are Corecup Nature Reserve (15 km south-west), Moornaming Nature Reserve (13 km east) and Johns Well Nature Reserve (23 km west), as well as patches of remnant vegetation on private lands. A Key Biodiversity Area (KBA), recognised by BirdLife International, has been identified 3.5 km to the south, known as the Badgebup – Kwobrup KBA (Figure 2). This area was listed primarily due to the presence of at least 1% of the known breeding population of Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) (Birdlife International 2018). Although KBA's are not formally protected (except where they already have protection e.g. as a Nature Reserve), the KBA designation indicates that the area has been identified as an area important to the on-going survival of a species (Birdlife International 2018).

2.2 Study Area

The study area includes 176.1 ha of native vegetation ('the study area') across two reserves; Woorgabup Nature Reserve and the Rifle Range Bushland, a recreational reserve (Figure 2). The study area includes the Critically Endangered Ecological Community *Eucalypt Woodlands of the Western Australian Wheatbelt*. This ecological community is defined primarily by its vegetation, so its significance is not further discussed in this report, except in terms of its value to fauna. The *Eucalypt Woodlands of the Western Australian Wheatbelt* are recognised as supporting a large number of fauna species, in particular a diversity of woodland birds (DoE 2015a). Iconic bird species include Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) and the Malleefowl (*Leipoa ocellata*).

3. Methods

The survey was conducted as a Level 1 fauna survey in accordance with:

- Statement of environmental principles, factors and objectives (Environmental Protection Authority (EPA) 2016a)
- Environmental factor guideline – terrestrial fauna (EPA 2016b)
- Technical guidance – terrestrial fauna surveys (EPA 2016c)
- Technical Guide: terrestrial vertebrate fauna surveys for environmental impact assessment (EPA and DEC 2010)
- EPBC Act Referral Guidelines for three threatened black cockatoos: Carnaby's Cockatoo, Baudin's Cockatoo and Forest Red-tailed Black-Cockatoo (DSEWPaC 2012).
- Revised Draft EPBC Act Referral Guidelines for three threatened black cockatoos: Carnaby's Cockatoo, Baudin's Cockatoo and Forest Red-tailed Black-Cockatoo (DEE 2017).

The Level 1 fauna survey included a search of available literature and databases (a 'desktop' study), and a field survey of the study area for two days, the 17th - 18th October 2017. The field survey served to put the desktop study into context, as well as allowing for the identification of fauna habitats and likely fauna assemblages of the study area.

3.1 Personnel

Ms Jenny Wilcox (*BSc.Biol./Env.Sci., Hons.Biol.*) and Mr Brenden Metcalf (*BSc.Env.Sci., Hons.Env.Sci.*), both of whom have over 17 years' experience with fauna surveys in Western Australia, undertook the fieldwork. Jenny Wilcox prepared this report.

3.2 Taxonomy and Nomenclature

Taxonomy and nomenclature for fauna species used in this report follow the Western Australian Museum checklists. These were last updated in 2016. In the text, common names are used where appropriate, and all scientific names are given in species lists (Appendices 1 – 4). Where a species lacks a common name they are referred to by their scientific name.



Figure 1. Katanning Gold Project: regional location

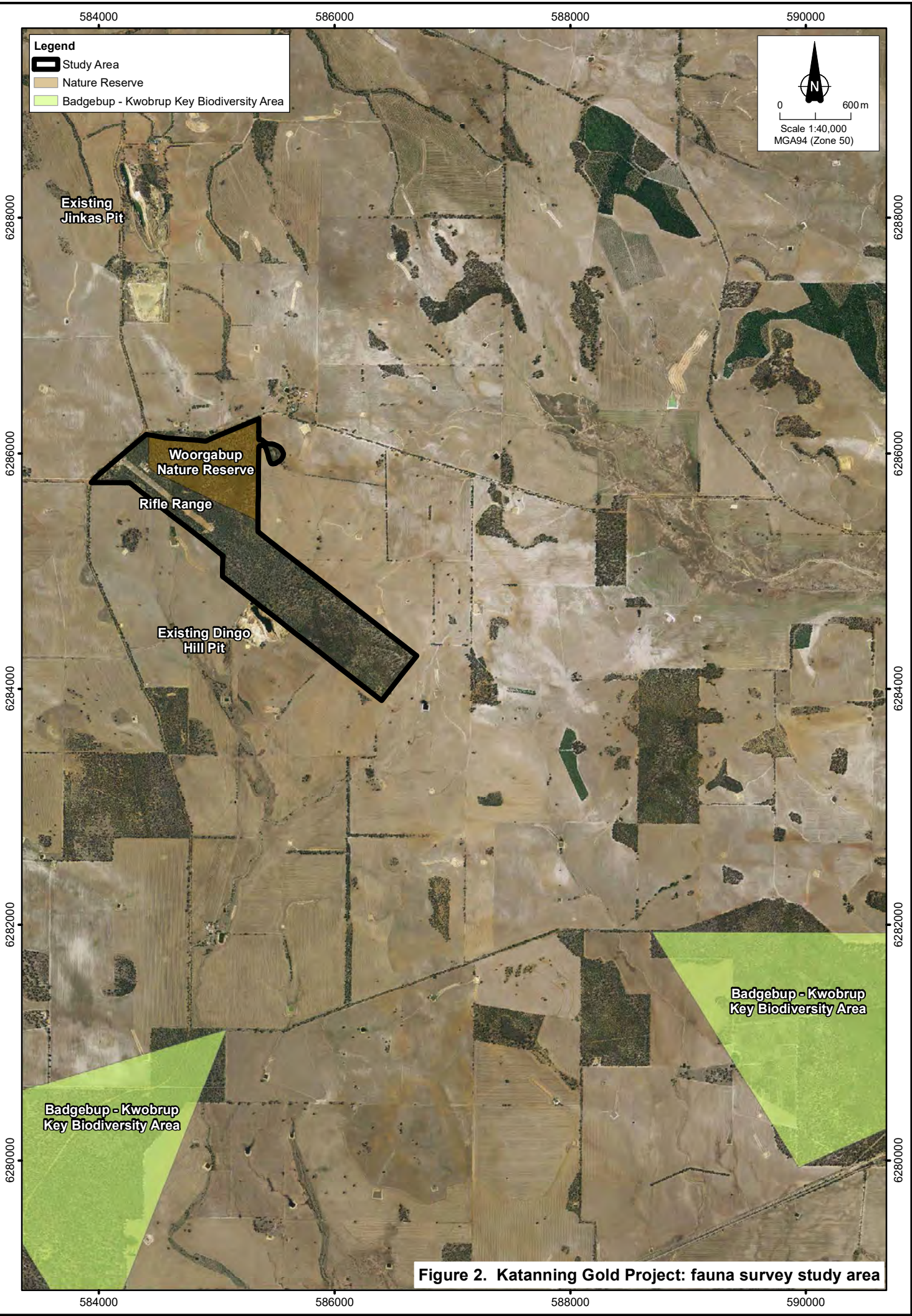


Figure 2. Katanning Gold Project: fauna survey study area

3.3 Habitat Mapping

Habitat mapping was undertaken using vegetation mapping provided by Mattiske Consulting (2017) and the observations made by fauna personnel in the field. CAD Resources produced the maps from information provided by Western Wildlife.

3.4 Literature Review

Lists of fauna expected to occur in the study area were produced using information from a number of sources. These included publications that provide information on general patterns of distribution of frogs (Tyler *et al.* 2000), reptiles (Storr *et al.* 1983, 1990, 1999 and 2002), birds (Barrett *et al.* 2003; Johnstone and Storr 1998 and 2004) and mammals (Churchill 1998, Menkhorst and Knight 2011; Van Dyck and Strahan 2008).

The databases listed in Table 1 were searched for fauna records in and around the study area. In all cases the extent of the database search was larger than the extent of the study area, in order to pick up records of species in the wider area that may also occur in the study area. Some species may occur on database results that are not likely to be present in the study area, usually due to a lack of suitable habitat or the study area being outside the known range of the species as presented in the literature. These species are generally not included in lists of expected fauna unless some discussion is thought to be necessary.

Table 1. Databases used in the preparation of Appendices 1 - 4.

Database	Type of records held on database	Area searched
WA Museum Specimen Database (DPAW 2007-)	Records of specimens held in the Western Australian Museum. Includes historical records.	40km radius around 33°34'15" S, 117°55'12" E
Fauna Survey Returns Database (DPAW 2007-)	Records collected from fauna surveys carried out in Western Australia. Includes observational and trapping data.	40km radius around 33°34'15" S, 117°55'12" E
Salinity Action Plan Database (DPAW 2007-)	Records collected during the Salinity Action Plan fauna surveys.	40km radius around 33°34'15" S, 117°55'12" E
DBCA's Threatened and Priority Fauna Database	Information and records on Threatened and Priority species in Western Australia	50km radius around 50H 585000 E, 6285600 N
Birds Australia Atlas Database (DPAW 2007-)	Records of bird observations in Australia, 1998-current.	40km radius around 33°34'15" S, 117°55'12" E
EPBC Act Protected Matters Search Tool	Records on matters protected under the EPBC Act, including threatened species and ecological communities, migratory species and marine species.	40km radius around 33°34'15" S, 117°55'12" E

These sources of information were used to create lists of species that potentially occur in the study area. As far as possible, expected species are those that are likely to utilise the study area. The lists exclude species that have been recorded in the general region as vagrants, or for which suitable habitat is absent within the study area.

3.5 Field Studies

The field study was carried out between 17th - 18th October 2017. The field study component of a Level 1 fauna survey is primarily to identify the fauna habitats present in the study area. In addition, all vertebrate fauna encountered during the field survey are recorded. The fauna species recorded are usually conspicuous species such as birds, large mammals and large reptiles. The presence of other species may be inferred from evidence such as tracks, burrows, scats or evidence of foraging. Particular attention was paid to searching for evidence of conservation significant species, or habitats likely to support conservation significant species, in particular, Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*). Breeding habitat for Carnaby's Black-Cockatoo defined as tree species known to support breeding, which have a suitable nest hollow or are at least 50cm diameter at breast height (DBH) for Marri and Jarrah or 30cm DBH for Wandoo and Salmon Gum (DSEWPac 2012, DEE 2017).

3.6 Survey Limitations

Various factors can limit the effectiveness of a fauna survey. Pursuant to EPA Technical Guidance (EPA 2016c), these factors have been identified and their potential to impact on the effectiveness of the surveys has been assessed in Table 2 below. All fauna surveys have limitations, and not all fauna species present on the site are likely to be sampled during a survey. Fauna may not be recorded because they are rare, they are difficult to trap or observe, or because they are only present on the site for part of the year.

Table 2. Fauna survey limitations.

Potential Limitation	Extent of limitation for the fauna survey	
Experience of fauna personnel	Not limiting:	The supervising and assisting zoologists have over 17 years' experience in fauna consulting.
Types of traps or other survey methods used	Not limiting:	No trapping was undertaken as this was a Level 1 survey. This restricts fauna records to opportunistic observations.
Number of trapping sites	Not limiting:	As above.
Ability to survey all habitats present	Not limiting:	All habitats present were surveyed during the fauna survey.
Availability of fauna information for the area in literature and on databases	Not limiting:	Moderate amount of fauna information available on databases and in the literature.
Effects of weather during the survey	Not limiting:	Weather during the field survey was cool and clear. Weather conditions are unlikely to affect the outcomes of a Level 1 fauna survey.
Seasonal effects	Not limiting:	Seasonal effects are not taken into account with a Level 1 survey, as the primary function is habitat assessment.
Disturbance to site such as recent fires, cattle grazing	Not limiting:	Parts of the site are disturbed due to some weed invasion and the presence of feral fauna (fox, rabbit).
Ease of access to site	Not limiting:	Site access is good. Entirety of site is accessible on foot.

3.7 Assessment of Conservation Significance

Three levels of conservation significance are used within this report to indicate the level of significance of fauna species. These are described in the following sub-sections.

3.7.1 Conservation Significance 1

Conservation Significance 1 (CS1) is the highest level of conservation significance, describing species that are protected under State or Commonwealth legislation. These species are considered to be of state and/or national conservation significance, and some species (e.g. some migratory species) may be considered of international significance.

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Commonwealth Government's primary piece of environmental legislation. Listed under Part 3 of the EPBC Act are 'Matters of National Environmental Significance'. These include threatened species, threatened ecological communities and migratory species.

Fauna species are assessed against categories based on International Union for Conservation of Nature (IUCN) criteria. These criteria are as follows:

Extinct:	Taxa not definitely located in the wild during the past 50 years.
Extinct in the wild:	Taxa known to survive only in captivity.
Critically Endangered:	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered:	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable:	Taxa facing a very high risk of extinction in the wild in the medium-term future.
Conservation Dependent:	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

Of the above, only fauna classified as 'extinct in the wild' 'critically endangered', 'endangered' or 'vulnerable' are listed as Matters of National Environmental Significance.

The migratory species listed under the EPBC Act are those recognised under international agreements. These agreements are the China-Australia Migratory Bird Agreement (CAMBA), the Japan-Australia Migratory Bird Agreement (JAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), or species listed under the Bonn Convention for which Australia is a range state.

Reports on the conservation status of most vertebrate fauna species have been produced by the Department of Environment and Energy (DEE) in the form of Action Plans. An Action Plan is a review of the conservation status of a taxonomic group against IUCN categories. Action Plans have been prepared for amphibians (Tyler 1998), reptiles (Cogger *et al.* 1993), birds (Garnett *et al.* 2011) and mammals (Woinarski *et al.* 2012). These publications also use categories similar to those used by the EPBC Act. The information presented in some of the earlier Action Plans may be out of date due to changes since publication.

The *Western Australian Wildlife Conservation Act 1950* (WC Act) is State legislation for fauna protection administered by the Department of Biodiversity, Conservation and Attractions (DBCA). The WC Act lists species under a set of Schedules, as listed below.

Schedule 1:	Fauna that is rare or likely to become extinct (critically endangered fauna)
Schedule 2:	Fauna that is rare or likely to become extinct (endangered fauna)
Schedule 3:	Fauna that is rare or likely to become extinct (vulnerable fauna)
Schedule 4:	Fauna presumed to be extinct
Schedule 5:	Migratory birds protected under an international agreement
Schedule 6:	Fauna that is of special conservation need (conservation dependent fauna)
Schedule 7:	Other specially protected fauna

3.7.2 Conservation Significance 2

Species of Conservation Significance 2 (CS2) are not listed under State or Commonwealth Acts, but are listed as Priority species by DBCA. These species may be considered to be regionally significant. In Western Australia, DBCA maintains a list of Priority Fauna made up of species that are not considered Threatened under the WC Act, but for which DBCA feels there is cause for concern. There are four levels of Priority as defined by DBCA, as listed below.

Priority 1:	Poorly known species (on threatened lands)
Priority 2:	Poorly known species in few locations (some on conservation lands)
Priority 3:	Poorly known species in several locations (some on conservation lands)
Priority 4:	Rare, near threatened and other species in need of monitoring

3.7.3 Conservation Significance 3

Conservation Significance 3 (CS3) species are not listed under State or Commonwealth Acts or in publications on threatened fauna or as Priority species by DBCA, but are considered by the author to potentially be of local significance because they are at the limit of their distribution in the area, they have a very restricted range or they occur in breeding colonies (e.g. some waterbirds). This level of significance has no legislative recognition and is based on interpretation of information on the species patterns of distribution. For example, the Government of Western Australia (2000) used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of Bush Forever. Recognition of such species is consistent with the aim of preserving regional biodiversity.

4. Habitats of the Study Area

The fauna habitats in the study area were identified on the basis of observations made in the field and vegetation mapping provided by Matiske Consulting Pty Ltd. Four broad habitats were identified:

- Wandoo woodland
- York Gum woodland
- Mallet woodland
- Banksia heath

The habitats are shown in Figure 4 and Plates 1 - 7. Overall, the habitats are in very good condition and likely to support a diverse faunal assemblage. There is little disturbance, except where vegetation has been cleared for the rifle range (Figure 2) and the existing Dingo mine open pit is adjacent to the vegetation (Figure 2, Plate 8). The study area is situated in a largely cleared landscape, where remnant native vegetation remains in patches with varying levels of connectivity along roadside verges and fencelines. The vegetation in the the study area is a comparatively large patch in the local area, and is thus likely to be important both for maintaining local faunal populations and as part of an ecological linkage.

Wandoo (*Eucalyptus wandoo*) woodland was the most common habitat in the study area, occurring on clays and sandy loams (Plates 1 – 3). The canopy consists of Wandoo and Red Morrel (*Eucalyptus longicornis*), over a sparse understorey of low native shrubs and grasses, sometimes with a midstorey of Rock Sheoak (*Allocasuarina huegeliana*). Salmon Gum (*Eucalyptus salmonophloia*) occurs sparsely on the lower slopes and valleys. Wandoo woodland comprises 102.49 ha of the study area.

Woodlands of Brown Mallet (*Eucalyptus astringens*) and Kondinin Blackbutt (*Eucalyptus kondininensis*) occur on sandy gravels and clays on the upper slopes of ridges (Plate 4). The understorey includes dense thickets of *Melaleuca atroviridis* over smaller shrubs such as *Acacia lasiocarpa*, *Gastrolobium trilobum* and *Beaufortia bracteosa*. Mallet woodland comprises 19.13 ha of the study area.

A woodland of York Gum (*Eucalyptus loxophleba*) over Jam (*Acacia acuminata*) occurs in the lower-lying areas on sandy loams and clays (Plate 5). The understorey includes herbs, grasses and sparsely occurring native shrubs, with some thickets of Rock Sheoak (*Allocasuarina huegeliana*). York Gum woodland comprises 25.43 ha of the study area.

A Banksia heath occurs in patches on upper slopes and ridges, where there are gravelly sands and clays (Plates 6 and 7). The heath consists of several species, including Parrotbush (*Banksia sessilis*), Prickly Dryandra (*Banksia armata*), Pingle (*Banksia squarrosa*), Bullock Poison (*Gastrolobium trilobum*), Dwarf Sheoak (*Allocasuarina humilis*), One-sided Bottlebrush (*Calothamnus quadrifidus*), *Beaufortia bracteosa*, Wax Grevillea (*Grevillea insignis*), Honeybush (*Hakea lissocarpha*), Two-leafed Hakea (*Hakea trifurcata*), Hop-bushes (*Dodonaea caespitosa* and *Dodonaea humifusa*) and *Xanthorrhoea drummondii*. There are emergent patches of eucalypts, including Wandoo and Kondinin Blackbutt. The Banksia heath habitat comprises 23.31 ha of the study area.

The study area also includes 5.78 ha of cleared land, where the 1 km rifle range was cleared in the Rifle Range Bushland.



Plate 1. Wandoo woodland.



Plate 2. Wandoo woodland.



Plate 3. Wandoo woodland with Rock Sheoak midstorey.



Plate 4. Mallet woodland.



Plate 5. York Gum woodland.



Plate 6. Banksia heath.



Plate 7. Banksia heath.



Plate 8. Dingo mine open pit.



Legend

- Study Area
- Wandoo woodland
- York Gum woodland
- Mallet woodland
- Banksia heath
- Cleared

Figure 3. Katanning Gold Project: fauna habitats

5. Vertebrate Fauna of the Study Area

The numbers of vertebrate species potentially occurring in the study area are summarised below in Table 3. The amphibians, reptiles, birds and mammals that have the potential to occur in the study area are listed in Appendices 1 - 4. Indicated in each table are the species recorded:

- In each study area by Western Wildlife during the October 2017 site visit.
- In the wider area on the WA Museum Specimen Database (see Table 1).
- In the wider area on the Birds Australia Atlas Database (see Table 1).
- In the wider area on DBCA's Threatened and Priority Fauna Database (see Table 1).
- In the wider area on the EPBC Protected Matters Search Tool (see Table 1).

Table 3. Summary of vertebrate fauna potentially occurring in the study area.

Taxon	Total species	Introduced species	Conservation significant species		
			CS1	CS2	CS3
Amphibians	9	0	-	-	-
Reptiles	43	0	-	-	2
Birds	119	2	4	1	12
Mammals	24	5	2	1	5
Totals:	195	7	6	2	19

Fauna of conservation significance are discussed in the sections below and are summarised in Table 4. The results of the EPBC Act Protected Matters Search Tool extract are given in Appendix 5.

5.1 Amphibians

There are nine species of frog that have the potential to occur in the study area (Appendix 1). No frogs were observed in the study area in October 2017, as expected during a brief site visit. In general, the frog species that occur in the study area are common and widely distributed in the southwest region.

Some of the frogs that potentially occur rely on permanent waters or at least permanently damp habitats (e.g. tree frogs). These species are unlikely to occur in most terrestrial habitats, but potentially occur in and adjacent to man-made habitats such as farm dams and water-filled open pits. Burrowing frogs (e.g. the Moaning Frog, *Heleioporus eyrei*) require water to breed, but during the non-breeding season these species range away from water and be found in terrestrial habitats where they forage and/or aestivate underground. The Turtle Frog (*Myobatrachus gouldii*) does not require open water to breed, as the young develop within the egg, potentially occurring in sandier soils in the study area.

5.1.1 Amphibians of Conservation Significance

No frogs of conservation significance are likely to be present in the study area.

5.2 Reptiles

There are 43 species of reptile that have the potential to occur in the study area (Appendix 2). Only three reptile species were observed in the study area in October 2017, though this is not unexpected during a brief site visit. The reptile assemblage is likely to be relatively diverse, as there is a mix of habitats and a relatively large area of remnant native vegetation.

Many of the reptile species present have broad habitat preferences and therefore potentially occur throughout the study area. Some species may favour particular substrates and be more common on the sandier soils, clay soils or the rocky areas on laterite hills. Fallen logs, woody debris and leaf litter are important shelter sites for reptiles. Some species can negotiate cleared areas, but many reptiles are likely to be restricted to areas of native vegetation.

5.2.1 Reptiles of Conservation Significance

There are two reptiles of local conservation significance that may occur in the study area, as listed and discussed below.

<u>Conservation Significance 3</u>	
Reticulated Velvet Gecko	<i>Hesperoedura reticulata</i>
Carpet Python	<i>Morelia spilota</i>

The **Reticulated Velvet Gecko** is an arboreal species that lives on smooth-barked eucalypt such as Wandoo and Salmon Gum, sheltering in dead wood on the tree (Bush *et al.* 2008). The habitat of this species has become fragmented in the wheatbelt region, and it has been found that individuals do not move between populations (Sarre *et al.* 1995). Consequently, the Reticulated Velvet Gecko is vulnerable to local extinction (e.g. due to bushfire) as it is unlikely to recolonise suitable habitat.

The **Carpet Python** is a large semi-arboreal species that appears to require large tracts of undisturbed bushland for survival (Bush *et al.* 2008). By day it shelters in tree hollows, hollow logs or animal burrows. As it basks on roads, it is vulnerable to road mortalities, which may impact on populations in isolated remnant vegetation. Until recently, the Carpet Python was listed as Specially Protected under the WC Act.

5.3 Birds

There are 119 species of bird that have the potential to occur in the study area, of which 42 were recorded opportunistically during the October 2017 site visit (Appendix 3). The bird assemblage is likely to be relatively diverse due to the mix of habitats present and the relatively large size of the remaining native vegetation. About 49% of Western Australian wheatbelt bird species have declined in abundance and/or distribution (Saunders and Ingram 1995). Passerine birds appear particularly vulnerable, with up to 75% of wheatbelt species experiencing declines (Burbidge and Gole 2005). All remnant native vegetation in the wheatbelt is likely to be important for birds. The larger the reserve, the more bird species it is likely to support, and though reserves of over 1,500 ha are required to conserve a local avifauna, areas as small as 80 ha can be important (Kitchener *et al.* 1982).

The Banksia heath supports a variety of nectar-feeding honeyeaters and small insectivores. When seeding, the Wandoo and York Gum woodlands and shrubs such as *Acacia* and *Allocasuarina* spp. provide food for granivorous species such as parrots, pigeons and cockatoos. Many species are likely to breed in the study area, constructing nests in trees or shrubs in the more densely vegetated areas. Many potential nest hollows were observed, particularly in Wandoo (Plate 9), but also in Salmon Gum and other eucalypts. Species that nest in hollows include owls, parrots, cockatoos, pardalotes, kingfishers and treecreepers.



Plate 9. Examples of hollow-bearing eucalypts in the study area.

Waterbirds, such as ducks, herons, egrets and ibis occur in the region and may occur nearby on farm dams or salt lakes. However, the only waterbirds included in Appendix 3 are ducks that may nest in tree hollows in the study area, walking the ducklings to adjacent waterbodies (e.g. farm dams).

The *Kwobrup – Badgebup Key Biodiversity Area* (KBA) is situated 3.5km south of the study area (Figure 2), consisting of 602 ha of Wandoo woodlands in the Kwobrup Nature Reserve and nearby Badgebup. This KBA is recognised by Birdlife Australia as important for Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), Inland Western Rosella (*Platycercus icterotis xanthogenys*), Regent Parrot (*Polytelis anthopeplus*), Rufous Treecreeper (*Climacteris rufus*), Blue-breasted Fairywren (*Malurus pulcherrimus*) and Western Yellow Robin (*Eopsaltria australis griseogularis*). The site has been listed primarily because it supports at least 1% of the breeding population of Carnaby's Black-Cockatoo (Birdlife Australia 2018).

5.3.1 Birds of Conservation Significance

There are 17 birds of conservation significance that may potentially occur in the study area. Each species is listed in the boxes below, and discussed. Relevant records of conservation significant birds from DBCA's Threatened and Priority Fauna Database are presented in Figure 4. Several shorebird and other waterbird species are listed on databases for the region, but have been excluded due to lack of suitable wetland habitats. Other birds excluded include the Western Whipbird (*Psophodes nigrogularis*) and Muir's Corella (*Cacatua pastinator pastinator*), as these species are locally extinct, and the Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) and Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) for which the study area is outside their current distribution as modelled by DEE (2017).

Conservation Significance 1**Malleefowl***Leipoa ocellata*

This species is listed as Vulnerable under the EPBC Act and under Schedule 3 (Vulnerable) of the WC Act.

Fork-tailed Swift*Apus pacificus*

This species is listed as migratory under the EPBC Act and under Schedule 5 (migratory birds protected under international agreement) of the WC Act.

Peregrine Falcon*Falco peregrinus*

This falcon is listed under Schedule 7 (other specially protected fauna) of the WC Act.

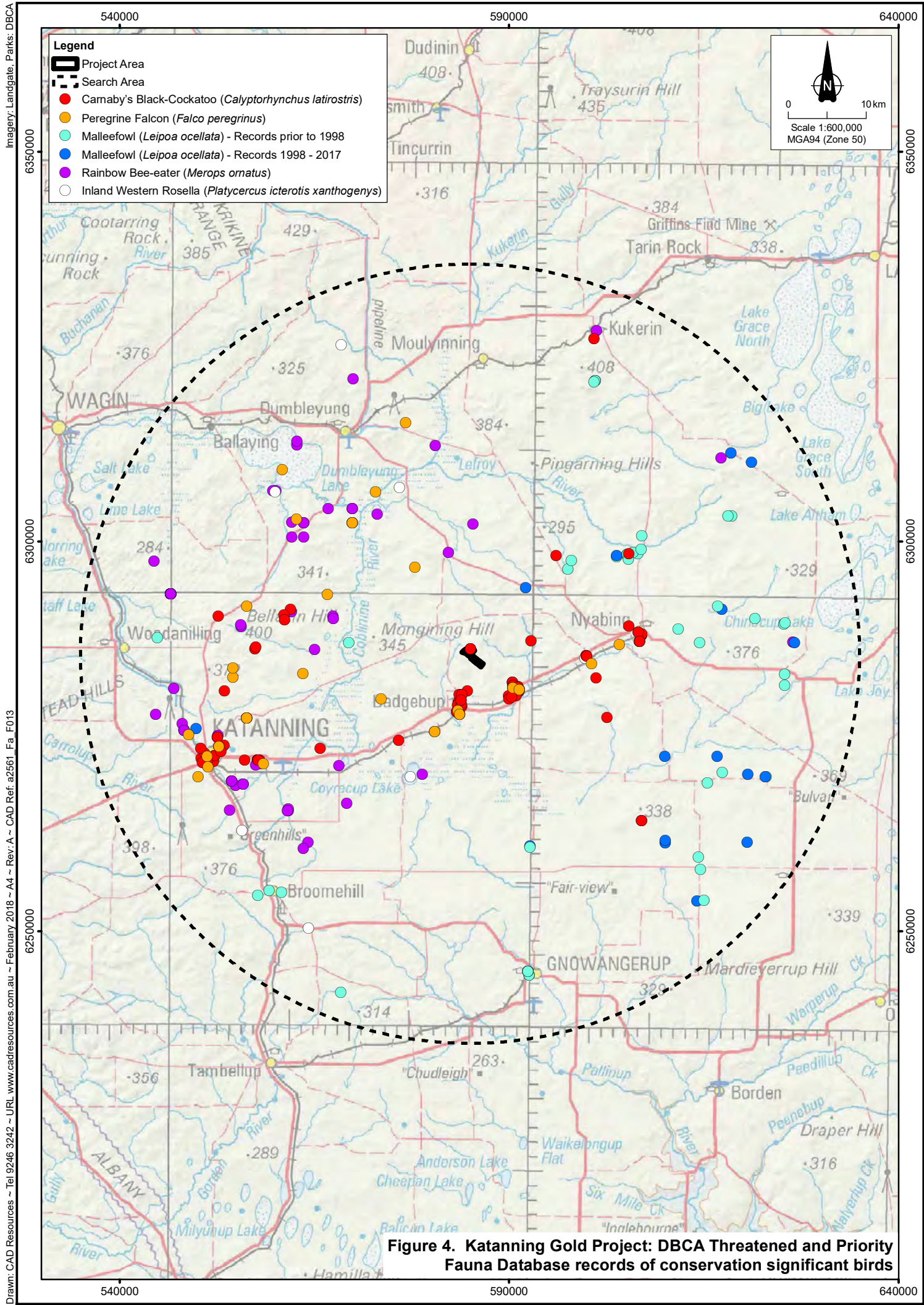
Carnaby's Black-Cockatoo*Calyptorhynchus latirostris*

This species is listed as Endangered under the EPBC Act and under Schedule 2 (Endangered) of the WC Act.

The **Malleefowl** is a large ground-dwelling bird inhabits mallee woodlands and *Acacia* shrublands that have a dense layer of leaf litter (Johnstone and Storr 1998, Benshemesh 2007). In Western Australia, birds favour mallee, shrubland and thicket vegetation, with woodlands less favoured (Benshemesh 2007). There are several records of this species in the vicinity of the study area on the DBCA Threatened and Priority Fauna Database, with more recent records to the south and east of the study area (Figure 4). Although Malleefowl may occur, it is likely that the habitats in the study area are not suitable to support breeding by this species.

The **Fork-tailed Swift** is a non-breeding visitor to Australia between September and April (Boehm 1962). While it can be common in the north, it is generally scarce in southwest Australia (Johnstone and Storr 1998). The bird is primarily observed foraging for insects in proximity to cyclonic weather (Boehm 1962). Although a migratory species, the Fork-tailed Swift has a large range and a large population that appears to be stable (BirdLife International 2017). The Fork-tailed Swift is largely an aerial species in Australia, so is unlikely to be affected by changes to the study area.

The **Peregrine Falcon** is a widespread bird of prey that globally has a very large range and a very large population that appears to be secure (BirdLife International 2017). In Western Australia the population is secure, though this species may experience reductions at a local level due to human disturbance at nesting sites (Debus 1998). The Peregrine Falcon nests mainly on ledges on cliffs or rocky outcrops, and it may also use tall trees (Johnstone and Storr 1998). This species often takes advantage of man-made structures such as abandoned open pits or quarries. There are several records of this species in the area on DBCA's Threatened and Priority Fauna Database (Figure 4), including records nearby at Badgebup and Kwobrup Nature Reserve. The Peregrine Falcon may occur in the study area, foraging over adjacent farmland, with taller trees providing potential breeding habitat.



Carnaby's Black-Cockatoo nests in large eucalypt hollows, usually in smooth-barked species such as Salmon Gum or Wandoo, though they may nest in any suitably sized hollow (DSEWPaC 2012, DPAW 2013). For breeding to be successful, birds rely on the presence of foraging habitat within 12km of the breeding site (DPAW 2013). During the non-breeding season, birds generally move west or south towards the coast, foraging in proteaceous shrublands and woodlands. Key threats for this species include loss of breeding habitat, loss of feeding habitat in close proximity to breeding habitat, loss of non-breeding season foraging habitat and night-roost sites, clearing for mining and extraction activities and illegal shooting (DPAW 2013). Carnaby's Black-Cockatoo is known to breed in the vicinity of the study area (Figure 5), with breeding records at nearby Badgebup - Kwobrup KBA (Birdlife International 2018). All Wandoo woodlands in the study area are potential breeding habitat for Carnaby's Black-Cockatoo, and many suitably-sized Wandoo trees and some Salmon Gum trees were noted to be present (Plate 9). It should be noted that breeding has also been recorded in Red Morrel and York Gum, both of which also occur in the study area. A pair of Carnaby's Black-Cockatoo were recorded nesting in a Wandoo during the site visit (Figure 6, Plate 10). The study area contains some foraging habitat for Carnaby's Black-Cockatoo, with patches of Banksia heath providing favoured foodplants and evidence of recent foraging was noted in three locations (Figure 6). The study area may also provide roosting habitat for Carnaby's Black-Cockatoo. Carnaby's Black-Cockatoo roost in tall trees, usually in riparian habitats (DSEWPaC 2012), and potentially roost in tall eucalypts overlooking Dingo mine open pit or adjacent dams.



Plate 10. Carnaby's Black-Cockatoo nesting hollow in the study area.

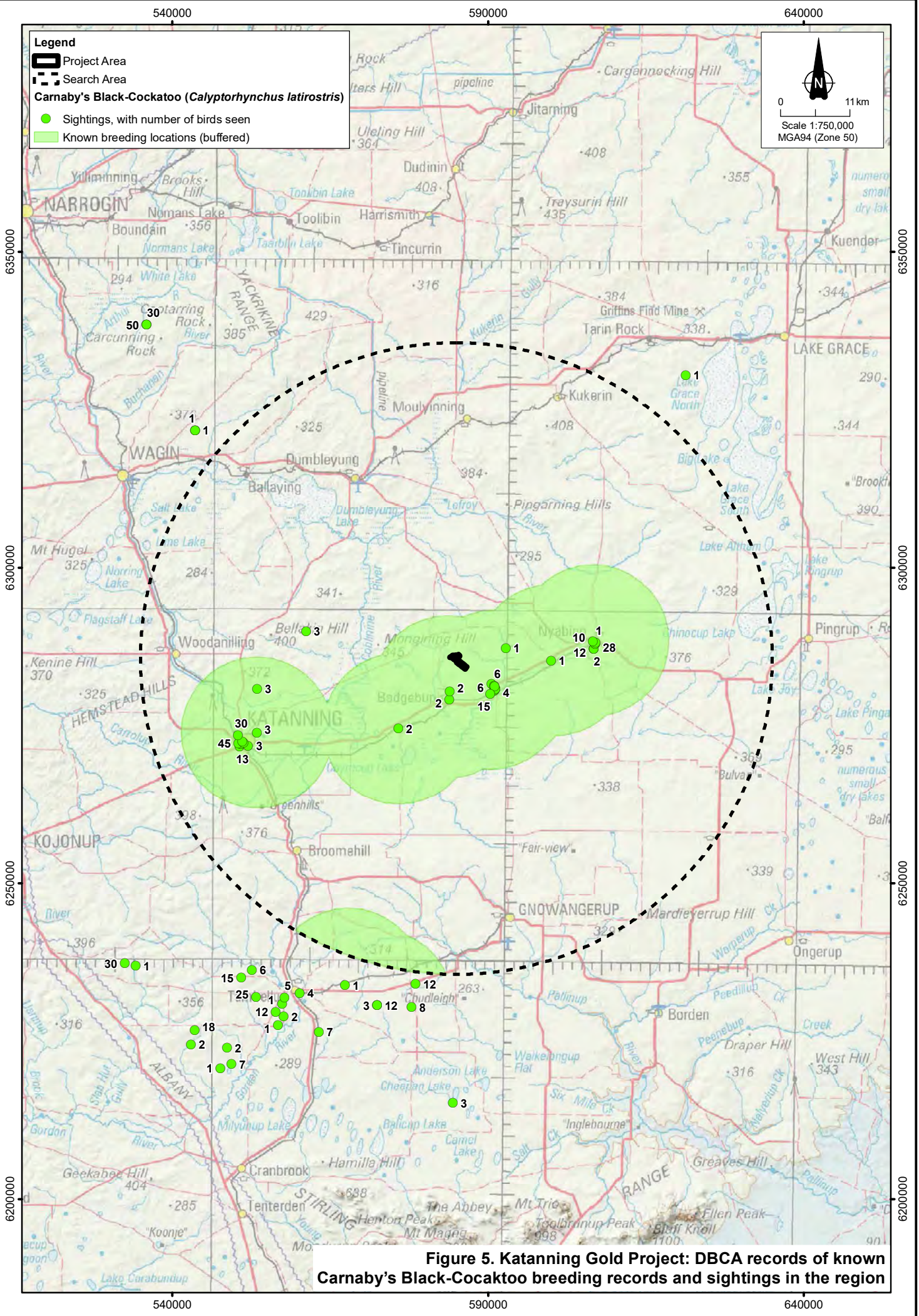
Conservation Significance 2

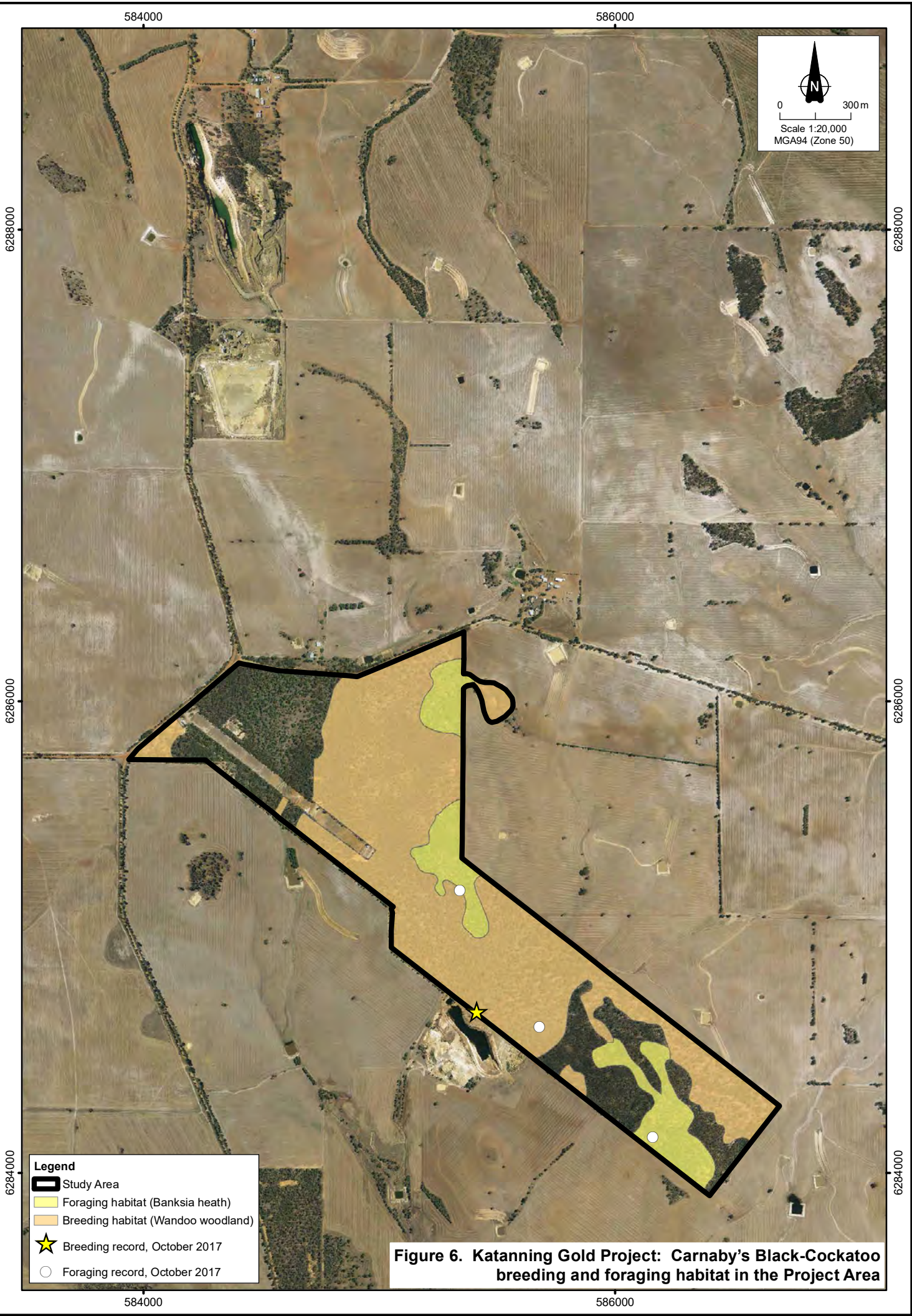
Inland Western Rosella

This species is listed as Priority 4 by DBCA.

Platycercus icterotis xanthogenys

The **Inland Western Rosella** is endemic to southern Western Australia. The population of this species is thought to be declining in the western wheatbelt due to clearing, but stable in the western woodlands (Garnett and Crowley 2000). Although still a Priority species, the Inland Western Rosella was not listed in the 2010 Action Plan for Australian Birds as the population is considered too large and the decline too slow to be designated as Near Threatened (Garnett *et al.* 2011). This species occurs in eucalypt and *Allocasuarina* woodlands, nesting in tree hollows (Johnstone and Storr 1998). Although not recorded during the site visit, the Inland Western Rosella has been recorded in the region on DBCA's Threatened and Priority Fauna Database (Figure 4). Despite the Inland Western Rosella being a distinctive species, there are very few records on the database, with all but one prior to 1986. It is likely that this species has declined in the shire, probably due to habitat loss and habitat fragmentation. The Inland Western Rosella may occur in the study area as either a foraging visitor or breeding resident, however, this species appears to be uncommon in the region.





Legend

- Study Area
- Foraging habitat (Banksia heath)
- Breeding habitat (Wandoo woodland)
- ★ Breeding record, October 2017
- Foraging record, October 2017

Figure 6. Katanning Gold Project: Carnaby's Black-Cockatoo breeding and foraging habitat in the Project Area

Conservation Significance 3

Bush Stone-Curlew
Purple-crowned Lorikeet
Yellow-plumed Honeyeater
Blue-breasted Fairy-wren
Rufous Treecreeper
Rufous Fieldwren
Shy Heathwren
Grey Shrike-thrush
Western Yellow Robin
Southern Scrub-Robin
Hooded Robin
Jacky Winter

Burhinus grallarius
Glossopsitta porphyrocephala
Ptilotula ornata
Malurus pulcherrimus
Climacteris rufus
Calamanthus campestris
Hylacola cauta
Colluricincla harmonica
Eopsaltria australis griseogularis
Drymodes brunneopygia
Melanodryas cucullata
Microeca fascinans

Twelve birds are listed above as potentially locally significant species. These are generally species that have been noted as declining in the wheatbelt (Saunders and Ingram 1995), with ground-foraging insectivores (e.g. Shy Heathwren, Western Yellow Robin and Blue-breasted Fairy-wren) being particularly vulnerable to decline. The Yellow-plumed Honeyeater, once common in wheatbelt woodlands, has virtually disappeared from the central wheatbelt (Burbidge and Gole 2005). While many of these species are common in other parts of their range, these species may be at higher risk of local extinction within a patch of remnant vegetation.

5.4 Mammals

There are 24 species of mammal that have the potential to occur in the study area, of which 19 are native and five introduced (Appendix 4). Three species were recorded opportunistically during the site visit, two native species and one introduced (Appendix 4). The native species observed were the Western Grey Kangaroo (*Macropus fuliginosus*), which is likely to be common in the study area, and Echidna (*Tachyglossus aculeatus*).

Twenty of the 53 species of mammal known to occur in the Avon Wheatbelt Bioregion are now extinct in the Bioregion (DoE 2015b). Almost all the remaining species have undergone dramatic reductions in their area of occupancy, as much of the native vegetation in the subregion has been cleared. While some species, such as the Western Grey Kangaroo, may range on to farmland to forage, almost all native mammals rely on native vegetation for breeding, foraging and shelter.

Several of the mammals listed in Appendix 4 are insectivorous bats. Bats are likely to forage over the study area at night, roosting in tree hollows or crevices by day. Small terrestrial species, such as dunnarts, are likely to rely on vegetation and fallen timber for shelter, with coarse woody debris also favouring the Western Pygmy Possum (*Cercartetus concinnus*) (Moore *et al.* 2013). If present, the Honey Possum (*Tarsipes rostratus*) and Western Pygmy Possum are likely to forage in the *Banksia* heath, as well as in the eucalypt canopy when it is flowering.

5.4.1 Mammals of Conservation Significance

There are eight mammals of conservation significance that may occur in the study area, as listed and discussed below. Relevant records of conservation significant mammals from DBCA's Threatened and Priority Fauna Database are presented in Figure 7. Other species have been listed on databases for the region, but have been excluded from the discussion below. The Quenda (*Isodon obesulus*), Woylie (*Bettongia penicillata*), Tammar Wallaby (*Macropus eugenii*), Numbat (*Myrmecobius fasciatus*), Western Mouse (*Pseudomys occidentalis*), Western Ringtail Possum (*Pseudocheirus occidentalis*) and Bilby (*Macrotis lagotis*) all used to occur, but are now locally extinct in the Avon Wheatbelt 2 subregion, except where populations of some species are managed in reserves.

Conservation Significance 1

Chuditch

This species is listed as Vulnerable under the EPBC Act and under Schedule 3 (Vulnerable) of the WC Act.

Dasyurus geoffroii

Red-tailed Phascogale

This species is listed as Vulnerable under the EPBC Act and under Schedule 6 (Conservation Dependent) of the WC Act.

Phascogale calura

The **Chuditch** used to occur across much of the continent, but is now restricted to the southwest of Western Australia. Although they used to occupy a range of habitats, the majority of Chuditch now occur in the Jarrah forest with some wheatbelt/goldfields populations in drier woodlands, heath and mallee shrublands (Van Dyck and Strahan 2008; Orrell and Morris 1994). There are a few nearby records of Chuditch on DBCA's Threatened and Priority Fauna Database (Figure 7), though some of these records are uncertain. The Chuditch is a highly mobile species. Though it is unlikely that a population of Chuditch occurs in the vicinity of the study area, occasional individuals may occur as they disperse through the landscape. If present, the Chuditch may occur in all habitats.

The **Red-tailed Phascogale** has declined in numbers and in range. It favours Wandoo or York Gum woodlands with Rock Sheoak (Woinarski *et al.* 2014). Long-unburnt habitats are important for this species, with frequent, intense fires being a key threat to the species. Other key threats include loss and fragmentation of habitat and predation by feral cats (Woinarski *et al.* 2014). The majority of the range of this species overlaps the southern wheatbelt, and as such the population is fragmented, often occurring in isolated reserves (Maxwell *et al.* 1996). There are many records of this species on DBCA's Threatened and Priority Fauna Database, including a number of more recent records made in the last two decades (Figure 7). The Red-tailed Phascogale potentially occurs in the study area, as the habitat is suitable, it is known to occur in the region and is known to survive in relatively small remnants.

Conservation Significance 2

Western Brush Wallaby

This species is listed as Priority 4 by DBCA.

Macropus irma

The **Western Brush Wallaby** is endemic to the southwest of Western Australia and occurs in open forests or woodlands (Van Dyck and Strahan 2008). There are several records of this species on DBCA's Threatened and Priority Fauna Database (Figure 7). It potentially occurs in the study area, where it may shelter in dense vegetation during the day, ranging out onto shorter vegetation or adjacent farmlands to forage at night.

Conservation Significance 3

Gilbert's Dunnart

White-tailed Dunnart

Honey Possum

Western Pygmy Possum

Brush-tailed Possum

Sminthopsis gilberti

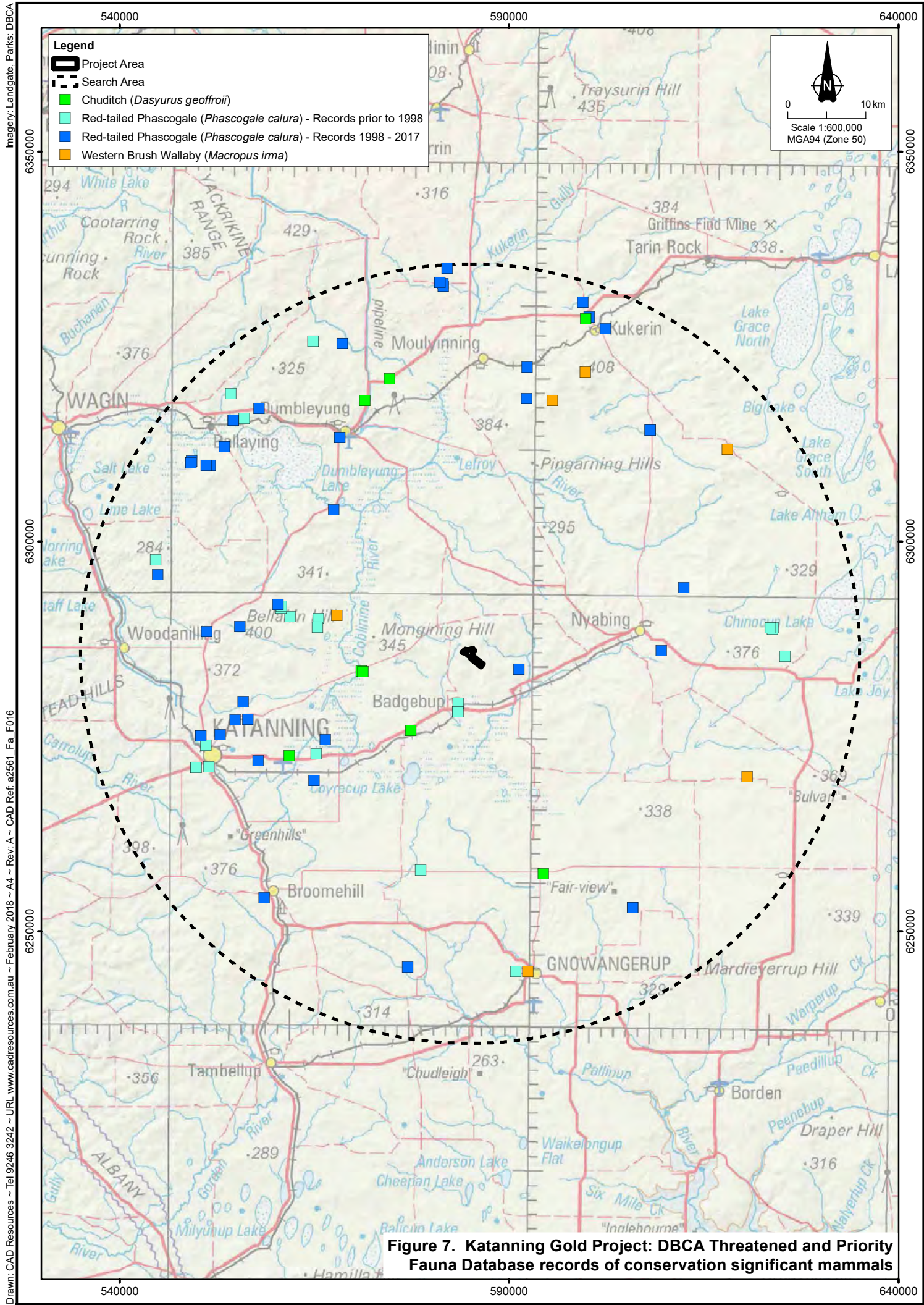
Sminthopsis granulipes

Tarsipes rostratus

Cercartetus concinnus

Trichosurus vulpecula

Five locally significant mammal species are listed above. Unlike flying species (i.e. bats), terrestrial mammals must disperse along the ground to move between vegetation remnants, meaning they are vulnerable to predation by foxes and cats, and to isolation of populations when remnants are too far apart. The Honey Possum requires large tracts of vegetation, so it can move to find nectar resources. It may be negatively impacted by fire, particularly in fragmented habitats (Bamford *et al.* 2009).



Imagery: Landgate, Parks, DBCA
 Drawn: CAD Resources ~ Tel 9246 3242 ~ URL www.cadresources.com.au ~ February 2018 ~ A4 ~ Rev. A ~ CAD Ref. a2561 ~ Fa F016

Table 4. Summary of conservation significant (CS) fauna in the study area.

Species	Conservation Status					Records	Likelihood of occurrence in the study area	Habitat preference	Likely habitat use in the study area			
	Level of Conservation Significance	EPBC Act	WC Act	DBCA Priority	Locally Significant				Wandoo woodland	York Gum woodland	Mallet Woodland	Banksia heath
<i>Calyptorhynchus latirostris</i> Carnaby's Black-Cockatoo	CS1	En	S2			Recorded breeding and foraging in study area, this survey, 2017. Also known to breed nearby.	Present	Breeds in large eucalypt hollows, forages on proteaceous shrublands, eucalypt woodlands and pine plantations	✓	✓	✓	✓
<i>Leipoa ocellata</i> Malleefowl	CS1	Vu	S3			Several records within 50 km (Figure 4).	Very low	Acacia thickets or mallee woodlands with leaf litter.		?		
<i>Dasyurus geoffroii</i> Chuditch	CS1	Vu	S3			A few records within 50 km (Figure 7).	Low	Various habitats including shrublands, woodlands and forests.	✓	✓	✓	✓
<i>Phascogale calura</i> Red-tailed Phascogale	CS1	Vu	S6			Many records within 50 km (Figure 7).	High	Rock Sheoak in association with Wandoo and York Gum woodlands.	✓	✓		
<i>Apus pacificus</i> Fork-tailed Swift	CS1	Mig	S5			-	Low	Overfly any habitat.	✓	✓	✓	✓
<i>Falco peregrinus</i> Peregrine Falcon	CS1		S7			Several records within 50 km (Figure 4).	Moderate	Variety of habitats, nests in tall trees, cliffs, open pits.	✓	✓	✓	✓
<i>Platycercus icterotis xanthogenys</i> Inland Western Rosella	CS2			P4		A few records within 50 km (Figure 4).	Moderate	Eucalypt woodlands and shrublands, nests in tree hollows.	✓	✓	✓	
<i>Macropus irma</i> Western Brush Wallaby	CS2			P4		A few records within 50 km (Figure 7).	Very low	Forests, woodlands and shrublands	✓	✓	✓	✓
<i>Hesperoedura reticulata</i> Reticulated Velvet Gecko	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 2).	High	Woodlands with smooth-barked eucalypts.	✓			
<i>Morelia spilota</i> Carpet Python	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 2).	Moderate	Various habitats.	✓	✓	✓	✓

Table 4 (cont.)

Species	Conservation Status					Records	Likelihood of occurrence in the study area	Habitat preference	Likely habitat use in the study area			
	Level of Conservation Significance	EPBC Act	WC Act	DBCA Priority	Locally Significant				Wandoo woodland	York Gum woodland	Mallet Woodland	Banksia heath
<i>Burhinus grallarius</i> Bush Stone-Curlew	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 3).	Low	Open woodlands, sheltering by day in dense vegetation.	✓	✓	✓	✓
<i>Glossopsitta porphyrocephala</i> Purple-crowned Lorikeet	CS3				x	-	Moderate	Eucalypt forests and woodlands.	✓	✓	✓	
<i>Ptilotula ornata</i> Yellow-plumed Honeyeater	CS3				X	-	Moderate	Woodlands.	✓	✓	✓	
<i>Malurus pulcherrimus</i> Blue-breasted Fairy-wren	CS3				x	Recorded within 40 km on Birds Australia Atlas Database (Appendix 3).	Low	Shrublands and areas of dense understorey.				✓
<i>Climacteris rufus</i> Rufous Treecreeper	CS3				x	Recorded this survey, October 2017.	Present	Open woodlands, nesting in tree hollows.	✓	✓	✓	
<i>Calamanthus campestris</i> Rufous Fieldwren	CS3				x	Recorded within 40 km on Birds Australia Atlas Database (Appendix 3).	Low	Shrublands and areas of dense understorey.				✓
<i>Hylacola cauta</i> Shy Heathwren	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 3).	Low	Shrublands and areas of dense understorey.				✓
<i>Colluricincla harmonica</i> Grey Shrike-thrush	CS3				x	Recorded this survey, October 2017.	Present	Forests and woodlands.	✓	✓	✓	✓
<i>Eopsaltria australis griseogularis</i> Western Yellow Robin	CS3				x	Recorded this survey, October 2017.	Present	Open woodlands.	✓	✓	✓	
<i>Drymodes brunneopygia</i> Southern Scrub-Robin	CS3				x	Recorded within 40 km on Birds Australia Atlas Database & WA Museum Database (Appendix 3).	Low	Shrublands and areas of dense understorey.				✓

Table 4 (cont.)

Species	Conservation Status					Records	Likelihood of occurrence in the study area	Habitat preference	Likely habitat use in the study area			
	Level of Conservation Significance	EPBC Act	WC Act	DBCA Priority	Locally Significant				Wandoo woodland	York Gum woodland	Mallet Woodland	Banksia heath
Hooded Robin <i>Melanodryas cucullata</i>	CS3				x	Recorded within 40 km on Birds Australia Atlas Database (Appendix 3).	Moderate	Open woodlands.	✓	✓	✓	
Jacky Winter <i>Microeca fascinans</i>	CS3				x	Recorded this survey, October 2017.	Present	Open woodlands.	✓	✓	✓	
<i>Sminthopsis gilberti</i> Gilbert's Dunnart	CS3				x	-	Moderate	Shrublands and heaths of gravelly sands.				✓
<i>Sminthopsis granulipes</i> White-tailed Dunnart	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 4).	Moderate	Shrublands on gravelly sands.				✓
<i>Tarsipes rostratus</i> Honey Possum	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 4).	Moderate		✓	✓	✓	✓
<i>Cercartetus concinnus</i> Western Pygmy Possum	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 4).	High		✓	✓	✓	✓
<i>Trichosurus vulpecula</i> Brush-tailed Possum	CS3				x	Recorded within 40 km on WA Museum Database (Appendix 4).	Moderate		✓	✓	✓	

6. Potential Impacts

The potential impacts discussed in this section are those typically associated with exploration, not any future mining at the Project. Initial exploration of the Project will involve dayshift-only drilling with all access through currently cleared areas such as existing tracks, the 1000m rifle range and areas of woodland without understorey vegetation. However, should further exploration be undertaken, it may require some clearing of tracks and drill pads to allow access for vehicles and personnel.

Based on these activities, the most likely potential impacts on fauna and fauna habitats are given below in Table 5.

Table 5. Potential impacts on fauna.

Scenario:	No clearing of habitat (including vegetation and fallen logs).	Some clearing of habitat for access tracks and drill pads
Direct impacts:	<ul style="list-style-type: none"> • Direct mortality of fauna through vehicle strike. 	<ul style="list-style-type: none"> • Direct mortality of fauna during formation of tracks or through vehicle strike. • Loss of fauna habitat and increased habitat fragmentation through creation of tracks and drill pads.
Indirect impacts:	<ul style="list-style-type: none"> • Habitat degradation in the vicinity of access tracks through the introduction of pathogens or weeds, by increased access by feral fauna or by trampling or crushing of adjacent vegetation. • Temporary disturbance to fauna in the vicinity of drilling, through noise, vibration and personnel. • Increased risk of fire. 	<ul style="list-style-type: none"> • Habitat degradation in the vicinity of access tracks through the introduction of pathogens or weeds, by increased access by feral fauna or by trampling or crushing of adjacent vegetation. • Temporary disturbance to fauna in the vicinity of drilling, through noise, vibration and personnel. • Increased risk of fire.

Each of the potential impacts are discussed in the sections below, along with potential impacts on conservation significant fauna specifically, and potential mitigation strategies. Note that though the scale of the potential impact will depend on the exploration scenario as given in Table 5. If no clearing is undertaken, the scale of the potential impact is likely to be low.

6.1 Direct Impacts

6.1.1 Direct Mortality of Fauna

Some direct mortality of fauna is always possible. Mortalities can occur during clearing of exploration tracks, through accidental vehicle strikes and by being trapped in open drill holes. As a key feature of the current proposed drilling programme is to avoid disturbance to vegetation in the reserves, mortalities associated with track creation should be minimised.

Clearing tracks may involve removal of vegetation and/or fallen timber. Fauna that are most at risk are small species that are likely to hide rather than move away from disturbance. This includes a range of small reptiles (e.g. many geckos and legless lizards) and mammals (e.g. Honey Possum) that shelter in shrubs or hollow logs, many of which are nocturnal. In cool weather, reptiles are less active and therefore less able to move away. In addition, while adult birds are able to disperse away, eggs or unfledged birds in nests are also vulnerable to mortality while clearing. Conservation significant species that are vulnerable to direct mortality during track clearing include locally significant reptiles (Reticulated Velvet Gecko and Carpet Python), locally significant mammals that nest in hollows, fallen logs or shrubs (Gilbert's Dunnart, White-tailed Dunnart, Honey Possum, Western Pygmy Possum and Common Brushtail Possum), and the eggs and dependent young of the birds listed in Table 4. The Red-tailed Phascogale nests in tree hollows and the skirts of grasstrees, so may be impacted if these are cleared.

Direct mortality may also occur due to accidental vehicle strikes. Faunal groups at risk include reptiles that bask on tracks (e.g. snakes) and large mammals (e.g. kangaroos). Owls and other nocturnal species may be at risk if vehicles are travelling at night. However, road mortalities are unlikely to negatively impact the conservation status of a fauna species unless the fauna population was small or otherwise fragile. Conservation significant species that are vulnerable to road mortalities include the Carpet Python, Malleefowl (though this species may be locally extinct), Carnaby's Black-Cockatoo, Western Brush Wallaby. The Chuditch is unlikely to be impacted as it is likely to be extremely uncommon in the vicinity of the study area.

Un-capped drill holes can cause mortalities when fauna fall in and are unable to climb out. Species most at risk are ground-dwelling frogs, reptiles and small mammals. Conservation significant species that may be trapped by un-capped drill holes include the Chuditch (though this species is likely to be extremely uncommon in the vicinity of the study area), the Red-tailed Phascogale and locally significant reptiles and small mammals listed in Table 4.

6.1.2 Habitat Loss and Fragmentation

Any habitat loss in the wheatbelt region is likely to be significant, as over 85% of all vegetation in the Avon Wheatbelt Bioregion has been cleared (DoE 2016b). The vegetation that remains is often highly fragmented, occurring in a network of patches in different sizes, with different levels of connectivity. Connectivity is important, as it allows gene-flow between populations and the capacity to move to take advantage of dispersed or temporary resources such as food or nesting sites. It also allows patches of remnant vegetation to be recolonised if there is a local extinction of a fauna species, e.g. due to bushfire. It can be difficult for fauna to move through a landscape that includes areas of cleared land, and this difficulty will be greater for some species than others. Highly mobile species (such as many birds, bats or large mammals such as kangaroos) may be able to negotiate cleared areas to travel between isolated patches of native vegetation. Small ground-dwelling species (such as many frogs, reptiles and small mammals) may not be able to negotiate cleared land, impacting on their ability to maintain gene-flow between populations, or repopulate areas after local extinction events.

Carnaby's Black-Cockatoo is known to breed and forage in the study area. Loss of any breeding habitat for Carnaby's Black-Cockatoo is likely to have a significant impact on the species (DSEWPaC 2012, DEE 2017), and the study areas include 102.5 ha of Wandoo woodland breeding habitat with breeding recorded during the site visit (Figure 6). The study area also includes 23.3ha of Banksia heath foraging habitat. Foraging habitat within close proximity to breeding habitat is important to support successful breeding (DPAW 2013). The current EPBC Act referral guidelines for Carnaby's Black-Cockatoo state that clearing more than 1ha of quality foraging habitat is a likely to have a high risk of a significant impact on the species (DSEWPaC 2012). The draft revised referral guidelines (not yet in general use at the time of writing) suggest that any clearing of high quality foraging habitat is likely to cause a significant impact (DEE 2017). Given the scarcity of vegetation in the region, the presence of a known cockatoo breeding site with 3.5km of the study area and the presence of a nesting tree in the study area, any clearing of foraging habitat has a high risk of a significant impact on the species.

The Red-tailed Phascogale has a high probability of occurring in the study area, in areas of York Gum or Wandoo woodland with a Rock Sheoak understorey. The best habitat for this species is that with many tree hollows and a semi-continuous canopy, possibly because this provides some protection against foxes and cats (Woinarski *et al.* 2014). Habitat loss and fragmentation in the study area may reduce the quality of the habitat for this species, reduce the number of nesting sites (if tree hollows are cleared) and allow increased access by feral predators.

The impact of habitat loss and fragmentation on the Malleefowl and Chuditch is likely to be low, as both species are likely to be extremely uncommon in the vicinity of the study area. Similarly, the impact on the Fork-tailed Swift is likely to be low, as it is an uncommon aerial visitor. The Peregrine Falcon may be impacted by some loss of habitat, but the impact is unlikely to be significant as these species are common and wide-ranging, foraging even in quite modified habitats.

6.2 Indirect Impacts

6.2.1 Habitat Degradation

There is a potential for habitats adjacent to the tracks to be degraded through the introduction of weeds, pathogens (e.g. Dieback) and increased access by feral predators. There is also the risk of accidental trampling or crushing of vegetation adjacent to tracks, either by personnel or by vehicles.

Weeds and pathogens modify vegetation communities and therefore fauna habitats. If they are introduced to the study area, the impacts are potentially long-term. Feral predators are likely to be currently present in the study area. Native fauna may be more vulnerable to predation by foxes and cats if vegetation is opened up by tracks, as tracks provide access and open areas have less shelter to hide from predators. Access by feral predators should be a temporary impact, ameliorated over time as the tracks are rehabilitated.

Conservation significant fauna potentially impacted by feral predators include the Malleefowl (if present), Chuditch (if present) and the Red-tailed Phascogale. Predation by feral cats or foxes is listed as a key threat to many species, including the Red-tailed Phascogale (Woinarski *et al.* 2014). Other fauna that may be impacted include small native mammals, reptiles, frogs and small birds, including the locally significant species listed in Table 4.

6.2.2 Disturbance to Adjacent Habitat

There is likely to be some temporary disturbance to fauna during exploration, due to noise, movement (by vehicles and personnel), or vibration. As Ausgold proposes dayshift drilling only, there will be no disturbance due to lighting. As the study area is adjacent to public roads, includes a rifle range, and is surrounded by farmland, there is a level of existing disturbance. However, exploration is likely to result in temporary disturbance at several locations within the reserves.

These disturbances are likely to result in some species temporarily avoiding areas of habitat that are otherwise suitable. Fauna may also experience increased stress and/or expend extra energy in avoidance behaviours. Should disturbance occur near breeding sites, there is the potential for abandonment of nests or young. Disturbance is unlikely to cause a significant impact to populations of most fauna species and the effects on most species are likely to be temporary. However, disturbance to Carnaby's Black-Cockatoo breeding sites must be avoided during the July to December breeding season, to prevent a significant impact on the species.

6.2.3 Increased Risk of Fire

The presence of vehicles and personnel in the project area increase the risk of an accidental fire. Sources of ignition include hot machinery in contact with vegetation and cigarettes that are not appropriately disposed of. Although bushfire is a natural part of the ecosystem, too-frequent, broad-scale or very hot fires can negatively impact fauna and fauna habitats. When large areas are impacted by fire there is a risk of local extinctions or rendering large tracts of habitat as temporarily unsuitable for a particular species or for breeding. For example, if a remnant is entirely burnt, this may lead to the local extinction of a Red-tailed Phascogale population (Woinarski *et al.* 2014). In a fragmented landscape, negative impacts are exacerbated, as fauna are less able to move between vegetated patches to recolonize after fire.

6.3 Strategies to Reduce Potential Impacts

For each of the potential impacts described in the preceding section, management strategies to avoid or reduce the risk of a significant impact have been listed below. It is understood that Ausgold is proposing to undertake exploration on disturbed and/or cleared areas within the reserves, to avoid physical disturbance to fauna habitats. It is also recognised that some of the following strategies are in common use in the mining and resource industries, and that Ausgold already implement these in their day to day operations.

Recommended strategies to reduce impacts on fauna:

- Plan track layout to minimise total area to be disturbed.
- Situate tracks and drill pads in open areas where possible.
- Avoid any clearing in the Banksia heath habitat where possible.
- Ensure that clearing occurs in designated areas only, with no disturbance to adjacent vegetation.
- Retain and avoid root disturbance to all mature eucalypts, particularly those with hollows or with a diameter at breast height of 30cm or more.
- Avoid operating during the breeding season for Carnaby's Black-Cockatoo (July to December). If operating during the breeding season, breeding trees must be identified and protected from disturbance with a buffer of at least 50m.
- Induction training to include awareness of fauna on site, appropriate responses to fauna related incidents and reporting requirements.
- Develop and implement a procedure to deal with disturbed or injured fauna.
- Implement low speed limits for all vehicles driving in the reserves.
- Prohibit off-road driving outside approved areas.
- Limit vehicle movements between dusk and dawn.
- If work must be undertaken at night, direct lights on to work area only and away from surrounding vegetation.
- Develop and implement a fire prevention and control strategy.
- Prohibit feeding of fauna.
- Dispose of food waste appropriately to avoid attracting feral fauna.
- Ensure all drill holes are securely capped.
- Develop and implement a procedure to ensure that pathogens and weeds are not introduced to the site, including contingency measures to deal with outbreaks.
- Rehabilitate tracks as soon as practicable after the cessation of activities.

6.4 Residual Risk

As 'fauna' are a diverse group, the potential impact of exploration is likely to vary between species. However, the residual risk of a significant impact on fauna is likely to be low for almost all species. The majority of the impacts are temporary and are likely to be ameliorated over time if rehabilitation of tracks is successful. The key risks to manage are those associated with habitat loss and fragmentation and degradation of adjacent habitat, (if a future exploration programme require disturbance to vegetation), and fire.

The majority of fauna species are unlikely to be significantly impacted by exploration. Many species, even if locally significant in the wheatbelt, are relatively common in other parts of their range. Of key concern are Carnaby's Black-Cockatoo and the Red-tailed Phascogale, both threatened species listed under the EPBC Act. The presence of Carnaby's Black-Cockatoo is confirmed, but it is unknown whether the Red-tailed Phascogale is present, though it is known from the region and the habitat present appears suitable. The study area contains:

- Potential habitat for the Red-tailed Phascogale (Wandoo and York Gum woodland with a Sheoak understorey). This species may be impacted by loss, degradation or fragmentation of their habitat, and fire can potentially cause their local extinction within an isolated patch of vegetation.
- Confirmed breeding habitat (Wandoo woodland) with a known nesting tree and foraging habitat (Banksia heath) within close proximity to breeding habitat for Carnaby's Black-Cockatoo. This species may be impacted by loss, degradation or fragmentation of their breeding or foraging habitat, and disturbance to nesting sites.

If exploration requires disturbance to vegetation that is habitat for these two species, it is recommended that the Project is referred under the EPBC Act.

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8. Appendices.

Appendix 1. Frog Species Recorded or Potentially Occurring in the Katanning Gold Project area.

Key to records:

Project area = species recorded in the study area October 2017 by Western Wildlife.

WAM = species records from the Western Australian Museum Database (see Table 1).

FSDB = species records from the Fauna Survey Database (see Table 1).

Salinity AP = species records from the Salinity Action Plan Database (see Table 1).

DBCA = species records from the DBCA Threatened and Priority Species Database (see Table 1).

EPBC = species & species habitat from the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation significance	Records					
		Project area	WAM	FSDB	Salinity AP	DBCA	EPBC
Hylidae (waterholding frogs and tree frogs)							
Slender Tree Frog <i>Litoria adelaidensis</i>			+				
Motorbike Frog <i>Litoria moorei</i>			+				
Limnodynastidae (ground frogs)							
Western Spotted Frog <i>Heleioporus albopunctatus</i>			+	+			
Banjo Frog <i>Limnodynastes dorsalis</i>			+		+		
White-footed Trilling Frog <i>Neobatrachus albipes</i>							
Humming Frog <i>Neobatrachus pelobatoides</i>					+		
Myobatrachidae (ground frogs)							
Bleating Froglet <i>Crinia pseudinsignifera</i>			+	+			
Turtle Frog <i>Myobatrachus gouldii</i>			+		+		
Gunter's Toadlet <i>Pseudophryne guentheri</i>			+				
Number of frog species:		9 predicted, 0 observed					

Appendix 2. Reptile Species Recorded or Potentially Occurring in the Katanning Gold Project area.

Key to records:

Project area = species recorded in the study area between October 2016 – November 2017 by Western Wildlife.

WAM = species records from the Western Australian Museum Database (see Table 1).

FSDB = species records from the Fauna Survey Database (see Table 1).

Salinity AP = species records from the Salinity Action Plan Database (see Table 1).

DBCA = species records from the DBCA Threatened and Priority Species Database (see Table 1).

EPBC = species & species habitat from the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation significance	Records					
		Project area	WAM	FSDB	Salinity AP	DBCA	EPBC
Carphodactylidae (knob-tailed geckoes) Southern Barking Gecko <i>Underwoodisaurus milii</i>			+				
Diplodactylidae (ground geckos) Clawless Gecko <i>Crenadactylus ocellatus</i> South Coast Gecko <i>Diplodactylus calcicolus</i> Wheatbelt Ground Gecko <i>Diplodactylus granariensis</i> <i>Diplodactylus pulcher</i> Reticulated Velvet Gecko <i>Hesperoedura reticulata</i> Western Spiny-tailed Gecko <i>Strophurus spinigerus</i>	CS3	+	+		+		
Gekkonidae (geckoes) Marbled Gecko <i>Christinus marmoratus</i>			+				
Pygopodidae (legless-lizards) Sandplain Worm-Lizard <i>Aprasia repens</i> <i>Delma australis</i> Fraser's Legless Lizard <i>Delma fraseri</i> Burton's Legless Lizard <i>Lialis burtonis</i> Common Scaly-foot <i>Pygopus lepidopodus</i>			+				
Agamidae (dragon lizards) Ornate Crevice Dragon <i>Ctenophorus ornatus</i> Spotted Military Dragon <i>Ctenophorus maculatus</i> Bearded Dragon <i>Pogona minor</i>			+		+		
Scincidae (skinks) Fence Skink <i>Cryptoblepharus buchananii</i> Odd-striped Ctenotus <i>Ctenotus impar</i> <i>Ctenotus schomburgkii</i> King's Skink <i>Egernia kingii</i> <i>Egernia richardi</i> <i>Hemiergis initialis</i> <i>Hemiergis peronii</i> <i>Lerista distinguenda</i> <i>Liopholis multiscutata</i> Dwarf Skink <i>Menetia greyii</i> Dusky Morethia <i>Morethia obscura</i> Western Blue-tongue <i>Tiliqua occipitalis</i> Bobtail <i>Tiliqua rugosa</i>			+		+		
		+	+				

Appendix 2. (cont.)

Species	Conservation significance	Records					
		Project area	WA Museum	FSDB	Salinity AP	DBCA	EPBC
Varanidae (monitor-lizards)							
Gould's Monitor <i>Varanus gouldii</i>		+					
Southern Heath Monitor <i>Varanus rosenbergi</i>			+				
Pythonidae (Australian pythons)							
Carpet Python <i>Morelia spilota</i>	CS3		+				
Typhlopidae (blind-snakes)							
Southern Blind Snake <i>Anilius australis</i>							
Dark-spined Blind Snake <i>Anilius bicolor</i>							
Fat Blind Snake <i>Anilius pinguis</i>							
Elapidae (front-fanged snakes)							
Bardick <i>Echiopsis curta</i>			+				
Tiger Snake <i>Notechis scutatus</i>			+				
Gould's Hooded Snake <i>Parasuta gouldii</i>			+				
Black-backed Snake <i>Parasuta nigriceps</i>			+				
Dugite <i>Pseudonaja affinis</i>			+				
Gwardar / Western Brown Snake <i>Pseudonaja mengdeni</i>			+				
Jan's Banded Snake <i>Simoselaps bertholdi</i>			+				
Rosen's Snake <i>Suta fasciata</i>			+				
Number of reptile species:		43 predicted, 3 observed					

Appendix 3. Bird Species Recorded or Potentially Occurring in the Katanning Gold Project area.

Key to records:

Project area = species recorded in the Project Area November 2017 by Western Wildlife.

Birds Aust. = species records from the Birds Australia Atlas Database (see Table 1).

WAM = species records from the Western Australian Museum Database (see Table 1).

FSDB = species records from the Fauna Survey Database (see Table 1).

DBCA = species records from the DPAW Threatened and Priority Species Database (see Table 1).

EPBC = species & species habitat from the EPBC Protected Matters Search Tool (see Table 1).

Species	Conservation significance	Records					
		Project area	Birds Aust.	WA Museum	FSDB	DBCA	EPBC
Dromaiidae (emus) Emu <i>Dromaius novaehollandiae</i>	CS3		+				
Anatidae (ducks, pygmy-geese & swan) Grey Teal <i>Anas gracilis</i> Pacific Black Duck <i>Anas superciliosa</i> Australian Wood Duck <i>Chenonetta jubata</i> Australian Shelduck <i>Tadorna tadornoides</i>			+				
Megapodiidae (mound-builders) Malleefowl <i>Leipoa ocellata</i>	CS1			+		+	
Phasianidae (pheasants and quails) Stubble Quail <i>Coturnix pectoralis</i>			+	+			
Accipitridae (kites, hawks and eagles) Black-shouldered Kite <i>Elanus caeruleus</i> Square-tailed Kite <i>Hamiostra isura</i> Whistling Kite <i>Haliastur sphenurus</i> Spotted Harrier <i>Circus assimilis</i> Brown Goshawk <i>Accipiter fasciatus</i> Collared Sparrowhawk <i>Accipiter cirrocephalus</i> Wedge-tailed Eagle <i>Aquila audax</i> Little Eagle <i>Hieraetus morphnoides</i>		+	+	+			
Turnicidae (button-quails) Painted Button-quail <i>Turnix varia</i> Little Button-quail <i>Turnix velox</i>			+				
Burhinidae (stone-curlews) Bush Stone-Curlew <i>Burhinus grallarius</i>	CS3			+			
Charadriidae (lapwings and plovers) Banded Lapwing <i>Vanellus tricolor</i>			+				
Columbidae (pigeons and doves) Domestic (Feral) Pigeon <i>Columba livia</i> Common Bronzewing <i>Phaps chalcoptera</i> Brush Bronzewing <i>Phaps elegans</i> Crested Pigeon <i>Ocyphaps lophotes</i>	Int.		+	+			

Appendix 3. (cont.)

Species	Conservation significance	Records					
		Project area	Birds Aust.	WA Museum	FSDB	DBCA	EPBC
Cuculidae (cuckoos)							
Pallid Cuckoo <i>Cacomantis pallidus</i>		+	+	+			
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>		+	+	+			
Black-eared Cuckoo <i>Chrysococcyx osculans</i>							
Horsfield's Bronze-Cuckoo <i>Chrysococcyx basalus</i>				+			
Shining Bronze-Cuckoo <i>Chrysococcyx lucidus</i>		+		+			
Tytonidae (barn owls)							
Eastern Barn Owl <i>Tyto alba</i>				+			
Strigidae (hawk-owls)							
Southern Boobook Owl <i>Ninox boobook</i>							
Podargidae (frogmouths)							
Tawny Frogmouth <i>Podargus strigoides</i>			+	+			
Caprimulgidae (nightjars)							
Spotted Nightjar <i>Eurostopodus argus</i>				+			
Aegothelidae (owlet-nightjars)							
Australian Owlet-Nightjar <i>Aegotheles cristatus</i>			+	+			
Apodidae (swifts)							
Fork-tailed Swift <i>Apus pacificus</i>	CS1						
Alcedinidae (forest kingfishers)							
Laughing Kookaburra <i>Dacelo noveguineae</i>	Int.	+	+	+			
Red-backed Kingfisher <i>Todiramphus pyrrhopygius</i>			+				
Sacred Kingfisher <i>Todiramphus sanctus</i>			+				
Meropidae (bee-eaters)							
Rainbow Bee-eater <i>Merops ornatus</i>	CS1	+	+			+	
Falconidae (falcons)							
Peregrine Falcon <i>Falco peregrinus</i>	CS1		+			+	
Australian Hobby <i>Falco longipennis</i>			+	+			
Brown Falcon <i>Falco berigora</i>			+				
Australian Kestrel <i>Falco cenchroides</i>		+	+				
Cacatuidae (cockatoos)							
Little Corella <i>Cacatua sanguinea</i>			+				
Carnaby's Black-Cockatoo <i>Calyptorhynchus latirostris</i>	CS1	+	+	+	+	+	+
Galah <i>Cacatua roseicapilla</i>		+	+				
Psittacidae (lorikeets & parrots)							
Purple-crowned Lorikeet <i>Parvipsitta porphyrocephala</i>	CS3						
Regent Parrot <i>Polytelis anthopeplus</i>			+	+			
Australian Ringneck <i>Platycercus zonarius</i>		+	+	+	+		
Western Rosella <i>Platycercus icterotis</i>	CS2		+	+		+	
Red-capped Parrot <i>Platycercus spurius</i>			+	+			
Mulga Parrot <i>Platycercus varius</i>							
Budgerigar <i>Melopsittacus undulatus</i>							
Elegant Parrot <i>Neophema elegans</i>		+	+				
Climacteridae (treecreepers)							
Rufous Treecreeper <i>Climacteris rufus</i>	CS3	+					

Appendix 3 (cont.)

Species	Conservation significance	Records					
		Project area	Birds Aust.	WA Museum	FSDB	DBCA	EPBC
Maluridae (fairy-wrens)							
Splendid Fairy-wren <i>Malurus splendens</i>			+				
Blue-breasted Fairy-wren <i>Malurus pulcherrimus</i>	CS3		+				
Meliphagidae (honeyeaters)							
Western Spinebill <i>Acanthorhynchus superciliosus</i>							
Red Wattlebird <i>Anthochaera carunculata</i>		+	+	+			
Western Wattlebird <i>Anthochaera lunulata</i>			+				
Spiny-cheeked Honeyeater <i>Acanthagenys rufogularis</i>			+				
Yellow-throated Miner <i>Manorina flavigula</i>			+	+			
Purple-gaped Honeyeater <i>Lichenostomus cratitius</i>			+	+			
Singing Honeyeater <i>Gavicalis virescens</i>				+			
White-eared Honeyeater <i>Lichenostomus leucotis</i>			+	+			
Yellow-plumed Honeyeater <i>Ptilotula ornata</i>	CS3						
Brown-headed Honeyeater <i>Melithreptus brevirostris</i>		+	+	+			
Western White-naped Honeyeater <i>Melithreptus chloropsis</i>				+			
Brown Honeyeater <i>Lichmera indistincta</i>		+	+				
New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>			+	+			
White-cheeked Honeyeater <i>Phylidonyris nigra</i>		+	+				
White-fronted Honeyeater <i>Purnella albifrons</i>				+			
Tawny-crowned Honeyeater <i>Glyciphila melanops</i>			+				
White-fronted Chat <i>Epthianura albifrons</i>			+				
Pardalotidae (pardalotes)							
Spotted Pardalote <i>Pardalotus punctatus</i>			+				
Striated Pardalote <i>Pardalotus striatus</i>		+	+	+			
Acanthizidae (thornbills, gerygones & allies)							
White-browed Scrubwren <i>Sericornis frontalis</i>	CS3	+	+				
Rufous Fieldwren <i>Calamanthus campestris</i>	CS3		+				
Shy Heathwren <i>Calamanthus cautus</i>	CS3			+			
Weebill <i>Smicromis brevirostris</i>		+	+	+			
Western Gerygone <i>Gerygone fusca</i>		+	+	+			
Inland Thornbill <i>Acanthiza apicalis</i>		+	+	+			
Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i>		+	+	+			
Western Thornbill <i>Acanthiza inornata</i>			+				
Pomatostomidae (Australian babbler)							
White-browed Babbler <i>Pomatostomus superciliosus</i>			+	+			
Artamidae (woodswallows)							
Masked Woodswallow <i>Artamus personatus</i>				+			
Black-faced Woodswallow <i>Artamus cinereus</i>			+				
Dusky Woodswallow <i>Artamus cyanopterus</i>		+	+	+			
Cracticidae (butcherbirds, currawongs & magpie)							
Grey Butcherbird <i>Cracticus torquatus</i>		+	+	+			
Pied Butcherbird <i>Cracticus nigrogularis</i>			+				
Australian Magpie <i>Cracticus tibicen</i>		+	+	+			
Grey Currawong <i>Strepera versicolor</i>		+	+	+			

Appendix 3. (cont.)

Species	Conservation significance	Records					
		Project area	Birds Aust.	WA Museum	FSDB	DBCA	EPBC
Campephagidae (cuckoo-shrikes and trillers)							
Ground Cuckoo-shrike <i>Coracina maxima</i>				+			
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>		+	+				
White-winged Triller <i>Lalage tricolor</i>							
Neosittidae (sittellas)							
Varied Sittella <i>Daphoenositta chrysoptera</i>		+	+	+			
Oreoicidae (bellbird)							
Crested Bellbird <i>Oreoica gutturalis</i>			+				
Pachycephalidae (whistlers)							
Crested Shrike-tit <i>Falcunculus frontatus</i>				+			
Western Golden Whistler <i>Pachycephala occidentalis</i>							
Rufous Whistler <i>Pachycephala rufiventris</i>		+	+				
Grey Shrike-thrush <i>Colluricincla harmonica</i>	CS3	+	+	+			
Rhipiduridae (wagtails and fantails)							
Grey Fantail <i>Rhipidura albiscapa</i>		+	+				
Willie Wagtail <i>Rhipidura leucophrys</i>		+	+				
Monarchidae (monarchs and flycatchers)							
Magpie-lark <i>Grallina cyanoleuca</i>			+	+			
Restless Flycatcher <i>Myiagra inquieta</i>		+	+				
Corvidae (ravens and crows)							
Australian Raven <i>Corvus coronoides</i>			+				
Petroicidae (Australian robins)							
Jacky Winter <i>Microeca fascinans</i>	CS3	+	+	+			
Hooded Robin <i>Melanodryas cucullata</i>	CS3		+				
Red-capped Robin <i>Petroica goodenovii</i>		+	+	+			
Scarlet Robin <i>Petroica multicolor</i>							
Western Yellow Robin <i>Eopsaltria australis griseogularis</i>	CS3	+		+			
Southern Scrub-robin <i>Drymodes brunneopygia</i>	CS3		+	+			
Hirundinidae (swallows)							
White-backed Swallow <i>Cheramoeca leucosterna</i>							
Welcome Swallow <i>Hirundo neoxena</i>		+					
Tree Martin <i>Petrochelidon nigricans</i>		+					
Locustellidae (Old World warblers, songlarks & grassbirds)							
Brown Songlark <i>Megalurus cruralis</i>							
Rufous Songlark <i>Megalurus mathewsi</i>							
Zosteropidae (white-eyes)							
Silvereye <i>Zosterops lateralis</i>		+	+				
Dicaeidae (flower-peckers)							
Mistletoebird <i>Dicaeum hirundinaceum</i>			+				
Motacillidae (pipits and true wagtails)							
Australian Pipit <i>Anthus australis</i>				+			
Number of bird species:		119 predicted, 42 observed					

Appendix 4. Mammal Species Recorded or Potentially Occurring in the Katanning Gold Project area.

Key to records:

Project area = species recorded in the study area in October 2017 by Western Wildlife.

WAM = species records from the Western Australian Museum Database (see Table 1).

FSDB = species records from the Fauna Survey Database (see Table 1).

Salinity AP = species records from the Salinity Action Plan Database (see Table 1).

DBCA = species records from the DBCA Threatened and Priority Species Database (see Table 1).

EPBC = species & species habitat from the EPBC Protected Matters Search Tool (see Table 1).

Int. = introduced species.

Species	Conservation significance	Records					
		Project area	WAM	FSDB	Salinity AP	DBCA	EPBC
Tachyglossidae (echidnas)							
Echidna <i>Tachyglossus aculeatus</i>		+					
Dasyuridae (carnivorous marsupials)							
Chuditch <i>Dasyurus geoffroii</i>	CS1					+	+
Red-tailed Phascogale <i>Phascogale calura</i>	CS1		+			+	+
Fat-tailed Dunnart <i>Sminthopsis crassicaudata</i>			+		+		
Gilbert's Dunnart <i>Sminthopsis gilberti</i>	CS3						
White-tailed Dunnart <i>Sminthopsis granulipes</i>	CS3		+				
Burramyidae (pygmy possums)							
Western Pygmy Possum <i>Cercartetus concinnus</i>	CS3		+				
Tarsipedidae (honey possum)							
Honey Possum <i>Tarsipes rostratus</i>	CS3		+				
Phalangeridae (brush-tail possums)							
Common Brushtail Possum <i>Trichosurus vulpecula</i>	CS3		+				
Macropodidae (kangaroos and wallabies)							
Western Brush Wallaby <i>Macropus irma</i>	CS2					+	
Western Grey Kangaroo <i>Macropus fuliginosus</i>		+	+				
Muridae (rodents)							
House Mouse <i>Mus musculus</i>	Int.		+				+
Black Rat <i>Rattus rattus</i>	Int.		+				+
Molossidae (free-tailed bats)							
White-striped Free-tailed Bat <i>Austronomus australis</i>							
Western Free-tailed Bat <i>Ozimops kitcheneri</i>							
Vespertilionidae (evening bats)							
Gould's Wattle Bat <i>Chalinolobus gouldii</i>			+				
Chocolate Wattle Bat <i>Chalinolobus morio</i>			+				
Lesser Long-eared Bat <i>Nyctophilus geoffroyi</i>			+				
Gould's Long-eared Bat <i>Nyctophilus gouldii</i>							
Central Long-eared Bat <i>Nyctophilus major</i>							
Southern Forest Bat <i>Vespadelus regulus</i>			+				
Canidae (dogs and foxes)							
Fox <i>Vulpes vulpes</i>	Int.			+			+
Felidae (cats)							
Feral Cat <i>Felis catus</i>	Int.			+			+
Leporidae (rabbits)							
European Rabbit <i>Oryctolagus cuniculus</i>	Int.	+		+			+
Number of mammal species:		24 predicted, 3 recorded					

Appendix 5. EPBC Protected Matters Search Tool results.

Species listed for the area 25km in radius from 33.57° S, 117.92° E on the EPBC Protected Matters Search Tool.

Species	Status	Author's Comment
Malleefowl <i>Leipoa ocellata</i>	Vulnerable	Unlikely to be present - lack of suitable habitat & likely to be locally extinct in the area.
Carnaby's Black-Cockatoo <i>Calyptorhynchus latirostris</i>	Endangered	Recorded in the study area
Curlew Sandpiper <i>Calidris ferruginea</i>	Critically Endangered & Migratory	Unlikely to be present – lack of suitable habitat.
Eastern Curlew <i>Numenius madagascariensis</i>	Critically Endangered & Migratory	Unlikely to be present – lack of suitable habitat.
Night Parrot <i>Pezoporus occidentalis</i>	Endangered	Unlikely to be present – lack of suitable habitat.
Chuditch <i>Dasyurus geoffroii</i>	Vulnerable	May possibly be present in the study area, though this species is extremely uncommon in the vicinity of the study area.
Dibbler <i>Parantechinus apicalis</i>	Endangered	Unlikely to be present - lack of suitable habitat & likely to be locally extinct in the area.
Red-tailed Phascogale <i>Phascogale calura</i>	Vulnerable	May be present in the study area.
Fork-tailed Swift <i>Apus pacificus</i>	Migratory (marine)	May be present in the study area.
Grey Wagtail <i>Motacilla cinerea</i>	Migratory (terrestrial)	Unlikely to be present - vagrant to the area
Common Sandpiper <i>Actitis hypoleucos</i>	Migratory (wetland)	Unlikely to be present – lack of suitable habitat.
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	Migratory (wetland)	Unlikely to be present – lack of suitable habitat.
Pectoral Sandpiper <i>Calidris melanotos</i>	Migratory (wetland)	Unlikely to be present – lack of suitable habitat.
Osprey <i>Pandion haliaetus</i>	Migratory (wetland)	Unlikely to be present – lack of suitable habitat.
Common Greenshank <i>Tringa nebularia</i>	Migratory (wetland)	Unlikely to be present – lack of suitable habitat.