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ENVIRONMENTAL SCIENCES

Terrestrial fauna assessment for the Fimiston Gold Mine Operations

Prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd

July 2022

Final

Terrestrial fauna assessment for the Fimiston Gold Mine Operations

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Version history

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EXECUTIVE SUMMARY

The Fimiston Operational Area forms part of Kalgoorlie Consolidated Gold Mines Pty Ltd's (KCGM) operations, located east of the City of Kalgoorlie-Boulder in the Goldfields region of Western Australia.

In September 2021, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by KCGM to undertake a basic terrestrial fauna and SRE survey and targeted SRE survey to supplement a previous fauna survey within the Eastern Floodway area of the Fimiston Operational Area and a regional survey targeting three species of mygalomorph spider currently only known in the Fimiston IIE area (*Conothele* 'MYG554' ('kalgoorlie') and *Idiosoma* 'kalgoorlie 1', and *Idiommata* 'kalgoorlie').

Several terrestrial fauna and SRE surveys have been undertaken within the Fimiston Operational Area, including a Level 2 fauna survey of the Fimiston IIE TSF, G cell and Fimiston III TSF area in 2015 (Harewood 2015) and a Level 1 terrestrial fauna and SRE survey within proposed infrastructure areas within the Eastern Floodway (Phoenix 2018b). Phoenix subsequently undertook a data currency review and gap biological review and gap biological survey for the broader Fimiston Operations in spring 2017 (Phoenix 2018e), and following this, a SRE survey for the FIM IIE Project (Phoenix 2019c). A targeted survey in the Fimiston area for ant species *Camponotus* sp. nr. *terebrans*, host of the Critically Endangered Arid Bronze Azure Butterfly (ABAB, *Ogyris subterrestris petrina*) was undertaken in 2021 (Phoenix 2021b). Within the Fimiston IIE area, the gap analysis determined that the 2015 terrestrial fauna survey adequately sampled the area and still meets EPA guidance. However, three species of mygalomorph spider appear to be only known from the Fimiston IIE area.

In 2020, the EPA released updated guidance for adequate sampling of terrestrial vertebrate fauna. A gap analysis to ensure previous surveys within the Eastern Floodway meet the current EPA requirements found the following work was required:

- additional fauna sites be sampled within the proposed clearing area
- additional SRE sites (including wet pit trapping if possible) in the valley area (Eastern Floodway), focusing on/near the proposed WRL expansion and any other potential disturbance.

The desktop review for the gap analysis comprised a literature review and database searches for significant flora, vegetation and terrestrial fauna previously recorded within the 40 km radius of the study area to identify knowledge gaps with respect to biological values within the study area.

Field surveys were undertaken from 13-20 September and 13-15 October 2021. Field methods included, active searches, foraging, vegetation type, deployment of bat detectors, Malleefowl habitat assessment and wet pitfall trapping. A total of 15 sites were surveyed for terrestrial fauna within the Eastern Floodway and an additional 10 sites outside of the Fimiston Operational Area were targeted SRE sites only.

Within the study area, three broad fauna habitats were mapped in the study area, Open woodland, Shrubland and Rehabilitation. A total of 47 terrestrial vertebrate species representing 25 families and 41 genera were recorded in the study area during the field survey. The assemblage included 44 native species and three introduced species. No conservation significant verytebrate fauna were recorded from the study area however evidence of two Threatened vertebrate species, Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroii* (both VU) was collected outside the study area. Both species are inferred to potentially use parts of the study area for dispersal and foraging but are unlikely to be dependent on the area for breeding purposes.

Four SRE habitats were present within the study area, Open woodland, Shrubland, Shrubland along drainage line and Rehabilitation. The Shrubland along drainage line habitat represents a high Potential SRE habitat based on its water retaining ability and density of vegetation. Twenty-one taxa collected in the field survey were identified as potential SREs, including six new mygalomorph spider species. All except one taxon (*Austrohorus* 'sp. Fi01') were associated with habitats which are common outside the study area.

Two of the three target mygalomorphs species were collected outside KCGM tenement areas: *(Conothele* 'MYG554' ('kalgoorlie') and *Idiosoma* 'kalgoorlie 1'). *Idiommata* 'kalgoorlie' was not found despite extensive searching and the deployment of wet pitfall traps for four weeks, however one of the two records is now located outside of the Fimiston III TSF area.

One significant invertebrate was recorded from the survey, *Jalmenus aridus*, a Priority 1 butterfly. This is a significant find given that so few records of this species exist. In order to protect the location of this species from butterfly collectors, a separate memo has been prepared.

Taking the results of the current and previous surveys into account, a total of 131 vertebrate fauna species have been recorded in the Project, representing 75 families. No conservation significant vertebrate fauna have been recorded from inside Fimiston Operation Area to date. Five significant fauna species considered likely to occur in the study area include Fork-tailed Swift (Mig.; EPBC & BC Acts), Peregrine Falcon (OS; BC Act), Malleefowl (VU; EPBC & BC Acts), Western Rosella (inland ssp) (P4), and Chuditch (VU; EPBC & BC Acts). The habitats within the Fimiston Operational Area are suitable only as foraging and dispersal habitat for Malleefowl and Chuditch.

A total of 40 SRE taxa and one P1 species have been collected from surveys within the Fimiston Operational Area. Of these, one is known only from the Eastern Floodway, *Austrohorus* 'sp. Fi01', recorded only from a High Potential SRE habitat: Shrubland along drainage line. This habitat type occupies 4.3% of the study area, which also extends between the northern and southern portion of the Eastern Floodway and to the north-east of the study area.

The Project does not pose any risk to vertebrate fauna, however, development in close proximity to the conservation significant invertebrate species, *Jalmenus aridus*, Inland Hairstreak butterfly (P1), is not advised.

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1. INTRODUCTION

The Fimiston Operational Area forms part of Kalgoorlie Consolidated Gold Mines Pty Ltd's (KCGM) operations, located east of the City of Kalgoorlie-Boulder in the Goldfields region of Western Australia. This area contains the Fimiston Gold Mine Operations (the Project), which comprise the Fimiston Open Pit, waste rock dumps, tailings storage facilities (Fimiston I, Fimiston II and Kaltails) and infrastructure corridors (Figure 1-1).

In September 2021, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by KCGM to undertake a basic terrestrial fauna and SRE survey and targeted SRE survey to supplement a previous fauna survey within the Eastern Floodway area of the Fimiston Operation Area and a regional survey targeting several species of mygalomorph spider currently only known then the Fimiston IIE area. The purpose of the survey was to inform Environmental Protection Authority (EPA) S38 approvals for additional development within the Fimiston Operational Area (Figure 1-1).

The study area is located in the Shire of Kalgoorlie-Boulder and the Eremaean Botanical Province as defined by EPA (2016b).

1.1 BACKGROUND

Several terrestrial fauna and SRE surveys have been undertaken within the Fimiston Operational Area, including a Level 2 fauna survey of the Fimiston IIE TSF, G cell and Fimiston III TSF area in 2015 (Harewood 2015) and a Level 1 terrestrial fauna and SRE survey within proposed infrastructure areas within the Eastern Floodway (Phoenix 2018b). Phoenix subsequently undertook a data currency review and gap biological review and gap biological survey for the broader Fimiston Operations in spring 2017 (Phoenix 2018e), and following this, a SRE survey for the FIM IIE Project (Phoenix 2019c). A targeted survey in the Fimiston area for ant species *Camponotus* sp. nr. *terebrans*, host of the Critically Endangered Arid Bronze Azure Butterfly (ABAB, *Ogyris subterrestris petrina*) is reported on separately (Phoenix 2021a, b).

In 2020, the EPA released updated guidance for adequate sampling (EPA 2020) of terrestrial vertebrate fauna. A gap analysis to ensure previous surveys within the Eastern Floodway meet the current EPA requirements found the following work was required:

- additional fauna sites be sampled within the proposed clearing area
- additional SRE sites (including wet pit trapping if possible) in the valley area, focusing on/near the proposed WRL expansion and any other potential disturbance.

Within the Fimiston IIE area, the gap analysis determined that the 2015 terrestrial fauna survey adequately sampled the area and meets EPA guidance. However, three species of mygalomorph spider appear to be only known from the Fimiston II area, thus there may be benefit in conducting regional surveys to find this species.

1.2 SCOPE OF WORK

The scope of work for the basic terrestrial fauna and SRE survey and targeted SRE survey was as follows:

- conduct a basic fauna survey of additional fauna sites within the Eastern Floodway proposed Waste Rock Landform (WRL) expansion area and any other potential disturbance areas to adequately sample habitats
- conduct a SRE survey (including wet pit trapping) in the Eastern Floodway, focusing on/near the proposed WRL expansion and any other potential disturbance areas

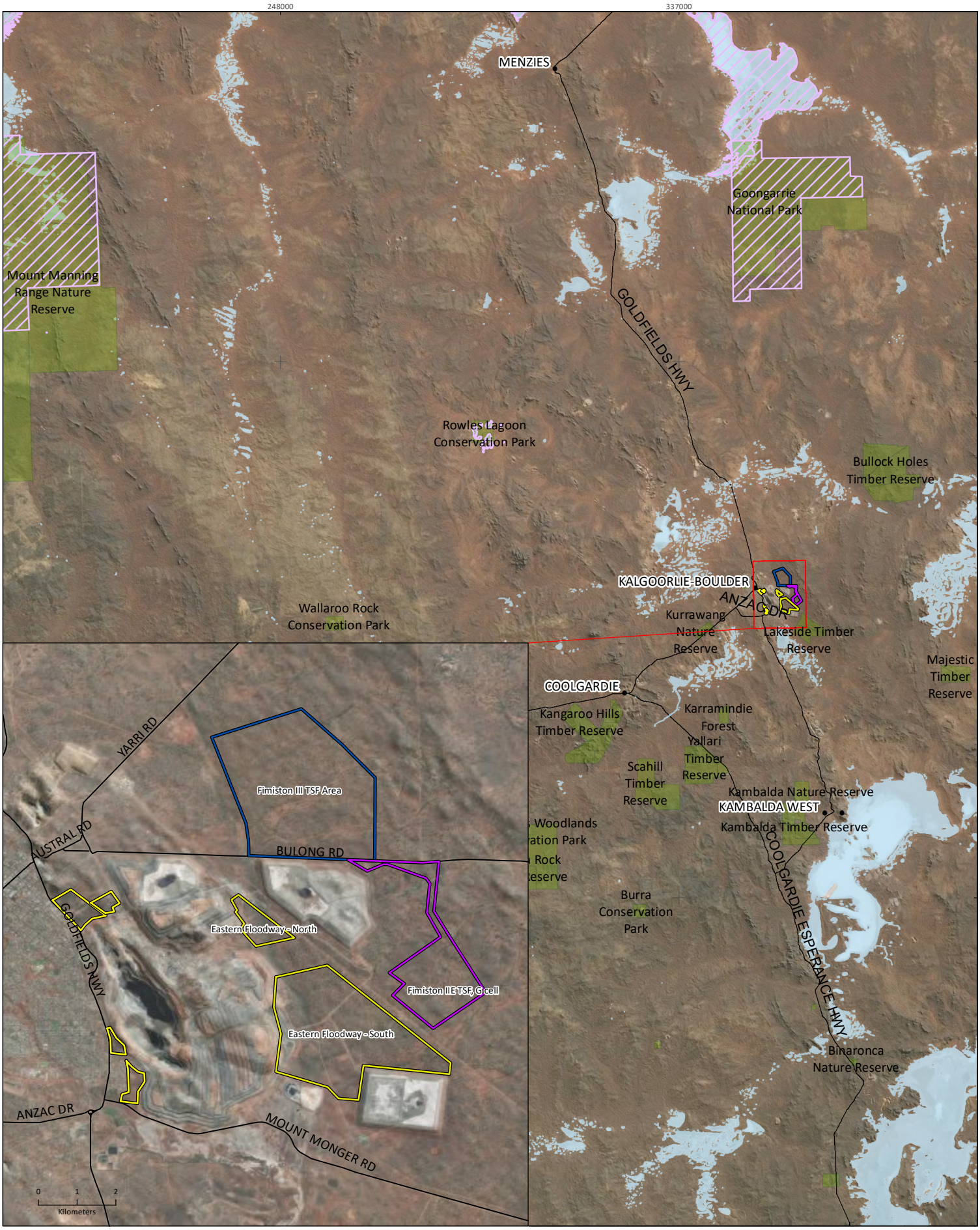
- conduct a regional targeted SRE survey for the mygalomorph spiders *Conothele* 'MYG554' ('kalgoorlie'), *Idiosoma* 'kalgoorlie 1', *Idiommata* 'kalgoorlie'
- prepare maps showing significant species records, vegetation type and condition, and fauna habitats in the survey areas
- prepare a technical report to document the survey findings.

1.3 STUDY AREA

The study area comprises of seven distinct areas (Figure 1-1):

- Eastern Floodway (832.6 ha) – located between the eastern side of the Kalgoorlie Fimiston waste rock dump and the Fimiston Tailings Storage Facilities which comprises of:
    - Eastern Floodway North
    - Eastern Floodway South
- four blocks of vegetation located adjacent to the north-west and south-west of the superpit (113.5 ha)
- Fim south extrapolation area – adjacent to the Fimiston III TSF Area and Fimiston IIE TSF, G Cell (153.3 ha).

The regional targeted SRE survey had no formal study area and took place along Bulong Road and an unnamed, unsealed road connecting Bulong Road and Yarri Road outside the proposed disturbance areas of the Fimiston IIE TSF, Fimiston III TSF and the Fimiston III TSF area, east and north of the Fimiston II TSF respectively (Figure 1-1).



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Project No	1442-FIM-KCG-FAU
Date	1/07/2022
Drawn by	IN
Map author	PS

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- Study area
- Fimiston IIE
- Fimiston III
- Environmentally sensitive areas
- DBCA managed land
- Lake
- Road

Figure 1-1

Project location and study area

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2. LEGISLATIVE CONTEXT

The protection of flora and fauna in WA is principally governed by three acts:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- State *Biodiversity Conservation Act 2016* (BC Act)
- State *Environmental Protection Act 1986* (EP Act).

The BC Act came into full effect on 1 January 2019 and replaced the functions of the *Wildlife Conservation Act 1950* (WC Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Federal Department of Agriculture, Water and the Environment (DAWE). The EPBC Act provides for the listing of Threatened fauna as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process.

Conservation categories applicable to Threatened fauna species under the EPBC Act are as follows:

- Extinct (EX)[1] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

The EPBC Act is also the enabling legislation for protection of Migratory species as matters of NES under several international agreements:

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

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened fauna species (Government of Western Australia 2018a, b)[2] in the following categories:

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

[2] 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 BC Act.

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future[3]
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future[3]
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium-term future[3].

Species may also be listed as specially protected (SP) under the BC Act in one or more of the following categories:

- species of special conservation interest (conservation dependent fauna, CD) – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range
- migratory species (Mig.), including birds subject to international agreement
- species otherwise in need of special protection (OS).

The Department of Biodiversity, Conservation and Attractions (DBCA) administers the BC Act and also maintains a non-statutory list of Priority fauna. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority fauna lists are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a TEC and its listing is otherwise in accordance with the ministerial guidelines.

2.2.3 Other significant fauna

Under the EPA's environmental factor guidelines, fauna may be considered significant for a range of reasons other than listing as a Threatened or Priority species.

In addition to listing as Threatened or Priority, EPA (2016a) identifies the following attributes that constitute significant fauna:

- species with restricted distribution (see also section 2.2.4)
- species subject to a degree of historical impact from threatening processes
- providing an important function required to maintain the ecological integrity of a significant ecosystem.

2.2.4 Short-range endemic invertebrates

SRE fauna are defined as animals that display restricted geographic distributions, nominally less than 10,000 km^2, that may also be disjunct and highly localised (Harvey 2002). EPA (2016a) identifies species with restricted distributions as being significant fauna in the context of environmental impact assessments (EIA). SRE fauna need to be considered in EIA as localised, small populations of species that are generally at greater risk of changes in conservation status due to environmental change than other, more widely distributed taxa.

Short-range endemism in terrestrial invertebrates is believed to have evolved through two primary processes (Harvey 2002):

- Relictual – where the drying climate reduced the area of suitable habitat available to a species, forcing a range contraction. Such habitats typically maintain historic mesic conditions (e.g. south-facing rock faces or slopes of mountains or gullies)
- Habitat speciality – where species settled in particular isolated habitat types (e.g. rocky outcrops) by means of dispersal and evolved in isolation into distinct species.

However, SRE invertebrates have also been reported in more widespread habitats such as spinifex plains or woodlands, mainly in groups with low dispersal capabilities, for example mygalomorph spiders and millipedes (see for example Car & Harvey 2014; Rix *et al.* 2018a).

There can be uncertainty in categorising a specimen as an SRE due to several factors including poor regional survey density, lack of taxonomic research and problems of identification, i.e. specimens that may represent SREs cannot be identified to species level based on the life stage at hand. For example, in contrast to mature males, juvenile and female millipedes, mygalomorph spiders and scorpions cannot be identified to species level. Molecular techniques such as 'barcoding' (Hebert *et al.* 2003a; Hebert *et al.* 2003b) are routinely employed to overcome taxonomic or identification problems.

Currently, there is no accepted system to determine the likelihood that a species is an SRE. The WA Museum applies four categories which were adopted in this assessment: Confirmed, potential, uncertain and not SRE. Confirmed SREs are taxa for which the distribution is known to be less than 10,000 km^2, the taxonomy is well known and the group is well represented in collections and/ or via comprehensive sampling (WAM 2013). Potential SREs include those taxa for which there is incomplete knowledge of the geographic distribution of the group and its taxonomy, and the group is not well represented in collections.

2.2.5 Environmentally sensitive areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the State or a class of areas of the State to be Environmentally Sensitive areas (ESAs). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005 (Government of Western Australia 2005).

ESAs are areas where the vegetation has high conservation value. Several types of areas are declared ESAs including:

- the area covered by vegetation within 50 metres (m) of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located
- the area covered by a TEC
- a defined wetland (Ramsar wetlands, conservation category wetlands and nationally important wetlands) and the area within 50 m of the wetland
- Bush Forever sites.

3. EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia's landscapes into large 'bioregions' and 'subregions' based on climate, geology, landform, native vegetation and species information (Department of the Environment and Energy 2016). The basic fauna study area is located near the eastern boundary of the Eastern Goldfields subregion (COO3) of the Coolgardie bioregion (Figure 3-1) which is characterised as (Cowan 2001a):

> "Coolgardie 3 lies on the Yilgarn Craton's 'Eastern Goldfields Terrains'. The relief is subdued and comprises of gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.
>
> The vegetation is of mallees, Acacia thickets and shrubheaths on sandplains. Diverse Eucalyptus woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. Woodlands and Dodonaea shrubland occur on basic graninulites of the Fraser Range. The area is rich in endemic Acacias. The climate is arid to semi-arid with 200-300 mm of rainfall, sometimes in summer but usually in winter."

Some of the regional targeted SRE sites are located in the Eastern Murchison subregion (MUR01) of the Murchison bioregion (Figure 3-1) which is characterised as (Cowan 2001c).

> "Characterised by its internal drainage, and extensive areas of elevated red desert sandplains with minimal dune development. Salt lake systems associated with the occluded Paleodrainage system. Broad plains of red-brown soils and breakaway complexes as well as red sandplains. Vegetation is dominated by Mulga Woodlands often rich in ephemerals; hummock grasslands, saltbush shrublands and Halosarcia shrublands. Arid climate, with mainly winter rainfall (200 mm)."

3.2 LAND SYSTEMS AND SURFACE GEOLOGY

DPIRD undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004). The study area intersects five land systems (Table 3-1; Figure 3-2). The Mx3 system is the dominant Land System within the study area, occupying 71.8% of the study area.

Table 3-1 Land systems and extent in study area

Land system	Description	Area (ha)	% of study area
Mx43 System	Gently undulating valley plains and pediments; some outcrop of basic rock	789.2	71.8%
BB5 System	Rocky ranges and hills of greenstones-basic igneous rocks	183.4	16.7%
Gumland System	Extensive pedeplains supporting eucalypt woodlands with halophytic and non-halophytic shrub understoreys	91.8	8.4%
Graves System	Basalt and greenstone rises and low hills supporting eucalypt woodlands with prominent saltbush and bluebush understoreys	19.0	1.7%
Moriarty System	Low greenstone rises and stony plains supporting chenopod shrublands with patchy eucalypt overstoreys	16.0	1.4%

According to the Surface Geology of Australia 1:1,000,000 scale, Western Australia database (Stewart *et al.* 2008), the study area intersects three geological formations (Table 3-2; Figure 3-2).

Table 3-2 Surface geology of the study area, extent by deposit type

Surface geology	code	Description	Area (ha)	% of study area
Colluvium	Qrc	Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite	572.3	52.0
Alluvium	Qa	Channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted	364.7	33.2
Mafic intrusive rocks	Ade	Mafic intrusive rocks, medium to coarse-grained; layered mafic to ultramafic intrusions - dolerite, gabbro, olivine gabbro, dotite, pyroxenite, leucogabbro, quartz dolerite, quartz, gabbronorite	32.9	3
	Ase	Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite	129.5	11.8

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Drawn by	IN
Map author	PS

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Study area
Fimiston IIE
Fimiston III

IBRA region and subregion

Coolgardie, Eastern Goldfield
Murchison, Eastern Murchison

Figure 3-1

Study area in relation to IBRA bioregions and subregions

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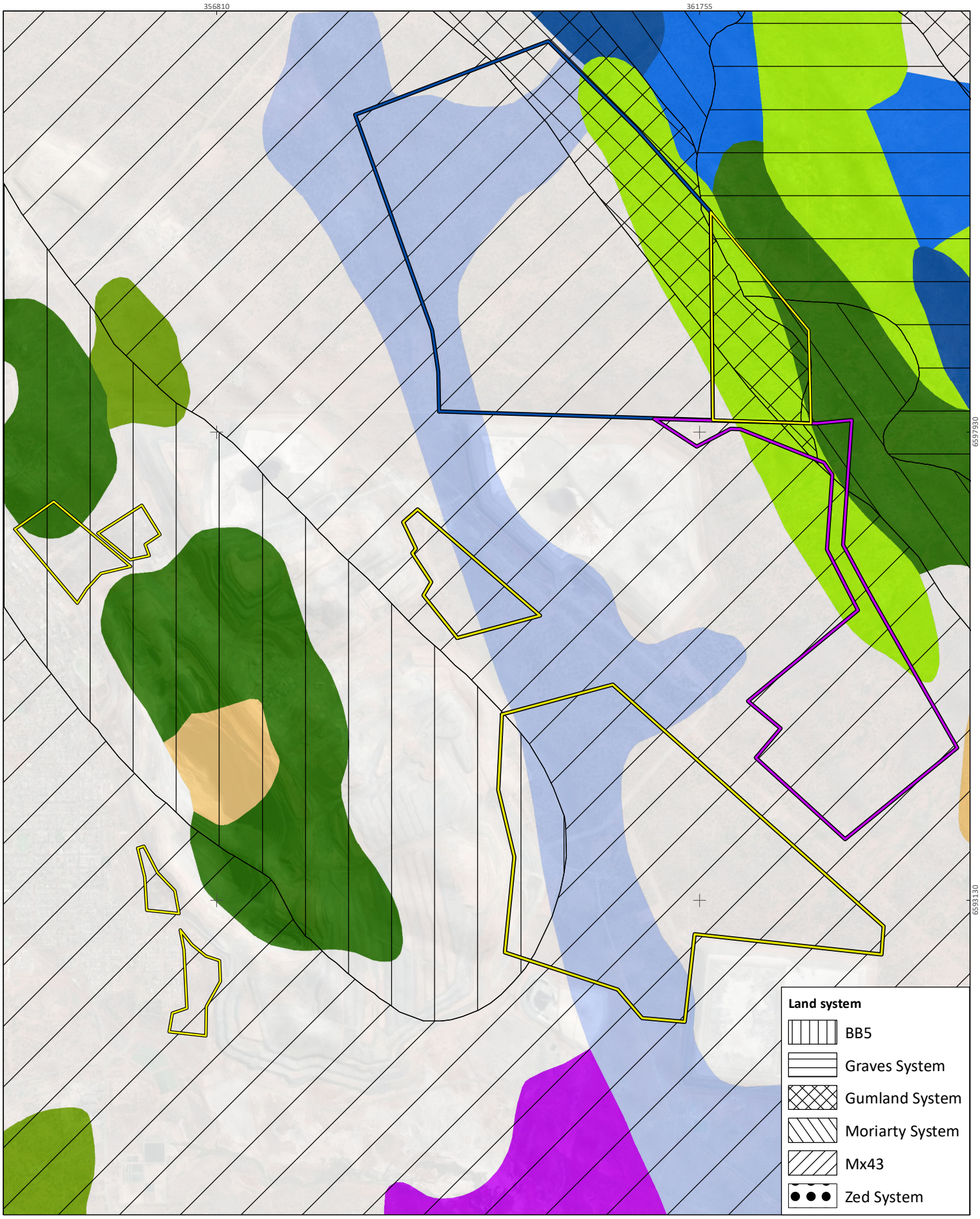

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KCGM Operations

Project No	1442-FIM-KCG-FAU
Date	27/06/2022
Drawn by	IN
Map author	PS

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Kilometers

1:50,000 (at A4) GDA 1994 MGA Zone 51

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Study area
Fimiston IIE
Fimiston III

Surface geology

Abe
Ade
Afe
Ase
Aue
Czl
Qa
Qdlu
Qrc

Figure 3-2

Land systems and surface geology in the study area

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3.3 CLIMATE AND WEATHER

The climate of the Eastern Goldfields subregion is described as arid to semi-arid and the climate of the Eastern Murchison subregion is defined as arid (Cowan 2001b, c). Both subregions receive 200–300 mm of annual rainfall, the majority occurring during winter months (Cowan 2001b, c). The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Kalgoorlie-Boulder Airport (no. 012038, Latitude: 30.78°S Longitude 121.45°E), located 8 km west of the study area.

Kalgoorlie-Boulder Airport records the highest mean maximum monthly temperature (33.6°C) in January (lowest in July, 16.8°C) and the lowest minimum mean monthly temperature (5.1°C) in July (highest in January, 18.3°C) (BoM 2021); Figure 3-3). Average annual rainfall is 264.9 mm with February, January and June recording the highest monthly averages (32.4, 27.2 and 27.1 mm respectively; Figure 3-3). Tropical rain-bearing depressions moving southwards from northern Australian waters can cause heavy rainfall events in summer.

Daily mean temperatures at Kalgoorlie-Boulder Airport in the months preceding the surveys were mostly close to historical averages with only the mean maximum temperature of February and April diverging by over 2°C with February 2.2°C colder and April 3°C hotter. Temperatures during the basic fauna survey and up to the collection of the invertebrate wet pit fall traps were consistent with historical averages (Figure 3-3).

Records from Kalgoorlie-Boulder Airport show that annual rainfall in the 12 months preceding the survey exceeded the historical average at 305.2 mm likely due to the above average rainfall in February caused by a Tropical Low (12U) over north-western WA. Rainfall in the three months preceding the survey was slightly above average in July and below average in August and September (Figure 3-3). A total of 11.2 mm fell in October while the wet pit traps were deployed. These represent suitable conditions leading up to and during the survey.

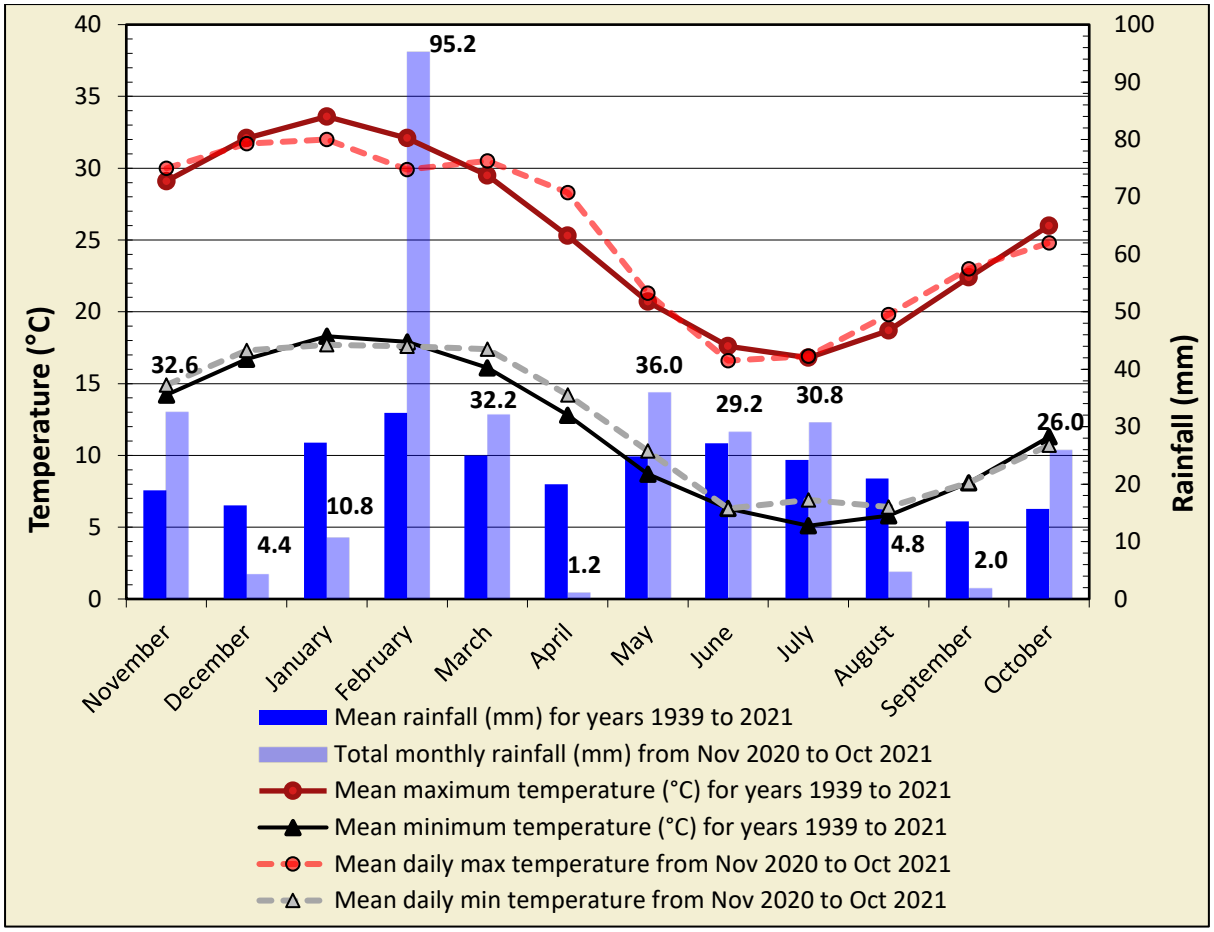

Figure 3-3 **Annual climate and weather data for Kalgoorlie-Boulder Airport (no. 012038) and mean monthly data for the 12 months preceding the survey (BoM 2021)**

3.4 LAND USE

The dominant land use within the Eastern Goldfields subregion is Unallocated Crown Land and Crown reserves. This accounts for the vast majority of land use in the subregion with grazing on native pastures, freehold, conservation and mining making up the remainder (Cowan 2001c).

3.5 CONSERVATION RESERVES AND ESAS

There are no conservation reserves or ESAs within 50 km of the study area however Goongarrie National Park is 67 km north of the study area and Clear and Muddy Lakes Nature Reserve is 71 km west north-west (Figure 1-1).

4. METHODS

The basic terrestrial fauna and SRE survey and targeted SRE survey were conducted in accordance with relevant survey guidelines and guidance, including:

- EPA Environmental Factor Guideline: Terrestrial fauna (EPA 2016a)
- EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)
- EPA Technical Guidance: Sampling methods for terrestrial vertebrate fauna (EPA 2016c)
- EPA Technical Guidance: Sampling of short-range endemic invertebrate fauna (EPA 2016d)

4.1 DESKTOP REVIEW

A desktop review was undertaken in 2018 (Phoenix 2019a). This involved database searches and a literature review undertaken to identify the significant fauna species and fauna habitats that may occur within the study area. All available biological survey reports either conducted for the Project or for other projects in the vicinity were reviewed. In addition, biological data from previous surveys conducted within the current study area was collated to generate lists of previous, fauna and fauna habitat records for the study area (Phoenix 2018a, b, c, d, 2019b). Significant species records from technical reports in the vicinity and database searches were collated with previous records for the study area to develop a list of potential significant values for the study area. The following database searches were undertaken within a 40 km buffer around the study area:

- EPBC Act Protected Matters Search Tool (Department of the Environment and Energy 2017)
- DBCA Threatened and Priority Flora, Fauna and Ecological Communities databases (DBCA 2017b)
- DBCA/WA Museum NatureMap database (DBCA 2017a)
- WA Museum Arachnology and Myriapodology, Crustacea and Mollusca databases, for SRE invertebrates – 100 km radius for SREs as proposed maximum range for short-range endemism (Harvey 2002)
- Phoenix invertebrate database, for SREs.

4.2 FIELD SURVEY

4.2.1 Survey timing

Field survey dates are provided in Table 4-1.

Table 4-1 Survey dates

Survey type	Season	Dates
Basic terrestrial fauna and SRE survey and targeted SRE survey	Spring	13-20 September 2021
SRE trap collection	Spring	15-16 October 2021

4.2.2 Basic terrestrial fauna survey

A total of 26 survey sites were sampled, 18 basic fauna and SRE sites and 11 regional targeted SRE sites (Figure 4-1; Appendix 1).

Field techniques included a variety of methods to locate and record fauna and associated habitats:

- habitat assessment (4.2.2.1)
- active searches (4.2.2.2)
- avifauna surveys (4.2.2.3)
- bat echolocation recordings (4.2.2.4)
- Malleefowl habitat assessment (4.2.2.5)
- SRE invertebrate sampling (4.2.2.6)
- regional targeted surveys for mygalomorph spiders (4.2.3)

4.2.2.1 habitat assessment

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were identified based on known habitats of such species within the Coolgardie bioregion. Tentative sites were selected for the terrestrial fauna survey to represent all habitat types. Final survey site selection was conducted after ground-truthing of site characteristics.

At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (drainage lines and creek), vegetation complexes and condition and soil type. Sites were primarily chosen to represent the best example of distinct habitats within the broader habitat associations of the study area with a focus on species of conservation significance identified in the desktop review. Habitat descriptions and characteristics were recorded at all survey sites (Figure 4-1; Table 4-2; Appendix 2).

Fauna habitat mapping was based on flora and vegetation mapping undertaken in 2015 (Botanica Consulting 2015).

Table 4-2 Terrestrial fauna survey effort

Site	Site type	Study area	Birding (hrs)	Foraging + nocturnal (hrs)	Burrow excavation (#)	Litter sieve (#)	Ultra-sonic recording (nights)	Wet pitfall trap (nights)
BAT01	Basic fauna	Eastern Floodway	0.7				7	
BAT02	Basic fauna	Eastern Floodway	0.7				7	
Fim01	Basic fauna	Eastern Floodway	0.7	2.2	3			
Fim02	Basic fauna	Eastern Floodway	0.8	0.4				
Fim03	Basic fauna	Eastern Floodway	1.1	2.0	2	3		
Fim04	Basic fauna	Eastern Floodway	0.7	1.2				
Fim05	Basic fauna	Eastern Floodway	1.8	1.8	2	3		
Fim06	Basic fauna	Eastern Floodway	0.7	1.3	1	3		
Fim07	Basic fauna	Eastern Floodway	0.7	1.3		3		
Fim08	Basic fauna	Eastern Floodway	0.7	2.5	3	3		
Fim09	Basic fauna	Eastern Floodway	0.7	1.1	1	3		
Fim10	Basic fauna	Eastern Floodway	0.7	0.5				
PIT01	Basic fauna	Eastern Floodway	0.8	2.7	3	3		155
PIT02	Basic fauna	Eastern Floodway	1.4	5.6	7			155
PIT03	Basic fauna	Eastern Floodway	0.7	0.7 + 1.9	6			145
PIT04	Basic fauna + targeted SRE	Eastern Floodway		2.1	2			140

Site	Site type	Study area	Birding (hrs)	Foraging + nocturnal (hrs)	Burrow excavation (#)	Litter sieve (#)	Ultra-sonic recording (nights)	Wet pitfall trap (nights)
PIT05	Basic fauna + targeted SRE	Eastern Floodway		0.8	1			135
PIT06	Basic fauna, targeted SRE	Eastern Floodway		2.0	5			130
Myg01	Targeted SRE	Regional		3.1	5			
Myg02	Targeted SRE	Regional		3.9	4			
Myg03	Targeted SRE	Regional		2.1	2			
Myg04	Targeted SRE	Regional		1.9	1			
Myg05	Targeted SRE	Regional		2.2	4			
Myg06	Targeted SRE	Regional		2.7	6			
Myg07	Targeted SRE	Regional		1.5				
Myg08	Targeted SRE	Regional		1.6	2			
Total			**12.9**	**49.1**	**60**	**21**	**14**	**860**

4.2.2.2 Active searches

Active searches were undertaken at each basic fauna site throughout the study area (Figure 4-1). Active searches primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence.

Searches were undertaken in any observable microhabitats considered likely to support mammals, reptiles and amphibians. Techniques included: raking leaf and bark litter, overturning logs, searching beneath the bark of trees, investigating dead trees and logs, investigating burrows, investigating infrastructure ruins or disused building materials such as tin piles and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as nests. Varying amounts of time were spent active searching at each site, depending on the richness and complexity of habitat, for a total of 49.1 hours over the duration of the basic fauna field survey (Table 4-2).

4.2.2.3 Avifauna surveys

Twenty-minute avifauna surveys were undertaken at all basic fauna sites. Avifauna surveys were confined to the habitat type (up to 2 ha) represented by each site to collect assemblage data for each habitat. Avifauna surveys were undertaken throughout the day with a focus on periods of higher activity around sunrise and sunset. Surveys consisted of bird recordings from visual sightings and call recognition. A total of 12.9 person hours of avifauna census was undertaken during the field survey (Table 4-2).

Additional avifauna observations were also recorded at opportunistically while other field work was being completed, including observations made during travel and active searches.

Night Parrot habitat suitability was assessed from aerial imagery and in the field. There was no suitable spinifex habitat identified and no Song Meter recording devices were deployed.

4.2.2.4 Bat echolocation recordings

Song Meter Mini Bat recording devices were used to record bat echolocation calls at two sites (BAT01 and BAT02). The Song Meters were positioned in areas of habitat likely to have increased insect

activity and to attract bats (i.e. likely foraging areas or movement corridors) and/or potential roosting sites. Recording devices were deployed at each site for seven nights of recording for between eight and 12 continuous hours per night (Table 4-2). Devices were aimed at a 45° angle to the ground.

4.2.2.5 Malleefowl habitat assessment

Malleefowl habitat was assessed in the field at 15 sites using a set of environmental variables based on features of critical Malleefowl habitat in Western and Central Australia, as described in the National Recovery Plan (Benshemesh 2007). Individual sites were assessed with a numerical score as a basis for mapping areas of suitable habitat in the study area. The score used is an unweighted sum of binary values (0 absent, one present) for the following attributes:

1. sandy substrate
2. canopy cover
3. litter (leaf litter forming distinct patches under vegetation, or continuous)
4. level ground
5. mallee present (presence of any mallee-form *Eucalyptus* sp.)
6. *Melaleuca* present (presence of any *Melaleuca* sp.)
7. mulga present (presence of any *Acacia* sp. of subgenus *Juliflorae*)
8. *Triodia* present (presence of any *Triodia* sp.)

Scores of four or greater (meaning a site contained at least 50% of features that comprise critical Malleefowl habitat) were considered to represent potential Malleefowl habitat. Generally speaking, the higher the score, the higher quality the habitat is for Malleefowl. Sites that attained a value of four or greater were applied to vegetation type polygons and the entire polygon (usually) assigned as potential Malleefowl habitat. Where two or more sites were assessed within a single polygon, the higher score was applied unless features of the lower-scored site(s) were more representative. Where no site occurred within a polygon, polygons were classified based on scores for similar vegetation nearby and inspection of relative vegetation density.

4.2.2.6 SRE invertebrate sampling

Sampling for SRE invertebrates was conducted at 24 sites (Figure 4-1) in areas identified as suitable habitat for SREs. Potential SRE habitat was rated as follows:

- Low - Vegetation is widespread, does not contain landforms, soils or vegetation likely to give rise to short-range endemism in the terrestrial invertebrate assemblage, may or may not have recorded Potential or Confirmed SRE taxa
- High – vegetation is locally restricted or regionally significant, contains landforms, soils or vegetation that acts to hold water in the landscape or is associated with surface water, likely to have recorded numerous Confirmed SRE taxa.

Sampling comprised the following methods:

- wet pit trapping
- active foraging
- litter/soil sieving.

Six wet pitfall trapping sites were established, each comprising of five one litre plastic containers with a 70 mm diameter dug in flush with the surface of the ground within suitable microhabitats at each site. Pit traps were half-filled with an ethanol and propylene glycol mix, which has been shown to preserve DNA under laboratory conditions in invertebrates (Vink *et al.* 2005). All traps were covered with a plastic lid elevated 25 mm above the trap with wooden blocks to minimise by-catch of vertebrates. Traps remained open following the setup and were retrieved four weeks later.

Active foraging for SRE invertebrate groups was comprised of the inspection of logs, larger plant debris, the underside of bark of larger trees and the underside of rocks. Methodical searches were conducted amongst the leaf litter of shade-bearing tall shrubs and trees, including raking of litter. Rocks and rock crevices were inspected, particularly for scorpions and pseudoscorpions.

Each site was sampled concurrently with active searches for vertebrate fauna for a total search effort of approximately 49.1 hours (Table 4-2). Trapdoor spider burrows identified during the searches were excavated by removing soil from around the burrow to carefully expose the burrow chamber and retrieving the spider. Sixty burrows were excavated over the course of the survey, including 32 from the targeted SRE survey and 28 from the Eastern Floodway.

Combined litter/soil sifts were undertaken at seven sites, with three sifts conducted at each site. In total, 21 sifts were undertaken (Table 4-2). The collection of leaf litter samples was standardised volumetrically by the diameter and height (310 mm x 50 mm = 1.55 L) of the sieves which were completely filled with compressed litter and the upper layers of underlying soil. Samples were sieved through three stages of decreasing mesh size over a round tray and invertebrates were picked from the sieves and tray with forceps. These samples particularly targeted small spiders (Araneomorphae), pseudoscorpions, buthid scorpions, millipedes, centipedes (in particular Geophilomorpha and Cryptopidae), smaller species of molluscs (e.g. Pupillidae) and isopods.

4.2.3 Regional targeted mygalomorph spider survey

Targeted SRE active foraging for the mygalomorph spiders *Conothele* 'MYG554' ('kalgoorlie'), *Idiosoma* 'kalgoorlie1' and *Idiommata* 'kalgoorlie' was conducted at regional sites outside proposed disturbance areas but within proximity to and in habitat matching previous records of the species. Eleven sites were searched with a total search effort of 23.9 hours and 32 mygalomorph spider burrows were excavated (Table 4-2).

4.2.4 Specimen identification and nomenclature

Specimens were morphologically identified to the lowest taxonomic level where possible. Dr Simon Judd identified all isopods and Dr Erich Volschenk identified all scorpions and pseudoscorpions. If specimens could not be morphologically identified, molecular sequencing was conducted. The molecular identification of species based on comparisons between the mitochondrial gene COI (Cytochrome Oxidase I) is referred to as DNA barcoding.

Nomenclature followed a number of taxon-specific references; however, some species are currently unnamed and required morpho-species designation as listed in this report. These are adopted from the respective taxonomic authorities. Interim Phoenix specific codes are used for some of the species identified using molecular tools pending a code-designation by the WA Museum. Reference collections for these morpho-species generally reside with the WA Museum, as expected by the EPA (EPA 2016d).

4.2.4.1 SRE invertebrate DNA barcoding

DNA was extracted from each specimen and the 658 base pair COI gene was amplified by Genotyping Australia using universal COI primers (Folmer *et al.* 1994). The data was subsequently compared to previously published sequences uploaded into GenBank using the BLAST function in Geneious Prime v11.1.5. Sequences were also compared inhouse, to Phoenix's molecular database, and previously sequenced specimens from past surveys (Phoenix 2022a). The top blast hits for each major taxon were reported, the sequences from the survey were added, duplicate sequences were removed, and remaining sequences then analysed with a Maximum Likelihood phylogenetic analysis using a GTR+G model of evolution and 100 bootstraps (RAxML). Distances were calculated via tree-based estimates of identical bases in Geneious Prime.

Species delineation was determined through analysis of pairwise similarity matrices and RAxML trees showing clusters of specimens with similar DNA to those from the current survey and GenBank, and if other clusters were present but clearly forming a separate species. Confidence in determining conspecific species was highest for taxa with 97% pairwise similarity and above.

Comparison of sequences is the most effective way of determining if conspecific species have been collected from another source. GenBank stores the world's largest collection of publicly available DNA sequences, with contributions from both private and public organisations, including tertiary and government research institutions; however, it is up to the discretion of the owner to share the sequences to GenBank. While not everything that has been morphologically identified has been sequenced, and not everything that has been sequenced has been shared with GenBank, it is still the largest collection of data available and most likely to return similar species. Recently, there has been a shift to molecular identification of SREs and so the GenBank database is growing and becoming more accurate.

Notwithstanding the above, species identification based on COI barcoding is not without problems as sequence divergence within species can be high and may exceed that between species in some taxa, including SRE target groups (Bond 2004; Boyer *et al.* 2007; Köhler & Johnson 2012). For example, sequence divergences of up to 10% may be considered to represent the same species in some genera of mygalomorph spiders, with evidence of some groups displaying less than 5% divergence.

A total of 39 specimen tissue samples were provided for sequencing, comprising of 38 mygalomorph spiders and one snail. Of the 38 mygalomorph spider tissue samples, 36 were from current survey and two were obtained from the 2015 survey which were sequenced for comparison (*Gaius austini*). Eight samples failed to align and three were not returned from Genotyping Australia. The remaining 28 samples produced successful sequences and were able to be analysed against the publicly available molecular data. All three of the target mygalomorph species had sequences available for comparison either through GenBank and Phoenix' own genetic database.

4.2.5 Likelihood of occurrence assessment

Following the field survey, the likelihood of occurrence for each significant fauna species identified in the desktop review was assessed and assigned to one of four ratings:

- recorded – species recorded within the study area by previous or current survey
- likely – study area within current known range of species, suitable habitat within the study area and home range of species intersects study area based on known records
- possible – study area within current known range of species, suitable habitat within the study area and home range of species does not intersect study area based on known records
- unlikely – study area outside current known range of species or no suitable habitat present.

4.2.6 Survey personnel

The personnel involved in the surveys are listed in Table 4-3. All survey work was carried out under DBCA Fauna taking (biological assessment) licence no. BA27000503.

Table 4-3 Survey personnel

Name	Qualifications	Role/s
Anna Jacks	BSc Hons (Env. Sci.)	Project management, invertebrate taxonomy
Caitlin Nagle	MSc (Cons. Biol.)	Field survey
Paula Strickland	MSc (Cons. Biol.)	Field survey, reporting
Dr Rod Eastwood	PhD (Env. Sci.)	Field survey
Dr Ikrom Nishanbaev	PhD (GIS)	GIS, figure production

355000
362500
370000
6601200
6592880
6584560

Myg06
Myg05
Pit05
Myg04
Myg03
Myg02
Myg01
Pit04
Myg08
Pit06
Myg07

Fim01
PIT01
Fim03
Fim02
Fim04
Fim08
Fim05
PIT02
BAT02
Fim06
Fim07
BAT01
PIT03
Fim10
Fim09

Kalgoorlie Consolidated Gold Mines Pty Ltd
KCGM Operations

Project No	1442-FIM-KCG-FAU
Date	27/06/2022
Drawn by	IN
Map author	PS

0 1 2
Kilometers

1:75,000 (at A3) GDA 1994 MGA Zone 51

- Study area
- Fimiston IIE
- Fimiston III
- SRE survey sites (Phoenix 2018)
- Fauna survey sites (Phoenix 2018)
- Regional targeted SRE survey site
- Basic terrestrial fauna survey site

Figure 4-1

Terrestrial fauna survey sites

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5. RESULTS

5.1 DESKTOP REVIEW

5.1.1 Vertebrate fauna

The desktop review from Phoenix (2019a) identified records of 254 vertebrate taxa within the desktop search extent (Appendix 3). The list comprised five frogs, 74 reptiles (73 native, one introduced), 138 birds (including three introduced) and 37 mammals (including ten introduced) (Table 5-1; Appendix 3). Previous surveys within the study area recorded a total of 120 vertebrate fauna species; three frogs, 29 reptiles (all native), 64 birds (63 native or migratory and one introduced) and 24 mammals (17 native and seven introduced). The Basic fauna survey undertaken by Phoenix (2018b) recorded a total of 57 vertebrate species.

Nineteen significant vertebrate species were identified in the desktop review, comprising seven species listed as Threatened, Conservation Dependent or Specially Protected under the EPBC Act and/or BC Act (Table 5-2). Ten avifauna species are listed as Migratory under the EPBC Act and BC Act (Table 5-2). The Curlew Sandpiper is listed as both Threatened and Migratory under the EPBC Act and BC Act (CR, VU). Two species are listed as Priority by DBCA (Table 5-2).

The Rainbow Bee-eater *Merops ornatus* has been removed from the results as it is no longer classified as Migratory under the EPBC Act and BC Act. The Great Egret *Ardea alba* and Cattle Egret *Ardea ibis* have been removed from the results as they are no longer classified as Migratory under the BC Act.

A total of 57 vertebrate species were recorded during the Phoenix (2018b) field survey representing approximately 22% of the species identified from the desktop review.

No conservation significant species have been recorded within the study area in previous surveys, but four species have been recorded within 5 km of the study area: Western Rosella (inland) (*Platycercus icterotis xanthogenys*) (P4), Malleefowl (*Leipoa ocellata)* (VU)*,* Wood Sandpiper *(Tringa glareola)* (Mig)*, and* Numbat (*Myrmecobius fasciatus)* (VU/EN) (Figure 5-1; Table 5-2). The Western Rosella was recorded at two locations close to the study area, one approximately 40 m and one approximately 700 m east of the study area (Figure 5-1). The Numbat is an historic record and outside the current range for this species.

Table 5-1 Summary of terrestrial fauna desktop results

Class	Native	Introduced	Total
Amphibians	5	0	5
Reptiles	73	1	74
Birds	135	3	138
Mammals	27	10	37
Total	240	14	254

Table 5-2 Significant vertebrate fauna identified in the desktop review

Scientific name	Common name	Conservation status			Recorded within 5 km of study area	Recorded from study area
		EPBC Act	BC Act	DBCA		
Reptiles						
Egernia stokesii badia	Western Spiny-tailed Skink	EN	VU			
Birds						

Scientific name	Common name	Conservation status			Recorded within 5 km of study area	Recorded from study area
		EPBC Act	BC Act	DBCA		
Actitis hypoleucos	Common Sandpiper	Mig	Mig			
Apus pacificus	Fork-tailed Swift	Mig	Mig			
Calidris acuminata	Sharp-tailed Sandpiper	Mig	Mig			
Calidris ferruginea	Curlew Sandpiper	CR/Mig	VU/Mig			
Calidris melanotos	Pectoral Sandpiper	Mig	Mig			
Calidris ruficollis	Red-necked Stint	Mig	Mig			
Falco peregrinus	Peregrine Falcon		SP			
Leipoa ocellata	Malleefowl	VU	VU		Yes	
Motacilla cinerea	Grey Wagtail	Mig	Mig			
Pezoporus occidentalis	Night Parrot	EN	CR			
Platycercus icterotis xanthogenys	Western Rosella			P4		
Plegadis falcinellus	Glossy Ibis		Mig			
Thinornis ribricollis	Hooded Plover			P4		
Tringa glareola	Wood Sandpiper	Mig	Mig		Yes	
Tringa nebularia	Common Greenshank	Mig	Mig			
Mammals						
Dasyurus geoffroii	Chuditch or Western Quoll	VU	VU			
Macrotis lagotis	Greater Bilby	VU	VU			
Myrmecobius fasciatus	Numbat	VU	EN		Yes	

1 — CR – Critically Endangered; EN – Endangered; VU – Vulnerable; Mig — Migratory; SP — Specially Protected
P4 —Priority 4

320600
356400
392200
6630550
6594700
6558850

Study area
Fimiston IIE
Fimiston III

Kalgoorlie Consolidated Gold Mines Pty Ltd
KCGM Operations

Project No	1442-FIM-KCG-FAU
Date	27/06/2022
Drawn by	IN
Map author	PS

0 5 10
Kilometers

1:350,000 (at A3) GDA 1994 MGA Zone 51

Species, status

- *Myrmecobius fasciatus, EN*
- *Dasyurus geoffroii, VU*
- *Egernia stokesii badia, VU*
- *Leipoa ocellata, VU*
- *Macrotis lagotis, VU*
- *Calidris ferruginea, VU, IA*
- *Calidris acuminata, IA*
- *Calidris ruficollis, IA*
- *Plegadis falcinellus, IA*
- *Tringa glareola, IA*
- *Tringa nebularia, IA*
- *Thinornis rubricollis, P4*

Figure 5-1

Desktop records of significant vertebrate fauna (Phoenix 2018)

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5.1.2 SRE and significant invertebrate fauna

The Phoenix (2019a) desktop review identified records of 43 SRE taxa from within the SRE desktop search area (Table 5-3; Figure 5-2). Eight of these were collected inside the 2018 study area by Harewood (2015), comprising of six mygalomorph spiders, one scorpion and one millipede. One of these taxa are only known from the Eastern Floodway study area:

- *Conothele* 'kalgoorlie' – Potential

A further two are known only from the Fimiston IIE or Fimiston III areas:

- *Idiommata* 'kalgoorlie' – Potential
- *Idiosoma* 'kalgoorlie 1' – Potential

A further two species are known only from the Phoenix (2018b) survey, however were not recorded within the Fimiston Operational Area:

- *Conothele* 'MYG554' – Potential
- *Antichiropus* 'DIP067' – Confirmed
- *Missulena harewoodi* – Confirmed

The mygalomorph spider *Gaius* 'kalgoorlie' was previously known from three locations within the Fimiston IIE and Fimiston III the study areas, however has been described and is now known as *Gaius austini*, a widespread species, ranging from Southern Cross and the Helena-Aurora Range east to at least Kalgoorlie and Lake Cowan (Rix *et al.* 2018b).
Thirteen of the taxa from the desktop review area are unidentifiable ("sp. indet."), i.e. female or juvenile spiders or millipedes, and may represent other species listed in the same genus where records exist (Table 5-3).

Two conservation significant species were returned in the desktop review. The Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) (EPBC Act, BC Act – CR) which was recorded from around Kalgoorlie until the early 1990s (Field 1999), but is currently only known from Barbalin Nature Reserve in the northern Avon Wheatbelt (Gamblin *et al.* 2009) and a site near Kalgoorlie (Phoenix 2022b). The Inland Hairstreak butterfly (*Jalmenus aridus*) (DBCA – P1), was originally described from Lake Douglas, ca. 12 km SW. of Kalgoorlie (Graham & Moulds 1988). The larvae of *J. aridus* feed on the leaves and flowers of *Senna nemophila* and *Acacia tetragonophylla*. The larvae are attended by the ant species *Froggatella kirbii*.

Table 5-3 SRE and Threatened and Priority invertebrate taxa identified in the desktop review

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
Class Arachnida, infraorder Mygalomorphae (trapdoor spiders)					
Actinopodidae	*Missulena harewoodi*	**Fimiston IIE TSF**	Confirmed	WA Museum, Harewood (2015)	Recorded in study area (Harewood 2015). Only known from single male specimen (Framenau & Harms 2017). Reported as *Missulena* 'kalgoorlie' in Harewood (2015)
Barychelidae	*Idiommata* 'kalgoorlie'	**Fimiston III TSF**	Potential	Harewood (2015)	Recorded in study area (Harewood 2015). Distribution unknown, SRE rating based on other species in genus Harewood (2015)
	Synothele goongarrie	Goongarrie, 90 km NNW. of Kalgoorlie	Confirmed	WA Museum, Raven (1994)	Not recorded in study area.
Halonoproctidae (Ctenizidae)	*Conothele* 'MYG549'	Rowles Lagoon Nature Reserve, 70 km NW. of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Conothele 'MYG554' ('kalgoorlie')	**Fimiston III TSF** Ora Banda, 50 km NW of Kalgoorlie	Potential	WA Museum, Harewood (2015)	Recorded in study area (Harewood 2015) and 0.6 km SW of Ora Banda
	Conothele 'sp. indet.'	**Fimiston III TSF**	Uncertain	WA Museum, Harewood (2015)	Recorded in study area (Harewood 2015). May represent *Conothele* 'MYG554'
Euagridae (Dipluridae)	*Cethegus* 'sp. indet.'	S. of Kambalda, 50 km SSE. of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area
Idiopidae	*Gaius austini* ('kalgoorlie')	**Fimiston IIE TSF** **Fimiston III TSF**	Formerly considered Potential, now known to be Widespread	Harewood (2015)	Recorded in study area (Harewood 2015)
	Eucyrtops 'sp. indet.'	Credo Station, 100 km NW of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area
	Idiosoma 'kalgoorlie 1'	**Fimiston IIE TSF** **Fimiston III TSF**	Potential	Harewood (2015)	Recorded in study area (Harewood 2015). Distribution unknown, SRE rating based on other species in genus (Harewood 2015);

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
					initially reported in the genus *Aganippe* (for genus-level change see Rix *et al.* 2017)
	Idiosoma 'MYG191'	S of Kambalda, 50 km SSE of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Idiosoma 'MYG244'	Rowles Lagoon Nature Reserve, 70 km NW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Idiosoma 'sp. indet.'	Throughout desktop review area	Uncertain	WA Museum	Throughout desktop review area. May represent *Idiosoma* 'kalgoorlie 1'
Aname (Nemesiidae)	*Aname* 'MYG213'	50 km ESE. of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Aname 'MYG223'	Kambalda, 50 km SSE of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Aname 'MYG522'	Coolgardie, 35 km SW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Aname 'MYG347-DNA'	Gindalbie Station, 80 km NE of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Aname 'sp. indet.'	Throughout desktop review area	Uncertain	WA Museum	Not recorded in study area. Throughout desktop review area. May represent other species listed in same genus
	Chenistona 'MYG345'	Credo Station, 100 km NW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Chenistona 'MYG435'	Credo Station, 100 km NW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Chenistona 'MYG441'	Credo Station, 100 km NW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Chenistona 'MYG506'	50 km ESE Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Chenistonia 'sp. indet.'	Goongarrie and Credo Stations, 90 – 100 km NW of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area. May represent other species listed in same genus

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
	Kwonkan goongarriensis	Goongarrie, 90 km NNW of Kalgoorlie	Potential	WA Museum, (Main 1983)	Not recorded in study area
	Kwonkan 'MYG096'	Goongarrie, 90 km NNW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	*Kwonkan '*sp. indet.'	S of Kambalda, 50 km SSE of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area. May represent other species listed in same genus
	Teyl 'MYG412'	Credo Station, 100 km NW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	*Teyl '*sp. indet.'	Throughout desktop review area	Uncertain	WA Museum	Not recorded in study area. May represent other species listed in same genus
	*Yilgarnia '*sp. indet.'	S of Kambalda, 50 km SSE of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area
Class Arachnida, order Pseudoscorpiones					
Garypidae	*Synsphyronus* '7/2 Goldfields'	Burra Rock, 70 – 110 km SW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Synsphyrnus 'PSE025'	Emu Rock (Credo Station), 100 km NW of Kalgoorlie	Potential	WA Museum	Not recorded in study area
	Synsphyronus 'sp. indet.'	Victoria Rock; granite outcrop E of Coolgardie, 35 km SW of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area. May represent other species listed in same genus
Class Arachnida, order Scorpiones					
Buthidae	*Lychas 'annulatus*-complex'	**Fimiston IIE TSF** **Fimiston III TSF**	Potential	Harewood (2015)	Recorded in study area (Harewood 2015). Taxonomy of species-complex poorly known
Class Chilopoda, order Geophilomorpha (soil centipedes)					
Geophilomorpha fam. indet.	Geophilomorpha 'sp. indet.'	Goongarrie, White Quartz Dam, 90 km NNW of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
Class Diplopoda, order Polydesmida (millipedes)					
Paradoxosomatidae	*Antichiropus* 'DIP067' ('broad arrows')	**Fimiston IIE TSF**	Confirmed	Harewood (2015) WA Museum	Recorded in study area (Harewood 2015) and ca. 60 km north of Kalgoorlie
	Antichiropus 'DIP065'	Binduli, 10 km SW Kalgoorlie	Confirmed	WA Museum	Not recorded in study area
	Antichiropus 'kalgoorlie'	Binduli, 10 km SW Kalgoorlie	Confirmed	WA Museum	Not recorded in study area
	Antichiropus 'sp. indet'	Binduli, 10 km SW Kalgoorlie	Uncertain	WA Museum	Not recorded in study area May represent other species listed in same genus
	Antichiropus nadinae	Credo Station, 100 km NW of Kalgoorlie	Confirmed	WA Museum, Car & Harvey (2014)	Not recorded in study are
Class Diplopoda, order Polyzoniida (sucking millipedes)					
Polyzoniidae	Polyzoniidae 'sp. indet.'	Emu Rock Track (Credo Station), 100 km NW of Kalgoorlie	Uncertain	WA Museum	Not recorded in study area
Class Isopoda (Slaters)					
Armadillidae	*Buddelundia frontosa*	Binduli, 10 km SW Kalgoorlie	Potential	Phoenix (2014)	Not recorded in study area.
Class Insecta, order Lepidoptera (butterflies)					
Lycaenidae	*Jalmenus aridus*	Lake Douglas, 12 km SW Kalgoorlie	DBCA – P1	Graham and Moulds (1988)	Not recorded in study area
	Ogyris subterrestris petrina	Lake Douglas, 12 km SW Kalgoorlie (believed extinct population); also Barbalin Nature Research (Avon Wheatbelt region)	EPBC, BC Act – CR	ALA (2017); (Environment 2014)	Not recorded in study area

342700
352800
362900
6610000
6598000
6586000

Idiommata 'kalgoorlie'
Lychas 'annulatus complex'
Idiosoma 'kalgoorlie1'
Lychas 'annulatus complex'
Idiommata 'kalgoorlie'
Conothele 'MYG554'
Gaius 'austini' (kalgoorlie)
Lychas 'annulatus complex'
Gaius 'austini' (kalgoorlie)
Idiosoma 'kalgoorlie1'
Idiosoma sp. indet.
Missulena harewoodi
Conothele 'MYG554' (kalgoorlie)
Gaius 'austini' (kalgoorlie)
Antichiropus 'DIP067'

Kalgoorlie Consolidated Gold Mines Pty Ltd
KCGM Operations

Project No	1442-FIM-KCG-FAU
Date	27/06/2022
Drawn by	IN
Map author	PS

0 1 2
Kilometers

1:101,000 (at A3) GDA 1994 MGA Zone 51

Study area
Fimiston IIE
Fimiston III

Status

CR (EPBC Act, WC Act)
P1
Confirmed
Potential
Uncertain
Widespread

Figure 5-2

Desktop records of SRE invertebrates (Phoenix 2018)

PHOENIX ENVIRONMENTAL SCIENCES

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5.2 FIELD SURVEY

5.2.1 Vertebrate fauna

5.2.1.1 Habitats

Three broad fauna habitat types were identified in the study area, comprising of Open woodland, Shrubland, Rehabilitation (Table 5-4; Figure 5-3). Native vegetation habitats (Open woodland and Shrubland) occupied the majority of the study area, accounting for 61.5% and 9.3% respectively. Rehabilitated areas occupy 10.1 % of the study area and the remaining 19.1% is cleared.

The woodland and shrubland habitats represent foraging habitat for conservation significant vertebrate fauna species Chuditch and Malleefowl. The rehabilitated areas may provide value as foraging or dispersal habitat for vertebrate fauna species.

Table 5-4 Extent and description of each fauna habitat in the study area

Habitat type	Site/s	Description	Extent in study area and % of study area	Representative photograph
Open woodland	BAT01, BAT02, Fim02, Fim03, Fim05, Fim06, Fim07, Fim08, Fim09 PIT03	Mid to tall open eucalypt woodland of gimlet and Salmon Gum with scattered *Brachychiton* over mixed shrub understorey of E*remophila*, *Senna*, *Acacia exocarpos* and *Santalum* on red-brown clay. Contains marginal Malleefowl habitat unlikely to be used for breeding due to open canopy. Potential foraging habitat for Malleefowl and Chuditch.	676.2 ha (61.5%)	
Shrubland	Fim04, PIT02	Tall open *Eremophila scoparia* shrubland over mid open *Acacia nyssophylla* and *Senna artemisioides* subsp. *filifolia* shrubland over low open *Eremophila caperata*, *Rhagodia drummondii* and *Scaevola spinescens* shrubland. Contains marginal Malleefowl habitat unlikely to be used for breeding due to open canopy. Potential foraging habitat for Malleefowl and Chuditch.	102.1 ha (9.3%)	

Habitat type	Site/s	Description	Extent in study area and % of study area	Representative photograph
Rehabilitation	Fim01, Fim10, PIT01,	Previously cleared areas that are now revegetated. Low value dispersal/foraging habitat for fauna occupying adjacent vegetated areas.	111 ha (10.1%)	
Cleared		Cleared for infrastructure or historic purposes	210.1 (19.1%)	

349240
356400
363560
6604200
6596800
6589400

Malleefowl foraging and dispersal habitat

Western Australia
PERTH

Kalgoorlie Consolidated Gold Mines Pty Ltd
KCGM Operations

Project No	1442-FIM-KCG-FAU
Date	1/07/2022
Drawn by	IN
Map author	PS

0 1 2
Kilometers

1:72,000 (at A3) GDA 1994 MGA Zone 51

Study area
Fimiston IIE
Fimiston III

Species, status

Dasyurus geoffroii, VU (scat)
Leipoa ocellata, VU (tracks)

Fauna habitat

Open Woodland
Shrubland
Rehabilitation
Cleared

Figure 5-3

Fauna habitats and significant fauna records from the field survey

PHOENIX ENVIRONMENTAL SCIENCES

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5.2.1.2 Malleefowl habitat assessment

Malleefowl habitat was found to be suitable to support the species in nine of 15 the sites assessed (Table 5-5). However, most of the habitat was borderline suitable habitat, with eight of the nine suitable sites scoring only the minimum four features out of eight. The low scores indicate suitable habitat for Malleefowl foraging and dispersal only, and it is unsuitable for breeding.

All three habitats displayed areas of suitable and unsuitable Malleefowl habitat. By extrapolating the highest score across sections of the same habitat types and condition rating, suitable, albeit low quality Malleefowl habitat occupies 727.6 ha (66.1%) of the study area, in areas within the Eastern Floodway and Fim south extrapolation area.

Table 5-5 Malleefowl habitat assessment scores

Malleefowl habitat	Score	Sites	Habitat	Total # of sites
No	0			0
	1			0
	2	Fim01, Fim03, Fim04	Open woodland, Shrubland, Rehabilitation	3
	3	BAT02, Fim02, Fim10,	Open woodland, Rehabilitation	3
Yes	4	BAT01, Fim05, Fim06, Fim07, Fim08, Fim09, PIT02, PIT03	Open woodland, Shrubland	8
	5	PIT01	Rehabilitation	1
	6			0
	7			0
	8			0
			Total	**15**

5.2.1.3 Vertebrate fauna species

A total of 47 terrestrial vertebrate species (Table 5-6) representing 25 families and 41 genera were recorded in the study area during the field survey (Appendix 3). The assemblage included 44 native species and three introduced species.

Table 5-6 Number of vertebrate species recorded in survey, by group

Group	No. species recorded in survey
Amphibians	0
Birds	27
Mammals	13 (incl. 3 introduced)
Reptiles	7
Total	**47**

Two Threatened fauna were recorded outside of the study area during the survey, Malleefowl *Leipoa ocellata* (VU - EPBC Act & BC Act) and Chuditch *Dasyurus geoffroii* (VU – EPBC Act & BC Act) (Table 5-7; Figure 5-3).

Malleefowl were recorded from fresh tracks at site Myg04 outside the study area. Chuditch was recorded from a scat at site Myg02 in a stand of gimlet eucalypts.

Table 5-7 Details of significant vertebrate fauna recorded during the field survey

Species	Status	Distribution and ecology	Survey records
Leipoa ocellata (Malleefowl)	VU (EPBC & BC Acts)	The Malleefowl is found across the southern half of the Australian continent and is the only Megapodiidae in the South-west Region. In Western Australia, the majority of the population is found south of a line from Shark Bay to the Nullarbor Plain. In the extreme south-west of WA, the species displays a patchy distribution. Malleefowl are typically found in mallee woodlands but also in Eucalyptus woodlands and shrublands.	Tracks at site Myg04, approx. 5 km NE of the Fimiston study area.
Dasyurus geoffroii (Chuditch)	VU (EPBC & BC Acts)	The Chuditch is now confined to south-western Australia, occurring in only 5% of its former range. Prior to European settlement the species occupied approximately 70% of continental Australia (Smith *et al.* 2004; Van Dyck & Strahan 2008). They are now mostly found in woodland, heath and mallee habitats.	Scat at site Myg02, approximately 7 km ENE of the Fimiston study area.

The likelihood of occurrence assessment for the significant species identified in the desktop review (section 5.1.1) determined five were likely to occur in the study area (Table 5-8), four birds and one mammal:

- Fork-tailed Swift *Apus pacificus* Mig. (EPBC & BC Acts)
- *Falco peregrinus* Peregrine Falcon OS (BC Act)
- *Leipoa ocellata* Malleefowl VU (EPBC & BC Acts)
- *Platycercus icterotis xanthogenys* Western Rosella (inland) P4 (BC Act)
- *Dasyurus geoffroii* Chuditch or Western Quoll VU (EPBC & BC Acts).

Table 5-8 Likelihood of occurrence for significant vertebrate fauna identified in the desktop review

Species	Status	Likelihood of occurrence	Comments	Habitats			
				Open woodland	Shrubland	Cleared	Rehabilitation
Reptiles							
Egernia stokesii badia Western Spiny-tailed Skink	EN (EPBC Act; VU (BC Act))	Unlikely	Study area outside of current known range.				
Birds							
Actitis hypoleucos Common Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Apus pacificus Fork-tailed Swift	Mig. (EPBC & BC Acts)	**Likely**	Not limited by habitat. The species can occur within a wide range of habitats, including those found in the study area, where is likely to forage, although it is unlikely it will land or nest within the study area.	•	•	•	•
Calidris acuminata Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Calidris ferruginea Curlew Sandpiper	CR, Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Calidris melanotos Pectoral Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Calidris ruficollis Red-necked Stint	Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Falco peregrinus Peregrine Falcon	OS (BC Act)	**Likely**	Suitable habitat in study area. The species is likely to forage within and in the vicinity of the survey area and may also nest in Open woodland habitat where suitable large trees are present.	•			
Leipoa ocellata Malleefowl	VU (EPBC & BC Acts)	**Likely**	Suitable habitat in study area. No evidence of Malleefowl presence has been recorded in the study area in the current or previous surveys. The species has previously been recorded numerous times within 10 km north and east of the study area.	•	•		

Species	Status	Likelihood of occurrence	Comments	Habitats			
				Open woodland	Shrubland	Cleared	Rehabilitation
			Suitable foraging and nesting habitat was recorded in the study area in Open woodland and Shrubland habitat.				
Motacilla cinerea Grey Wagtail	Mig. (EPBC & BC Acts)	Unlikely	Suitable stream and river habitat absent.				
Pezoporus occidentalis Night Parrot	EN (EPBC Act; CR (BC Act))	Unlikely	Suitable spinifex habitat absent.				
Platycercus icterotis xanthogenys Western Rosella (inland ssp.)	P4 (DBCA list)	**Likely**	The Western Rosella (inland ssp) are primarily found in eucalypt and casuarina woodlands, preferring Salmon Gum, Wandoo and tall mallees (Johnstone & Storr 1998). They feed on a range of fruits, seeds and marri flowers both on the ground and in trees. Salmon Gum, Gimlet, Wandoo, Marri, Flooded Gum and York Gum are preferentially used for nesting (KLA 2011).	•	•		
Plegadis falcinellus Glossy Ibis	Mig. (BC Act)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Thinornis ribricollis Hooded Plover	P4 (DBCA list)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Tringa glareola Wood Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Tringa nebularia Common Greenshank	Mig. (EPBC & BC Acts)	Unlikely	Suitable habitat absent. Possible visitor to salt lakes 5 -20 km from study area.				
Mammals							
Dasyurus geoffroii Chuditch or Western Quoll	VU (EPBC & BC Acts)	**Likely**	Suitable woodland habitat present. No evidence of Chuditch presence has been recorded in the study area in the current or previous surveys. The species has previously been recorded 45 km south of the study area at Kambalda and Chuditch scat was found during the field survey at a regional targeted SRE site approximately 7 km ENE of the study area.	•			

Species	Status	Likelihood of occurrence	Comments	Habitats			
				Open woodland	Shrubland	Cleared	Rehabilitation
Macrotis lagotis Greater Bilby	VU (EPBC & BC Acts)	Unlikely	Study area outside of current known range.				
Myrmecobius fasciatus Numbat	VU (EPBC Act; EN (BC Act))	Unlikely	Study area outside of current known range.				

5.2.2 SRE and significant invertebrate fauna

5.2.2.1 SRE habitats

A total of four SRE habitats are present within the study area, Open woodland, Shrubland, Shrubland along drainage line, and rehabilitation. These occupy a total of 80.9% of the study area. A further 19.1% of the study area is cleared. One of the SRE habitats was identified within the study area that has High potential for SRE invertebrates (Shrubland along drainage line) (Table 5-9; Figure 5-4). The Shrubland along drainage line occupies 4.3% of the study area and comprises of low shrubland species along a drainage line. This habitat is comparatively dense and has the potential to retain moisture, thus may provide better quality habitat for SRE invertebrate species. The Open woodland, Shrubland, and Rehabilitation habitats provide Low potential SRE habitat and collectively occupy 76.6% of the study area. The Open woodland is widespread within and outside of the study area and the Shrubland extends to the north and north-west of the study area. The Shrubland along drainage line habitat is limited within the study area, however extends between the northern and southern portions of the Eastern Floodway and to the north of the study area.

Table 5-9 Extent and description of each SRE habitat in the study area

Habitat type	Site/s	Description	Extent in study area (ha, %)	SRE habitat potential
Open woodland	BAT01, BAT02, Fim03, Fim05 Fim06, Fim07, Fim08, Fim09, PIT03	Mid to tall open eucalypt woodland of gimlet and Salmon Gum with scattered brachychiton over mixed shrub understorey of E*remophila*, *Senna*, *Acacia*, *Exocarpos* and *Santalum* on red-brown clay	676.2 ha (61.5%)	Low
Shrubland	none	Tall open *Eremophila scoparia* shrubland over mid open *Acacia nyssophylla* and *Senna artemisioides* subsp. *filifolia* shrubland over low open *Eremophila caperata*, *Rhagodia drummondii* and *Scaevola spinescens* shrubland	54.8 ha (5.0%)	Low
Shrubland along drainage line	Fim04, PIT02	Low shrubland of *Acacia*, *Senna* and *Eremophila* with no tree overstorey on red-brown clay soils restricted to the floodway running north-south through the study area	47.3 ha (4.3%)	**High**
Rehabilitation	Fim01, Fim02, Fim10, PIT01	Revegetated with mostly native species, developed into a shrubland or open woodland	111 ha (10.1%)	Low
Cleared			205.8 ha (19.1%)	None

5.2.2.2 SRE and significant invertebrate fauna records

A total of 272 specimens from 37 SRE taxa were collected within the study area (Table 5-10). They were comprised of 16 taxa of mygalomorph spiders, 12 taxa of pseudoscorpions, two taxa of scorpions, five taxa of isopods, and one species each of snail and butterfly Figure 5-4; Table 5-11).

Of these, one is a Confirmed SRE (*Missulena harewoodi* – a mygalomorph spider), 21 (55%) are Potential SRE species, and one is a P1 species. The remaining 15 taxa are widespread or uncertain SREs.

Missulena Harewoodi was previously collected from the Project in 2015 (Harewood 2015) and 2018 (Phoenix 2019c) and is known only from the vicinity of Fimiston Operational Area. The potential SREs are comprised of nine mygalomorph spiders, eight pseudoscorpions and four isopods.

One conservation significant species was recorded from the survey, *Jalmenus aridus* (P1; DBCA) was found at multiple sites in the study area and has been addressed in a separate report (Phoenix 2022c).

Six mygalomorph spiders had significant divergence from their closest matches on GenBank and are considered to be new species:

- *Kwonkan* 'Phoenix0082' – was collected at three sites inside the study area in the north and south-east in Open woodland habitat (Low potential SRE habitat) and one site outside the study area
- *Kwonkan* 'Phoenix0085' – was collected at one site inside the study area in the south in Open woodland habitat (Low potential SRE habitat)
- *Teyl* 'Phoenix 0081' – collected at one site in the south-east of the study area in Open woodland habitat (Low potential SRE habitat) and two sites outside the study area
- *Synothele* 'Phoenix0083' – collected from one site within the study area in the north in Open woodland habitat (Low potential SRE habitat) and one site outside the study area
- *Synothele* 'Phoenix0084' – only recorded from one site outside the study area
- *Idiosoma* 'Phoenix0086' – only recorded from one site outside the study area.

Table 5-10 Summary of SRE taxa collected during the field survey

Higher taxon	Families	Genera	Taxa	Eastern Floodway	Regional
Mygalomorphs (trapdoor spiders)	6	10	16	9	15
Pseudoscorpions	4	9	12	10	8
Scorpions	1	2	2	1	2
Isopods (slaters)	2	3	5	3	1
Snails	1	1	1	1	0
Butterfly	1	1	1	1	0
Total	**15**	**26**	**37**	**25**	**26**

Eastern Floodway

Within the Eastern Floodway, a total of 25 taxa were collected. This assemblage was dominated by pseudoscorpions (10) and mygalomorph spiders (9), followed by isopods (3). Of these, one is a P1 species, 11 are potential SREs, six are widespread species and six are of uncertain SRE status due to unresolved taxonomy.

The location and record details of the P1 species, *Jalmenus aridus* is discussed is a separate memo report due to the significance of this record (Phoenix 2022c).

Of the 11 potential SREs, eight have been recorded outside of the Eastern Floodway, either recorded in the regional targeted survey or desktop review. The remaining three taxa are from groups whose taxonomy is very poorly understood:

- *Austrohorus* 'sp. Fi01' – recorded from Pit02 (Shrubland along drainage line) via wet pitfall trap
- *Nesidiochernes* 'sp. Fi01' – recorded at sites PIT01 (Rehabilitation) and Fim05 (Open woodland) via litter sift and wet pitfall trap

- *Spherillo* 'sp. indet. A1' – recorded at site PIT01 (Rehabilitation) via wet pitfall trap. This specimen is possibly synonymous with *Spherillo* 'sp. indet. A2' as the genus is so poorly understood.

Two taxa known only from the Eastern Floodway were collected from rehabilitated sites (*Nesidiochernes* 'sp. Fi01' and *Spherillo* 'sp. indet. A1') indicating these taxa are not likely to be restricted to the study area. Only two Potential SRE taxa were recorded from the high potential SRE habitat, Shrubland along drainage line (*Austrohorus* 'sp. Fi01' and *Buddelundia frontosa*). *B. frontosa* was also collected from Open woodland (PIT04) habitat and also collected outside the study area from near Lake Lefroy to the south-east and Koolyanobbing to the east. *Austrohorus* 'sp. Fi01' is currently only known from one location within the study area.

Regional targeted SRE survey

A total of 26 taxa from SRE groups were collected from the regional targeted mygalomorph survey, including 15 taxa of mygalomorph spiders. Of these, one is a Confirmed species (*Missulena harewoodi*), nine are Potential SRE species, three are widespread species and one is of uncertain SRE status due to unresolved taxonomy.

Of the three target species currently known only from the Fimiston Operational Area (*Conothele* 'MYG554' ('kalgoorlie'), *Idiosoma* 'kalgoorlie 1', and *Idiommata* 'kalgoorlie'), two were re-collected during the regional survey:

- *Idiosoma* 'kalgoorlie 1' – three female specimens collected from two sites (PIT05 and PIT06). All were collected via burrow excavations
- *Conothele* 'MYG554' – one female specimen collected from one site (PIT06). This specimen was collected via burrow excavation

Idiommata 'kalgoorlie' was not re-collected and thus only known from one location within the Fimiston III TSF area and one location approximately 275 m north of the Fimiston III TSF area.

The additional collection of a single female specimen of *Missulena harewoodi* from the regional targeted survey is also significant given there are only two records of this species. This specimen was collected from site Myg05 via burrow excavation.

Table 5-11 Specimens from SRE groups recorded in the field survey. Rows in grey represent previously unknown taxa.

Higher order/Family	Taxa	Locality	Site/s	Habitats				No. specimens	SRE status/ significance	Comments
				H	L	L	L			
				Shrubland	Open woodland	Unmapped	Cleared			
Class Arachnida, infraorder Mygalomorphae (trapdoor spiders)										
Actinopodidae	*Missulena harewoodi*	Regional	Myg05		•			1	Confirmed	This specimen is **6.1%** divergent from MK715491 (*Missulena harewoodi* voucher WAM T147517) and is therefore considered conspecific. Only recorded outside the study area.
Anamidae	*Aname* 'MYG212'	Eastern Floodway, Regional	Fim01, Fim05, Fim06, Fim08, PIT01, PIT02, PIT03, PIT04	•	•	•	•	10	Widespread	These specimens are **7.9-9.1%** divergent from MW518657 (*Aname* sp. MYG212 isolate WAMT130488) and are therefore considered as a conservative conspecific. Recorded inside and outside the study area. Nearest record: Parker Range Haul Road 190 km W of Kalgoorlie.
Anamidae	*Kwonkan* 'Phoenix0082'	Eastern Floodway, Regional	Fim01, Fim03, PIT03, Myg02		•			4	Potential	These specimens are **13.5-14.2%** divergent from MW039184 (*Kwonkan* sp. MYG699 voucher WAMT151298) and are therefore considered as a new species. Recorded inside and outside the study area.
Anamidae	*Kwonkan* 'Phoenix0085'	Eastern Floodway	Fim09		•			1	Potential	This specimen is **13.5%** divergent from MW039184 (*Kwonkan* sp. MYG699 voucher WAMT151298) and is therefore considered as a new species. Only recorded inside the study area.

Higher order/Family	Taxa	Locality	Site/s	Habitats				No. speci-mens	SRE status/ significance	Comments
				H	L	L	L			
				Shrubland	Open woodland	Unmapped	Cleared			
Anamidae	*Teyl* 'Phoenix 0081'	Eastern Floodway, Regional	PIT03, Myg01 Myg06		•			4	Potential	These specimens are **13.2-13.7%** divergent from MG800178 (*Teyl* sp. MYG457 voucher WAMT132932) and are therefore considered as a new species. Recorded inside and outside the study area.
Barychelidae	*Synothele* 'Phoenix0083'	Eastern Floodway, Regional	PIT01, Myg06		•			4	Potential	These specimens are **9.4-10.6%** divergent from KY017602 (*Synothele arrakis* isolate ARAMY002135) and are therefore considered as a new species. Recorded inside and outside the study area.
Barychelidae	*Synothele* 'Phoenix0084'	Regional	PIT04		•			1	Potential	This specimen is **14.2%** divergent from KJ744654 (*Synothele* sp. MYG311 voucher T107392) and is therefore considered as a new species. Only recorded outside the study area.
Halonoproctidae	*Conothele* 'MYG554' ('kalgoorlie')	Regional	PIT06		•			1	Potential	This specimen is **2.1%** divergent from MK735664 (*Conothele* sp. MYG554 voucher WAMT139800) and is therefore considered conspecific. Only recorded outside the study area. **Target species, found off tenement.**
Euagridae	*Cethegus* 'MYG050'	Regional	PIT06, Myg06		•			2	Widespread	These specimens are **7.9%** divergent from MW199727 (*Cethegus* sp. MYG050 voucher WAMT151186) and are therefore considered as a conservative conspecific. Only recorded outside the study area. Nearest record: Parker Range Haul Road 190 km W Kalgoorlie.

Higher order/Family	Taxa	Locality	Site/s	Habitats				No. speci-mens	SRE status/ significance	Comments
				H	L	L	L			
				Shrubland	Open woodland	Unmapped	Cleared			
Idiopidae	*Gaius austini* (previously *G*. 'kalgoorlie')	Eastern Floodway, Regional	Fim03, PIT02, PIT03, PIT04, Myg02, Myg03, Myg04	•	•			8	Widespread	These specimens are **11.6-11.9%** divergent from MG652494 (*Gaius austini* (sp. 1 MGR-2018 isolate NCB_027_T116013)) and are therefore considered conservatively conspecific as members of this group have large intraspecific divergences (18-20%). Recorded inside and outside the study area.
Idiopidae	*Idiosoma* 'kalgoorlie 1'	Regional	PIT05, PIT06		•			3	Potential	These specimens are **0.2-3.1%** divergent from MW621135 (*Aganippe* sp. kalgoorlie 1 voucher WAMT139804) and are therefore considered conspecific. Only recorded outside the study area. **Target species, found off tenement.**
Idiopidae	*Idiosoma* 'Phoenix0086'	Regional	Myg06		•			1	Potential	This specimen is **13.5%** divergent from KJ745427 (*Aganippe* sp. MYG015 voucher T96445) and is therefore considered as a new species. Only recorded outside the study area.
Idiopidae	*Idiosoma* 'MYG244'	Regional	Myg01, Myg05, Myg08		•			5	Potential	These specimens are **7.2-7.6%** divergent from KJ744920 (*Aganippe* sp. MYG244 voucher T118992) and are therefore considered a conservative conspecific. Only recorded outside the study area.
Idiopidae	*Idiosoma* 'MYG256'	Eastern Floodway	Fim01, Fim08, PIT02	•	•			5	Widespread	These specimens are **0.2-0.8%** divergent from MW621136 (*Aganippe* sp. MYG256 voucher WAMT139805) and are therefore considered conspecific. Only recorded inside the study area.

Higher order/Family	Taxa	Locality	Site/s	Habitats				No. speci-mens	SRE status/ significance	Comments
				H	L	L	L			
				Shrubland	Open woodland	Unmapped	Cleared			
										Nearest record: Mt Ida 200 km NW Kalgoorlie.
Idiopidae	*Idiosoma* 'sp. indet.'	Eastern Floodway, Regional	PIT02, PIT03 PIT06, Myg01 Myg02, Myg03, Myg06, Myg08	•	•			8	Uncertain	Recorded inside and outside the study area.
Idiopidae	Idiopidae 'sp. indet.'	Eastern Floodway	PIT03		•			1	Uncertain	Only recorded inside the study area.
Class Arachnida, order Scorpiones (scorpions)										
Buthidae	*Isometroides* 'goldfields1'	Regional	Myg01		•			1	Widespread	Only recorded outside the study area.
Buthidae	*Lychas* 'splendens'	Eastern Floodway, Regional	PIT02, PIT05	•	•			2	Widespread	Recorded inside and outside the study area.
Class Arachnida, order Pseudoscorpiones (pseudoscorpions)										
Cheliferidae	Cheliferidae 'sp. Fi01'	Regional	PIT05		•			1	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded outside the study area.
Chernetidae	*Conicochernes* 'PSE024'	Eastern Floodway, Regional	Fim03, Fim06, Fim09, PIT01, PIT04, PIT06		•			29	Widespread	Recorded inside and outside the study area.
Chernetidae	*Nesidiochernes* 'sp. Fi01'	Eastern Floodway	Fim05, PIT01		•	•		4	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded inside the study area.

Higher order/Family	Taxa	Locality	Site/s	Habitats				No. speci-mens	SRE status/ significance	Comments
				H	L	L	L			
				Shrubland	Open woodland	Unmapped	Cleared			
Chernetidae	*Nesidiochernes* 'sp. Fi02'	Eastern Floodway, Regional	PIT01, PIT06		•			3	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Recorded inside and outside the study area.
Chernetidae	*Nesidiochernes* 'sp. indet.'	Eastern Floodway	Fim08		•			3	Uncertain	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded inside the study area.
Garypidae	*Synsphyronus mimulus*	Regional	PIT04		•			3	Potential	Complex. Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded outside the study area.
Garypidae	*Synsphyronus* 'sp. indet.'	Eastern Floodway	PIT03		•			1	Uncertain	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded inside the study area.
Olpiidae	*Austrohorus* 'sp. Fi01'	Eastern Floodway	PIT02	•				2	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded inside the study area.
Olpiidae	*Beierolpium* '8/4-Fi02'	Eastern Floodway, Regional	Fim08, PIT01, PIT03, PIT04, PIT05, PIT06		•			11	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Recorded inside and outside the study area.
Olpiidae	*Beierolpium* '8/4'	Eastern Floodway	PIT03		•			3	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded inside the study area.
Olpiidae	*Indolpium* 'sp. Fi03'	Eastern Floodway, Regional	PIT01, PIT06		•			2	Potential	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Recorded inside and outside the study area.

Higher order/Family	Taxa	Locality	Site/s	Habitats				No. speci-mens	SRE status/ significance	Comments
				H	L	L	L			
				Shrubland	Open woodland	Unmapped	Cleared			
Olpiidae	Olpiidae 'sp. indet.'	Eastern Floodway	PIT02	•				1	Uncertain	Potential SRE owing to taxonomic data deficiency. Distribution unknown. Only recorded inside the study area.
Class Malacostraca, order Isopoda (isopods)										
Armadillidae	*Buddelundia frontosa*	Eastern Floodway, Regional	Fim05, PIT02, PIT04	•	•	•		3	Potential	Recorded inside and outside the study area. Also known from Lake Lefroy and Koolyanobbing.
Armadillidae	*Spherillo* 'sp. indet. A1'	Eastern Floodway	PIT01		•			1	Potential	Only recorded inside the study area. Female juvenile but a poorly known group and may be more widespread.
Armadillidae	*Spherillo* 'sp. indet. A2'	Regional	PIT06		•			1	Potential	Only recorded outside the study area. Potentially the same species as S. 'A1'
Armadillidae	*Spherillo* 'sp. indet. B'	Regional	PIT05		•			1	Potential	Only recorded outside the study area.
Paraplaty-arthridae	*Paraplatyarthrus* 'sp. indet.'	Eastern Floodway, Regional	Fim05, PIT06		•	•		3	Uncertain	Recorded inside and outside the study area.
Class Gastropoda (snails)										
	Sinumelon jimberlanensis	Eastern Floodway	PIT02	•				1	Widespread	This specimen is **6.9%** divergent from KP965354 (*Sinumelon jimberlanensis* isolate c voucher WAM:S66450) and is therefore considered as a conservative conspecific. Only recorded inside the study area.
Class Insecta, order Lepidoptera (butterflies)										
Lycaenidae	*Jalmenus aridus*	Eastern Floodway			•			132	P1	Only recorded inside the study area.

Map placeholder

Figure 5-4 SRE habitats and recorded SRE taxa

349930 356440 362950

6608550 6601220 6593900

Confirmed

- 2, *Missulena harewoodi*

Potential

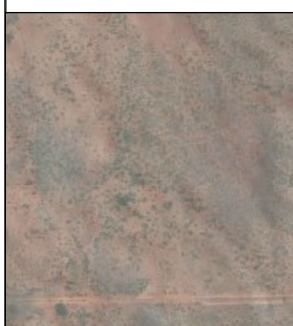
- 3, *Austrohorus* `sp. Fi01`
- 4, *Beierolpium* '8/4'
- 5, *Beierolpium* '8/4-Fi02'
- 6, *Buddelundia frontosa*
- 7, Cheliferidae `sp. Fi01`
- 9, *Idiosoma* 'kalgoorlie 1'
- 10, *Idiosoma* 'MYG244'
- 11, *Idiosoma* 'Phoenix0086'
- 12, *Indolpium* `sp. Fi03`
- 13, *Kwonkan* 'Phoenix0082'
- 14, *Kwonkan* 'Phoenix0085'
- 15, *Nesidiochernes* `sp. Fi01`
- 16, *Nesidiochernes* `sp. Fi02`
- 17, *Spherillo* `sp. indet. A1`
- 19, *Spherillo* `sp. indet. B`
- 20, *Synothele* 'Phoenix0083'
- 23, *Teyl* 'Phoenix0081'

Uncertain

- 24, *Chilopoda* 'sp. indet.'
- 25, Olpiidae `sp. indet.`
- 26, Idiopidae `sp. indet.`
- 27, *Idiosoma* `sp. indet.`
- 28, *Nesidiochernes* `sp. indet.`
- 29, *Paraplatyarthrus* `sp. indet.`
- 30, *Synsphyronus* `sp. indet.`

Widespread

- 31, *Aname* 'MYG212'
- 32, *Conicochernes* 'PSE024'
- 33, *Idiosoma* 'MYG256'
- 35, *Lychas* 'splendens'
- 36, *Sinumelon jimberlanensis*
- 37, *Cethegus* 'MYG050'
- 38, *Gaius austini*



Kalgoorlie Consolidated Gold Mines Pty Ltd
KCGM Operations

Project No	1442-FIM-KCG-FAU
Date	27/06/2022
Drawn by	IN
Map author	PS

0 1 2
Kilometers

1:71,300 (at A3) GDA 1994 MGA Zone 51

- Study area
- Fimiston IIE
- Fimiston III

SRE habitat

- Open Woodland
- Rehabilitation
- Shrubland
- Shrubland along drainage line
- Cleared

Figure 5-4

SRE habitats and recorded SRE taxa from the field survey

PHOENIX ENVIRONMENTAL SCIENCES

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5.3 SURVEY LIMITATIONS

The limitations of the basic terrestrial fauna and SRE survey and targeted SRE survey have been considered in accordance with EPA (EPA 2016c, d, 2020) (Table 5-12).

Table 5-12 Consideration of potential survey limitations

Limitations	Limitation	Comments
Availability of contextual information at a regional and local scale	No	Numerous surveys have previously been undertaken within or in the vicinity of the study area which provide adequate contextual information.
Competency/experience of the team carrying out the survey	No	The field team and report authors have extensive experience in terrestrial fauna surveys within the vicinity of the study area and across WA.
Scope and completeness	No	Suitable survey methods were used based on EPA technical guidance (EPA 2016b). All target terrestrial fauna groups, conservation significant species and habitats within the study area were surveyed adequately.
Proportion of flora and fauna recorded and/or collected, any identification issues	No	The fauna survey is considered adequate for a basic survey considering the limited number of habitat types present in the study area relative to those present within the desktop search area. All vertebrate fauna was identified to species level in the field. Invertebrate fauna specimens were submitted to taxonomic specialists on relevant groups for identification.
Access within the study area	No	The whole of the study area was accessible by vehicle or on foot.
Timing, rainfall, season	No	Weather preceding and during the survey was comparable to annual averages for previous years. The survey timing was within the optimal timing for reptiles, birds and mammals and butterflies but was outside the optimal timing for SREs in the Goldfields (May-August), however conditions leading up to the survey and during the survey were suitable in terms of adequate rainfall and temperatures for SRE activity.
Disturbance that may have affected the results of the survey	No	No disturbances occurred during the field survey which are considered to have impacted the results.

6. DISCUSSION

In assessing development proposals, the EPA has the objective of protecting terrestrial fauna so that biological diversity and ecological integrity are maintained (EPA 2016a). Considerations for terrestrial fauna in EIA at the State level include significance of values present, current state of knowledge of those values, potential impacts and the scale at which the impacts are assessed (EPA 2016a). In this section, the consolidated results of the desktop review and field surveys are presented and discussed to provide a current assessment of terrestrial fauna values for the Fimiston Operational Area.

6.1.1 Vertebrate fauna

Of the three broad fauna habitats identified in the Fimiston Operational Area: Open woodland, Shrubland and Rehabilitation; Open woodland was the most abundant, occupying 55.7% of the Eastern Floodway and 99.9% of the Fimiston IIE and III areas. Both Open woodland and Shrubland are regionally widespread with no restricted habitat isolates present.

Taking the results of the current and previous surveys into account, a total of 131 vertebrate fauna species have been recorded in the Project, representing 75 families (Appendix 4). The most common group was birds (138 taxa), followed by reptiles (74 taxa), mammals (37) and amphibians (5 taxa).

No conservation significant vertebrate fauna have been recorded from inside Fimiston Operational Area to date. Five significant fauna species considered likely to occur in the study area, including Fork-tailed Swift (Mig.; EPBC & BC Acts), Peregrine Falcon (OS; BC Act), Malleefowl (VU; EPBC & BC Acts), Western Rosella (inland ssp), and Chuditch (VU; EPBC & BC Acts).

Fork-tailed Swifts are summer migrants to Australia and may be found over any habitat type, where they forage in the airspace above. The species may infrequently occur in the study area to forage; however, as they are almost exclusively aerial, they are unlikely to land or nest in the study area.

Peregrine Falcons have large foraging ranges and are considered likely to occasionally forage within and in the vicinity of the study area and may also nest in Open woodland habitat where suitable tall trees are present.

The Western Rosella is endemic to south-western Western Australia. The inland form is known from arid areas including the Wheatbelt and Goldfields regions. Primary habitat for this species is eucalypt and casuarina woodlands which is abundant within and outside the study areas.

Malleefowl habitat suitability assessments showed the study area contains habitat suitable for foraging and dispersal only, and is unsuitable for breeding. A key feature of Malleefowl breeding habitat is thick, vision obscuring vegetation that provides plentiful leaf litter for building the mound. The areas with the thickest vegetation cover in the study area are mostly part of the floodway and associated drainage lines which are not suitable for mound building as they are likely to flood which also prevents leaf litter from accumulating. Malleefowl was recorded from a fresh track outside the Fimiston study area, approximately 5 km to the north-east.

Chuditch was recorded from one scat outside the Fimiston Operational Area, approximately 7 km east north-east. Chuditch records in the area are sparse with the closest known desktop records over 40 km to the south at Kambalda, north-west of Lake Lefroy. Open woodland habitat within the study area may be suitable foraging and dispersal habitat.

6.1.2 SRE and significant invertebrate fauna

A total of 40 SRE taxa have been collected from surveys within the Fimiston Operational Area, comprising of two Confirmed SRE species, and 25 Potential SRE species. In addition, one P1 species, *Jalmenus aridus* – Inland Hairstreak butterfly, was recorded. The discovery of *Jalmenus aridus* is discussed in detail in a separate memo (Phoenix 2022c) due to the significance of this record. All

previously known populations of *Jalmenus aridus* have disappeared since its discovery in 1983, and it has not been recorded since 1999.

The Confirmed SRE species is a mygalomorph spider, *Missulena harewoodi*. This species has been collected from two previous surveys within the study area (Harewood 2015; Phoenix 2019a), and the current survey. One of these records is from within the Fimiston Operations Area and two records are outside. Notably, the female of this species was excavated from a burrow outside of the study area, indicating breeding habitat is present outside of the study area.

Of the Potential SRE taxa, three are only known only from within the Eastern Floodway (*Austrohorus* 'sp. Fi01', *Nesidiochernes* 'sp. Fi01' and *Spherillo* 'sp. indet. A1'). All three are morpho-species from genera that have such poor taxonomic resolution that comparisons to other specimens by experienced taxonomists is not generally undertaken. There is currently very limited literature available outlining physical characters which may be reliably used to identify species. The pseudoscorpion and isopod morpho-species codes are a reflection of the number of different species recorded from the survey rather than new species.

Nesidiochernes 'sp. Fi01' was recorded from two sites, Rehabilitation and Open woodland, thus is highly likely to be more widespread and occur outside of the Eastern Floodway.

Similarly, *Spherillo* 'sp. indet. A1' was recorded from rehabilitation and is also highly likely to be more widespread and occur outside of the Eastern Floodway.

Austrohorus 'sp. Fi01' was collected in the Shrubland along drainage line habitat which is High potential SRE habitat. The genus *Austrohorus* is widespread throughout arid Australia and is commonly collected from arid areas, however this group has very limited taxonomic knowledge, with very little in the way of reliable characters on which to distinguish species within the genus. It is uncertain whether the regional records of *Austrohorus* sp. indet. are the same or many different species, however, given the genus is well known from arid areas, it is possibly well-adapted to arid environments thus more widely distributed.

The Shrubland along drainage line High potential SRE habitat represents a restricted habitat and is limited within the study area, occupying only 47.3 ha (4.3%) of the study area. An additional 35.5 ha is located outside of the study area between the northern and southern parts of the Eastern Floodway and also extents to the north-east of the study area. An additional seven species from SRE groups were collected from the Shrubland along drainage line habitat, of which six are widespread and one is a Potential SRE (*Buddelundia frontosa*). *B. frontosa* has a known distribution of about 10,000 km^2 but is only known from three populations in the Goldfields.

6.2 CONCLUSION

Within the wider Fimiston Operational Area, impacts to conservation significant vertebrate fauna likely to occur in the study area are considered negligible. The two Threatened vertebrate species, Malleefowl *Leipoa ocellata* and Chuditch *Dasyurus geoffroii* (both VU), may potentially use parts of the study area intermittently for dispersal and foraging, but not to be breeding residents. Any significant species with potential to occur would not be restricted to the study area.

Development in close proximity to the conservation significant invertebrate species, *Jalmenus aridus*, Inland Hairstreak butterfly (P1), is not advised.

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Appendix 1 Survey site locations

Site name	Site type	Latitude	Longitude
BAT01	Basic fauna	-30.787699	121.569929
BAT02	Basic fauna	-30.776509	121.543744
Fim01	Basic fauna	-30.753591	121.527789
Fim02	Basic fauna	-30.758421	121.530234
Fim03	Basic fauna	-30.759175	121.534461
Fim04	Basic fauna	-30.769612	121.537375
Fim05	Basic fauna	-30.776864	121.538397
Fim06	Basic fauna	-30.776044	121.552438
Fim07	Basic fauna	-30.781743	121.55465
Fim08	Basic fauna	-30.770565	121.544443
Fim09	Basic fauna	-30.792273	121.551458
Fim10	Basic fauna	-30.790635	121.544635
PIT01	Basic fauna	-30.755707	121.530776
PIT02	Basic fauna	-30.77645	121.541902
PIT03	Basic fauna	-30.787115	121.570212
PIT04	Basic fauna and Targeted SRE	-30.74281	121.625997
PIT05	Basic fauna and Targeted SRE	-30.702921	121.566795
PIT06	Basic fauna and Targeted SRE	-30.753435	121.641567
Myg01	Targeted SRE	-30.743312	121.638834
Myg02	Targeted SRE	-30.742252	121.612856
Myg03	Targeted SRE	-30.741605	121.583872
Myg04	Targeted SRE	-30.728651	121.568095
Myg05	Targeted SRE	-30.688455	121.56597
Myg06	Targeted SRE	-30.674018	121.547664
Myg07	Targeted SRE	-30.76463	121.647442
Myg08	Targeted SRE	-30.755666	121.647678

Appendix 2 Terrestrial fauna survey site descriptions

Appendix 3 Vertebrate fauna field survey results

Family	Species	Common name	Status	Introduced	This survey
Birds (27)					
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat			•
Acanthizidae	*Smicrornis brevirostris*	Weebill			•
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			•
Campephagidae	*Coracina novaehollandiae subpallida*	Black-faced Cuckoo-shrike			•
Columbidae	*Ocyphaps lophotes*	Crested Pigeon			•
Corvidae	*Corvus coronoides*	Australian Raven			•
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird			•
Cracticidae	*Strepera versicolor*	Grey Currawong			•
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze Cuckoo			•
Dicruridae	*Grallina cyanoleuca*	Magpie-lark			•
Dicruridae	*Rhipidura leucophrys*	Willie Wagtail			•
Dromaiidae	*Dromaius novaehollandiae*	Emu			•
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren			•
Maluridae	*Malurus splendens*	Splendid Fairy-wren			•
Megapodiidae	*Leipoa ocellata*	Malleefowl	VU (EPBC & BC Acts)		•
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater			•
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird			•
Meliphagidae	*Gavicalis virescens*	Singing Honeyeater			•
Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater			•
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater			•
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner			•
Meliphagidae	*Ptilotula ornata*	Yellow-plumed Honeyeater			•
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush			•
Pachycephalidae	*Oreoica gutturalis*	Crested Bellbird			•
Pardalotidae	*Pardalotus striatus*	Striated Pardalote			•

Psittacidae	*Parvipsitta porphyrocephala*	Purple-crowned Lorikeet			•
Psittacidae	*Platycercus zonarius*	Australian Ringneck			•
Mammals (13)					
Bovidae	*Bos taurus*	European Cattle		*	•
Dasyuridae	*Dasyurus geoffroii*	Chuditch	VU (EPBC & BC Acts)		•
Felidae	*Felis catus*	Cat		*	•
Leporidae	*Oryctolagus cuniculus*	Rabbit		*	•
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo			•
Molossidae	*Austronomus australis*	White-striped Free-tailed Bat			•
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna			•
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat			•
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat			•
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat			•
Vespertilionidae	*Scotorepens balstoni*	Inland Broad-nosed Bat			•
Vespertilionidae	*Vespadelus baverstocki*	Inland Forest Bat			•
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat			•
Reptiles (7)					
Agamidae	*Ctenophorus cristatus*	Bicycle Dragon			•
Gekkonidae	*Gehyra variegata*	Variegated Dtella			•
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko			•
Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard			•
Scincidae	*Menetia greyii*	Common Dwarf Skink			•
Scincidae	*Tiliqua occipitalis*	Western Blue-tongue			•
Scincidae	*Tiliqua rugosa*	Bobtail			•

Appendix 4 Vertebrate species records from desktop review and this survey

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Amphibians																	
Hylidae	*Litoria moorei*	Motorbike Frog					●										
Limnodynastidae	*Neobatrachus kunapalari*	Kunapalari Frog					●					●				●	
Limnodynastidae	*Neobatrachus sutor*	Shoemaker Frog					●					●		●		●	
Limnodynastidae	*Neobatrachus wilsmorei*	Plonking Frog					●							●			
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet					●					●				●	
Reptiles																	
Agamidae	*Ctenophorus caudicinctus*	Ring-tailed Dragon					●					●				●	
Agamidae	*Ctenophorus cristatus*	Bicycle Dragon					●			●	●	●	●	●		●	●
Agamidae	*Ctenophorus fordi*	Mallee Sand Dragon					●							●			
Agamidae	*Ctenophorus isolepis citrinus*	Crested Dragon					●										
Agamidae	*Ctenophorus nuchalis*	Central Netted Dragon					●										
Agamidae	*Ctenophorus reticulatus*	Western Netted Dragon					●							●			
Agamidae	*Ctenophorus salinarum*	Salt Pan Dragon					●										
Agamidae	*Ctenophorus scutulatus*	Lozenge-marked Dragon					●				●			●	●	●	
Agamidae	*Moloch horridus*	Thorny Devil					●							●			
Agamidae	*Pogona minor minor*	Dwarf Bearded Dragon					●										
Agamidae	*Tympanocryptis pseudosephos*	Pebble Dragon					●								●	●	
Boidae	*Morelia spilota imbricata*	Carpet Python					●										
Carphodactylidae	*Nephrurus laevissimus*						●										

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Carphodactylidae	*Nephrurus vertebralis*						●							●			
Cheluidae	*Chelodina colliei*	Oblong Turtle					●										
Diplodactylidae	*Diplodactylus granariensis granariensis*						●					●		●		●	
Diplodactylidae	*Diplodactylus pulcher*						●					●		●		●	
Diplodactylidae	*Hesperoedura reticulata*						●					●		●		●	
Diplodactylidae	*Lucasium damaeum*						●										
Diplodactylidae	*Lucasium maini*						●			●		●		●		●	
Diplodactylidae	*Rhynchoedura ornata*	Western Beaked Gecko					●					●		●		●	
Diplodactylidae	*Strophurus assimilis*	Goldfields Spiny-tailed Gecko					●				●	●				●	
Diplodactylidae	*Strophurus elderi*						●							●			
Elapidae	*Acanthophis pyrrhus*	Desert Death Adder					●										
Elapidae	*Brachyurophis fasciolatus fasciolatus*	Narrow-banded Shovel-nosed Snake					●										
Elapidae	*Brachyurophis semifasciatus*	Southern Shovel-nosed Snake					●					●				●	
Elapidae	*Demansia psammophis*	Yellow-faced Whipsnake					●					●		●		●	
Elapidae	*Echiopsis curta*	Bardick					●										
Elapidae	*Furina ornata*	Moon Snake					●										
Elapidae	*Neelaps bimaculatus*	Black-naped Snake					●										
Elapidae	*Parasuta gouldii*						●										
Elapidae	*Parasuta monachus*						●							●			
Elapidae	*Pseudechis australis*	Mulga Snake					●					●		●		●	

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Elapidae	*Pseudonaja mengdeni*	Western Brown Snake					●					●		●		●	
Elapidae	*Pseudonaja modesta*	Ringed Brown Snake					●							●			
Elapidae	*Simoselaps bertholdi*	Jan's Banded Snake					●					●				●	
Elapidae	*Suta fasciata*	Rosen's Snake					●										
Gekkonidae	*Gehyra purpurascens*						●					●				●	
Gekkonidae	*Gehyra variegata*						●					●		●		●	●
Gekkonidae	*Hemidactylus frenatus*	Asian House Gecko				●	●										
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko					●					●		●	●	●	●
Gekkonidae	*Underwoodisaurus milii*	Barking Gecko					●					●		●		●	
Pygopodidae	*Delma australis*						●					●		●		●	
Pygopodidae	*Delma butleri*						●							●			
Pygopodidae	*Lialis burtonis*						●					●		●		●	●
Pygopodidae	*Pygopus lepidopodus*	Common Scaly Foot					●										
Pygopodidae	*Pygopus nigriceps*						●										
Scincidae	*Cryptoblepharus buchananii*						●							●			
Scincidae	*Cryptoblepharus plagiocephalus*						●					●				●	
Scincidae	*Ctenotus atlas*						●							●			
Scincidae	*Ctenotus leonhardii*						●							●			
Scincidae	*Ctenotus schomburgkii*						●							●			
Scincidae	*Ctenotus uber*	Spotted Ctenotus					●					●		●		●	
Scincidae	*Cyclodomorphus melanops elongatus*	Slender Blue-tongue					●							●			

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Scincidae	*Egernia depressa*	Southern Pygmy Spiny-tailed Skink					●										
Scincidae	*Egernia formosa*						●							●			
Scincidae	*Egernia stokesii badia*	Western Spiny-tailed Skink	EN	VU			●		●								
Scincidae	*Eremiascincus richardsonii*	Broad-banded Sand Swimmer					●										
Scincidae	*Hemiergis initialis*						●					●				●	
Scincidae	*Lerista kingi*													●			
Scincidae	*Lerista muelleri*						●										
Scincidae	*Lerista picturata*						●					●		●		●	
Scincidae	*Lerista stictopleura*						●										
Scincidae	*Lerista timida*						●					●				●	
Scincidae	*Liopholis inornata*	Desert Skink					●							●			
Scincidae	*Menetia greyii*						●					●		●	●	●	●
Scincidae	*Morethia adelaidensis*						●							●			
Scincidae	*Morethia butleri*						●										
Scincidae	*Morethia obscura*						●										
Scincidae	*Tiliqua occipitalis*	Western Blue-tongue					●					●		●		●	●
Scincidae	*Tiliqua rugosa*						●			●		●	●	●		●	●
Varanidae	*Varanus caudolineatus*						●					●		●		●	
Varanidae	*Varanus gouldii*	Gould's Monitor					●					●	●	●	●	●	
Varanidae	*Varanus tristis*	Black-headed Monitor					●										
Aves																	

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Acanthizidae	*Acanthiza apicalis*	Broad-tailed Thornbill					●			●	●	●		●		●	
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill					●			●	●	●		●		●	
Acanthizidae	*Acanthiza robustirostris*	Slaty-backed Thornbill					●										
Acanthizidae	*Acanthiza uropygialis*	Chestnut-rumped Thornbill					●			●	●	●		●	●	●	
Acanthizidae	*Aphelocephala leucopsis*	Southern Whiteface					●					●				●	
Acanthizidae	*Gerygone fusca*	Western Gerygone					●				●				●	●	
Acanthizidae	*Hylacola cauta whitlocki*	Shy Heathwren (western)					●										
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat					●				●	●		●	●	●	●
Acanthizidae	*Smicrornis brevirostris*	Weebill					●			●	●	●	●	●		●	●
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk					●										
Accipitridae	*Accipiter fasciatus*	Brown Goshawk					●				●						
Accipitridae	*Aquila audax*	Wedge-tailed Eagle					●				●	●				●	
Accipitridae	*Elanus caeruleus*	Black-shouldered Kite					●					●			●	●	
Accipitridae	*Haliastur sphenurus*	Whistling Kite					●										
Accipitridae	*Hieraaetus morphnoides*	Little Eagle					●										
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar					●										
Anatidae	*Anas gracilis*	Grey Teal					●				●	●				●	
Anatidae	*Anas rhynchotis*	Australasian Shoveler					●										
Anatidae	*Anas superciliosa*	Pacific Black Duck					●					●				●	
Anatidae	*Aythya australis*	Hardhead					●										
Anatidae	*Biziura lobata*	Musk Duck					●										

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Anatidae	*Chenonetta jubata*	Australian Wood Duck					●					●				●	
Anatidae	*Cygnus atratus*	Black Swan					●				●						
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck					●										
Anatidae	*Stictonetta naevosa*	Freckled Duck					●										
Anatidae	*Tadorna tadornoides*	Australian Shelduck					●					●	●			●	
Anhingidae	*Anhinga novaehollandiae*	Australasian Darter					●										
Apodidae	*Apus pacificus*	Fork-tailed Swift	Mig.	Mig.				●									
Ardeidae	*Ardea ibis*	Cattle Egret						●	●								
Ardeidae	*Ardea modesta*	Eastern Great Egret						●									
Ardeidae	*Ardea novaehollandiae*	White-faced Heron					●			●	●						
Artamidae	*Artamus cinereus*	Black-faced Woodswallow					●							●		●	●
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow					●			●	●	●		●		●	
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike					●										
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike					●			●	●	●		●	●	●	
Campephagidae	*Lalage tricolor*	White-winged Triller					●					●		●		●	
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar					●				●						
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover					●				●						
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel					●										
Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel					●										
Charadriidae	*Thinornis cucullatus*	Hooded Plover			P4			●	●								
Charadriidae	*Vanellus tricolor*	Banded Lapwing					●				●						

Family	Species	Common name	EPBC Act	WC Act	DBCA Priority Fuana	Naturalised	DBCA (2017a)	Department of the Environment and Energy (2017)	DBCA (2017b)	Harewood 2010a, b, c (in Harewood 2015)	Harewood 2011 (in Harewood 2015)	Harewood (2015)	KLA 2009 a, b, c (in Harewood 2015	McKenzie and Hall (1992)	Phoenix (2018)	All study area records	This survey
Cinclosomatidae	*Cinclosoma clarum*	Western Chestnut Quail-thrush									●	●				●	
Climacteridae	*Climacteris rufus*	Black-tailed Treecreeper												●			
Columbidae	*Columba livia*	Domestic Pigeon				●	●					●				●	
Columbidae	*Ocyphaps lophotes*	Crested Pigeon					●				●	●	●	●	●	●	●
Columbidae	*Phaps chalcoptera*	Common Bronzewing					●			●	●	●			●	●	
Columbidae	*Streptopelia chinensis*	Spotted Turtle-Dove				●											
Columbidae	*Streptopelia senegalensis*	Laughing Turtle-Dove				●	●										
Corvidae	*Corvus bennetti*	Little Crow					●										
Corvidae	*Corvus coronoides*	Australian Raven					●				●	●	●			●	●
Corvidae	*Corvus orru*	Torresian Crow					●										
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird					●			●	●	●	●	●	●	●	●
Cracticidae	*Cracticus tibicen*	Australian Magpie					●			●	●	●	●	●		●	●
Cracticidae	*Cracticus torquatus*	Grey Butcherbird					●			●	●	●		●	●	●	
Cracticidae	*Strepera versicolor*	Grey Currawong					●				●	●	●	●	●	●	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo					●										
Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo					●							●	●	●	
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze Cuckoo					●				●	●		●		●	●
Cuculidae	*Chrysococcyx osculans*	Black-eared Cuckoo					●								●	●	
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird					●					●				●	
Dicruridae	*Grallina cyanoleuca*	Magpie-lark					●				●	●			●	●	●
Dicruridae	*Rhipidura albiscapa*	Grey Fantail					●										
Dicruridae	*Rhipidura leucophrys*	Willie Wagtail					●			●		●	●		●	●	●

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Dromaiidae	*Dromaius novaehollandiae*	Emu					●			●		●	●	●	●	●	●
Estrilidae	*Taeniopygia guttata*	Zebra Finch					●								●	●	
Falconidae	*Falco berigora*	Brown Falcon					●					●		●	●	●	
Falconidae	*Falco cenchroides*	Australian Kestrel					●				●	●			●	●	
Falconidae	*Falco longipennis*	Australian Hobby					●				●	●				●	
Falconidae	*Falco peregrinus*	Peregrine Falcon		SP							●						
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher					●			●		●				●	
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher					●										
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow					●				●	●				●	
Hirundinidae	*Hirundo neoxena*	Welcome Swallow					●			●	●	●		●		●	
Hirundinidae	*Petrochelidon nigricans*	Tree Martin					●				●	●		●		●	
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren					●				●	●		●		●	●
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairy-wren					●										
Maluridae	*Malurus splendens*	Splendid Fairy-wren					●				●	●			●	●	●
Megapodiidae	*Leipoa ocellata*	Malleefowl	VU	VU			●	●	●							●	●
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater					●				●	●			●	●	●
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird					●			●	●	●	●	●		●	●
Meliphagidae	*Epthianura albifrons*	White-fronted Chat					●										
Meliphagidae	*Epthianura tricolor*	Crimson Chat					●								●	●	
Meliphagidae	*Gavicalis virescens*	Singing Honeyeater									●	●		●	●	●	●
Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater					●				●	●		●	●	●	●
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater					●			●	●	●		●	●	●	●
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner					●			●	●	●	●	●	●	●	●

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Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater					●					●				●	
Meliphagidae	*Ptilotula ornata*	Yellow-plumed Honeyeater								●	●	●		●	●	●	●
Meliphagidae	*Ptilotula plumula*	Grey-fronted Honeyeater										●				●	
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater					●			●	●	●		●	●	●	
Meropidae	*Merops ornatus*	Rainbow Bee-eater					●	●	●	●	●	●	●	●	●	●	
Motacillidae	*Anthus australis*	Australian Pipit					●				●	●		●		●	
Motacillidae	*Motacilla cinerea*	Grey Wagtail	Mig.	Mig.				●									
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella					●					●		●		●	
Otididae	*Ardeotis australis*	Australian Bustard					●										
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush					●				●	●	●	●		●	●
Pachycephalidae	*Oreoica gutturalis pallescens*	Crested Bellbird					●			●	●	●	●	●	●	●	●
Pachycephalidae	*Pachycephala inornata*	Gilbert's Whistler					●					●				●	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler					●					●				●	
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote					●										
Pardalotidae	*Pardalotus striatus*	Striated Pardalote					●			●	●	●	●	●	●	●	●
Petroicidae	*Eopsaltria australis griseogularis*	Western Yellow Robin					●										
Petroicidae	*Melanodryas cucullata*	Hooded Robin					●							●			
Petroicidae	*Microeca fascinans*	Jacky Winter					●			●	●	●		●		●	
Petroicidae	*Petroica goodenovii*	Red-capped Robin					●			●		●	●	●		●	
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant					●										
Podargidae	*Podargus strigoides*	Tawny Frogmouth					●				●	●				●	
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe					●				●						

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Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe					●				●						
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler					●					●		●	●	●	
Psittacidae	*Cacatua roseicapilla*	Galah					●				●	●		●	●	●	
Psittacidae	*Cacatua sanguinea*	Little Corella					●										
Psittacidae	*Melopsittacus undulatus*	Budgerigar									●						
Psittacidae	*Nymphicus hollandicus*	Cockatiel					●							●			
Psittacidae	*Parvipsitta porphyrocephala*	Purple-crowned Lorikeet									●	●		●		●	●
Psittacidae	*Pezoporus occidentalis*	Night Parrot	EN	CR				●									
Psittacidae	*Platycercus icterotis*	Western Rosella					●										
Psittacidae	*Platycercus varius*	Mulga Parrot					●					●		●		●	
Psittacidae	*Platycercus zonarius*	Australian Ringneck					●			●	●	●	●	●	●	●	●
Rallidae	*Fulica atra*	Eurasian Coot					●										
Rallidae	*Porzana fluminea*	Australian Spotted Crake					●										
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt					●				●						
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt					●										
Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet					●										
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Mig.	Mig.				●									
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	Mig.	Mig.			●	●	●								
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	CR/Mig	VU/Mig			●	●	●								
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	Mig.	Mig.				●									

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Scolopacidae	*Calidris ruficollis*	Red-necked Stint	Mig.	Mig.			●		●								
Scolopacidae	*Tringa glareola*	Wood Sandpiper	Mig.	Mig.			●		●								
Scolopacidae	*Tringa nebularia*	Common Greenshank	Mig.	Mig.			●	●	●								
Sylviidae	*Megalurus cruralis*	Brown Songlark												●			
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill					●										
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis					●										
Turnicidae	*Turnix velox*	Little Button-quail					●				●				●	●	
Tytonidae	*Tyto alba delicatula*	Barn Owl					●										
Zosteropidae	*Zosterops lateralis*	Grey-breasted White-eye					●										
Mammals																	
Bovidae	*Bos taurus*	European Cattle				●	●					●			●	●	●
Bovidae	*Capra hircus*	Goat				●	●			●	●	●	●			●	
Bovidae	*Ovis aries*	Sheep					●					●	●			●	
Burramyidae	*Cercartetus concinnus*	Western Pygmy-possum					●					●		●		●	
Canidae	*Canis lupus*	Dog				●						●				●	
Canidae	*Canis dingo*	Dingo				●	●										
Canidae	*Vulpes vulpes*	Red Fox				●											
Dasyuridae	*Dasyurus geoffroii*	Chuditch	VU	VU				●								●	●
Dasyuridae	*Ningaui yvonneae*	Southern Ningaui					●										
Dasyuridae	*Sminthopsis crassicaudata*	Fat-tailed Dunnart					●							●			
Dasyuridae	*Sminthopsis dolichura*	Little long-tailed Dunnart					●					●		●		●	

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Dasyuridae	*Sminthopsis gilberti*	Gilbert's Dunnart					●										
Dasyuridae	*Sminthopsis ooldea*	Ooldea Dunnart					●					●				●	
Emballonuridae	*Taphozous hilli*	Hill's Sheathtail-bat					●					●				●	
Equidae	*Equus asinus*	Donkey				●											
Equidae	*Equus caballus*	Horse				●											
Felidae	*Felis catus*	Cat				●	●					●				●	●
Leporidae	*Oryctolagus cuniculus*	Rabbit				●	●			●	●	●	●		●	●	●
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo					●				●	●	●	●	●	●	●
Macropodidae	*Macropus robustus*	Euro					●			●							
Macropodidae	*Macropus rufus*	Red Kangaroo					●			●		●		●		●	
Molossidae	*Austronomus australis*	White-striped Free-tailed Bat									●	●		●	●	●	●
Molossidae	*Mormopterus petersi*	Inland Free-tailed Bat									●	●		●	●	●	
Muridae	*Mus musculus*	House Mouse				●	●					●		●		●	
Muridae	*Pseudomys bolami*	Bolam's Mouse					●					●				●	
Muridae	*Pseudomys hermannsburgensis*	Sandy Inland Mouse					●										
Myrmecobiidae	*Myrmecobius fasciatus*	Numbat	VU	EN			●		●								
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna					●					●		●	●	●	●
Thylacomyidae	*Macrotis lagotis*	Bilby	VU	VU			●		●								
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat					●				●	●		●	●	●	●
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat					●				●	●		●	●	●	●
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat					●				●	●		●	●	●	●

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Vespertilionidae	*Nyctophilus major tor*	South-western Long-eared Bat									●						
Vespertilionidae	*Scotorepens balstoni*	Inland Broad-nosed Bat					●				●	●		●	●	●	●
Vespertilionidae	*Vespadelus baverstocki*	Inland Forest Bat					●				●	●				●	●
Vespertilionidae	*Vespadelus finlaysoni*	Finlayson's Cave Bat					●					●				●	
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat					●					●		●	●	●	●