PHOENIX
ENVIRONMENTAL SCIENCES

Terrestrial fauna assessment for the Fimiston Gold Mine Operations (Revised)

Prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd

February 2024

Final

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Prepared for Kalgoorlie Consolidated Gold Mines Pty Ltd

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Phoenix Environmental Sciences Pty Ltd
2/3 King Edward Road OSBORNE PARK WA 6017
P: 08 6323 5410
E: admin@phoenixenv.com.au
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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 to supplement a previous fauna survey within the Eastern Floodway area of the Fimiston Operational Area and a regional SRE survey targeting three species of mygalomorph spider currently only known in the Fimiston IIE area (*Conothele* 'MYG554' ('kalgoorlie'), *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, and a Level 1 terrestrial fauna survey within proposed infrastructure areas within the Eastern Floodway. Phoenix subsequently undertook a data currency review and gap biological review and gap biological survey for the broader Fimiston Operations in spring 2017, and following this, a SRE survey for the FIM IIE Project(Phoenix 2019). 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. 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, habitat assessment, 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 11 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 vertebrate 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 confidential 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.

CONTENTS

Executive summary ii
Contents iv
1. Introduction 7
1.1 Background 7
1.2 Scope of work 8
1.3 Study area 8
2. Legislative context 10
2.1 Commonwealth 10
2.2 State 10
2.2.1 Threatened and Priority Species 10
2.2.2 Critical habitat 11
2.2.3 Other significant fauna 11
2.2.4 Short-range endemic invertebrates 11
2.2.5 Environmentally sensitive areas 12
3. Existing environment 13
3.1 Interim Biogeographic Regionalisation of Australia 13
3.2 Land systems and surface geology 14
3.3 Climate and weather 18
3.4 Land use 19
3.5 Conservation reserves and ESAs 19
4. Methods 20
4.1 Desktop review 20
4.2 Historical surveys 20
4.3 Field survey 21
4.3.1 Survey timing 21
4.3.2 Basic terrestrial fauna survey 21
4.3.3 Regional targeted mygalomorph spider survey 26
4.3.4 Specimen identification and nomenclature 26
4.3.5 Likelihood of occurrence assessment 27
4.3.6 Survey personnel 27
5. Results 29
5.1 Desktop review 29
5.1.1 Vertebrate fauna 29
5.1.2 SRE and significant invertebrate fauna 32
5.2 Historical surveys 38
5.2.1 Harewood (2015). Fauna survey (Level 2 - Phase 1 and 2). Proposed Tails Storage Facility Expansion. 38
5.2.2 Phoenix (2018). Flora and vegetation, and terrestrial fauna survey for proposed infrastructure within the Development Envelope of the Fimiston Gold Mine Operations 41
5.2.3 Phoenix (2019). Targeted flora and SRE survey for the FIM IIE Project 44
5.3 Field survey 45

5.3.1 Vertebrate fauna 45
5.3.2 SRE and significant invertebrate fauna 54
5.4 Survey limitations 64
6. Discussion 65
6.1.1 Vertebrate fauna 65
6.1.2 SRE and significant invertebrate fauna 66
6.2 Conclusion 71
References 72

LIST OF FIGURES

Figure 1-1 Project location and study area 9
Figure 3-1 Study area in relation to IBRA bioregions and subregions 15
Figure 3-2 Land systems in the study area 16
Figure 3-3 Surface geology in the study area 17
Figure 3-4 Annual climate and weather data for Kalgoorlie-Boulder Airport (no. 012038) and mean monthly data for the 12 months preceding the survey (BoM 2021) 18
Figure 4-1 Terrestrial fauna survey sites 28
Figure 5-1 Desktop records of significant vertebrate fauna 31
Figure 5-2 Desktop records of SRE invertebrates 37
Figure 5-3 Fauna habitats and significant fauna records from the field survey 48
Figure 5-4 Malleefowl habitat suitability within the study area 50
Figure 5-5 SRE habitats and recorded SRE taxa 63
Figure 6-1 Consolidated survey sites 67
Figure 6-2 Consolidated fauna habitats and significant fauna records 68
Figure 6-3 Consolidated Malleefowl habitat suitability 69
Figure 6-4 Consolidated SRE habitats and recorded SRE taxa 70

LIST OF TABLES

Table 3-1 Land systems and extent in study area 14
Table 3-2 Surface geology of the study area, extent by deposit type 14
Table 4-1 Survey dates 21
Table 4-2 Terrestrial fauna survey effort 22
Table 4-3 Survey personnel 27
Table 5-1 Summary of terrestrial fauna desktop results 29
Table 5-2 Significant vertebrate fauna identified in the desktop review 30
Table 5-3 SRE and Threatened and Priority invertebrate taxa identified in the desktop review 33
Table 5-4 Survey dates (Harewood 2015) 38
Table 5-5 Site locations (Harewood 2015) 38
Table 5-6 Trapping effort at systematic sites (Harewood 2015) 39
Table 5-7 Trapping effort at non-systematic sites (Harewood 2015) 40
Table 5-8 Number of vertebrate fauna species recorded (Harewood 2015) 40
Table 5-9 SRE invertebrate species recorded (Harewood 2015) 41
Table 5-10 Survey dates (Phoenix 2018a) 41
Table 5-11 Terrestrial fauna survey sites and effort (Phoenix 2018a) 42
Table 5-12 Number of vertebrate taxa recorded during the survey, by group (Phoenix 2018a) 43
Table 5-13 Survey dates (Phoenix 2019) 44
Table 5-14 Survey site locations (Phoenix 2019) 44
Table 5-15 SRE taxa from target SRE groups recorded during the survey (Phoenix 2019) 45

Table 5-16 Extent and description of each fauna habitat in the study area 46
Table 5-17 Malleefowl habitat assessment scores 49
Table 5-18 Number of vertebrate species recorded in survey, by group 51
Table 5-19 Details of significant vertebrate fauna recorded during the field survey 51
Table 5-20 Likelihood of occurrence for significant vertebrate fauna identified in the desktop review 52
Table 5-21 Extent and description of each SRE habitat in the study area 54
Table 5-22 Summary of SRE taxa collected during the field survey 55
Table 5-23 Specimens from SRE groups recorded in the field survey. Rows in grey represent previously unknown taxa. 57
Table 5-24 Consideration of potential survey limitations 64

LIST OF APPENDICES

Appendix 1 Survey site locations
Appendix 2 Terrestrial fauna survey site descriptions
Appendix 3 Vertebrate species records from desktop review and this survey

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 to supplement a previous fauna survey within the Eastern Floodway area of the Fimiston Operation Area and a regional SRE survey targeting several species of mygalomorph spider currently only known from 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 Climatic Region as defined by EPA (2020).

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 survey within proposed infrastructure areas within the Eastern Floodway (Phoenix 2018a) (Figure 1-1). Phoenix subsequently undertook a data currency review and gap biological review for the broader Fimiston Operations in spring 2017 (Phoenix 2018b), and following this, a SRE survey for the FIM IIE Project (Phoenix 2019) (Figure 1-1).

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. The updated guidance also changed the naming conventions for survey types with Level 2 surveys now referred to as detailed and Level 1 surveys as basic. 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, so it was determined that it may be beneficial to conduct regional surveys to find those species.

As the study area is small in size, located within a well surveyed area and unlikely to support many significant fauna, a basic vertebrate fauna survey was considered adequate with additional targeted work for SREs.

1.2 SCOPE OF WORK

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

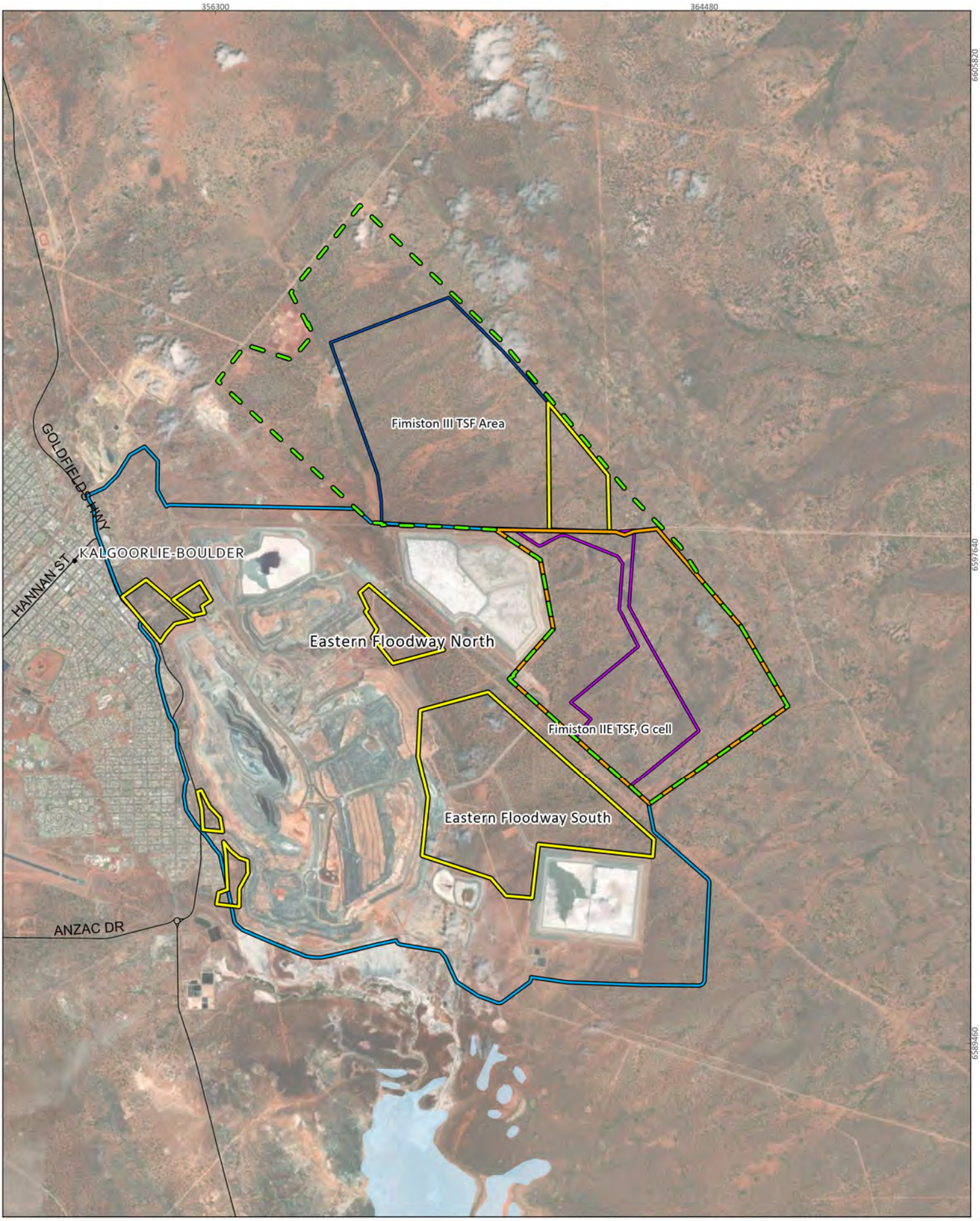
- conduct a basic fauna survey of additional fauna sites within the Eastern Floodway proposed Waste Rock Landform (WRL) expansion area and any other potential disturbance areas to adequately sample habitats
- conduct a SRE survey (including wet pit trapping) in the Eastern Floodway, focusing on/near 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 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 and Fimiston III TSF (Figure 1-1).



Fimiston report updates
KCGM Operations

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Date	5/04/2023
Drawn by	BK
Map author	PS

0 1 2
Kilometers

1:81,800 (at A4) GDA 1994 MGA Zone 51

- Fimiston IIE
- Fimiston III

Study areas:

- Current survey
- Phoenix 2019 SRE survey
- Phoenix 2018 level 1 survey
- Harewood 2015 level 2 survey
- Roads
- Lakes

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 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 (DoEE 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.

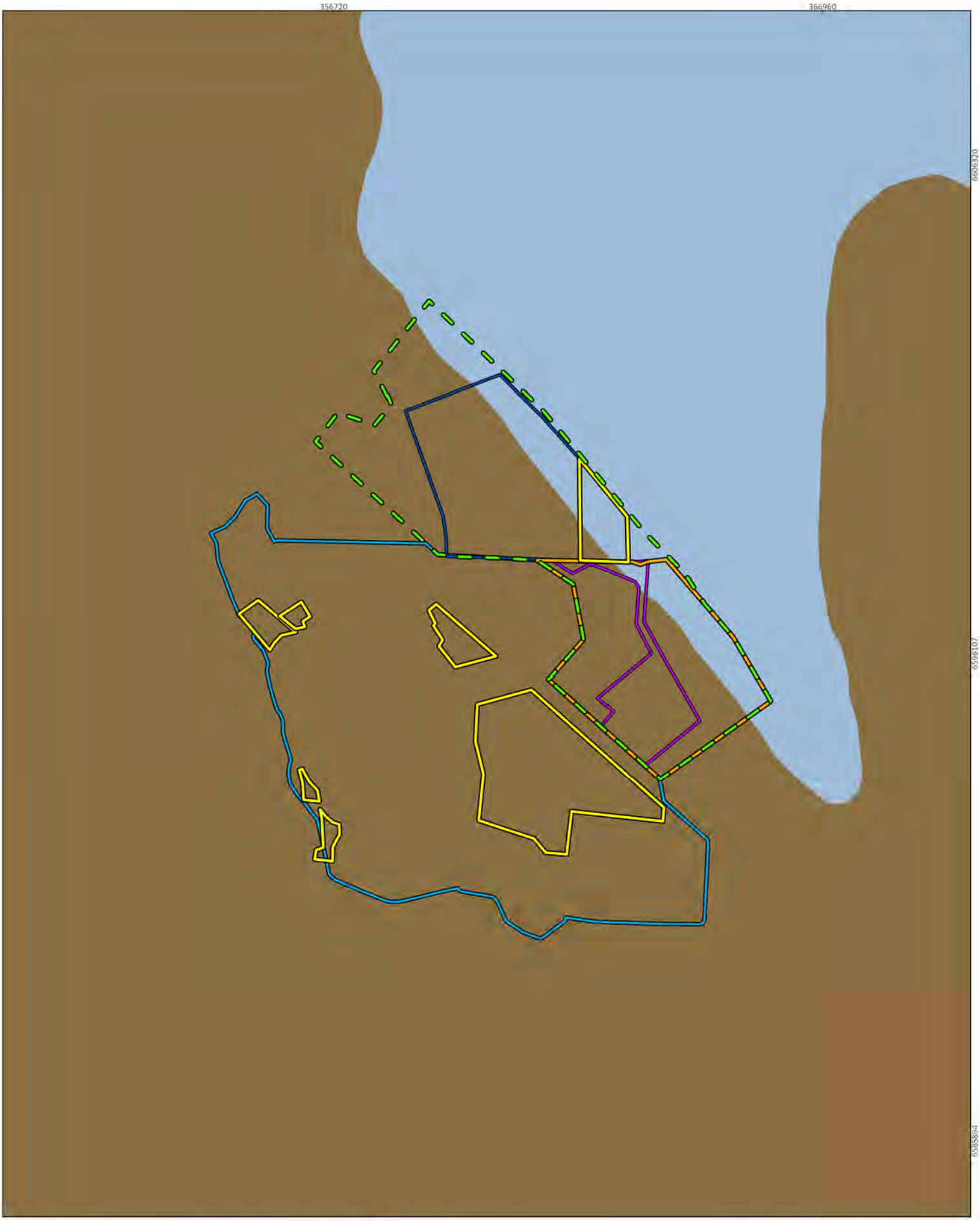
Table 3-1 Land systems and extent in study area

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
	Total	**1,099.4**	**100**

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 3-3).

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
		Total	**1,099.4**	**100**



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Map author	PS

0 1.5 3
Kilometers

1:102,400 (at A4) GDA 1994 MGA Zone 51

- Fimiston IIE
- Fimiston III
- Current study area
- Phoenix 2019 SRE survey
- Phoenix 2018 level 1 survey
- Harewood 2015 level 2 survey

Region, subregion

- Coolgardie,Eastern Goldfield
- Murchison,Eastern Murchison

Figure 3-1

Study area in relation to IBRA bioregions and subregions

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Drawn by	BK
Map author	PS

0 1 2
Kilometers

1:67,100 (at A4) GDA 1994 MGA Zone 51

Fimiston IIE
Fimiston III

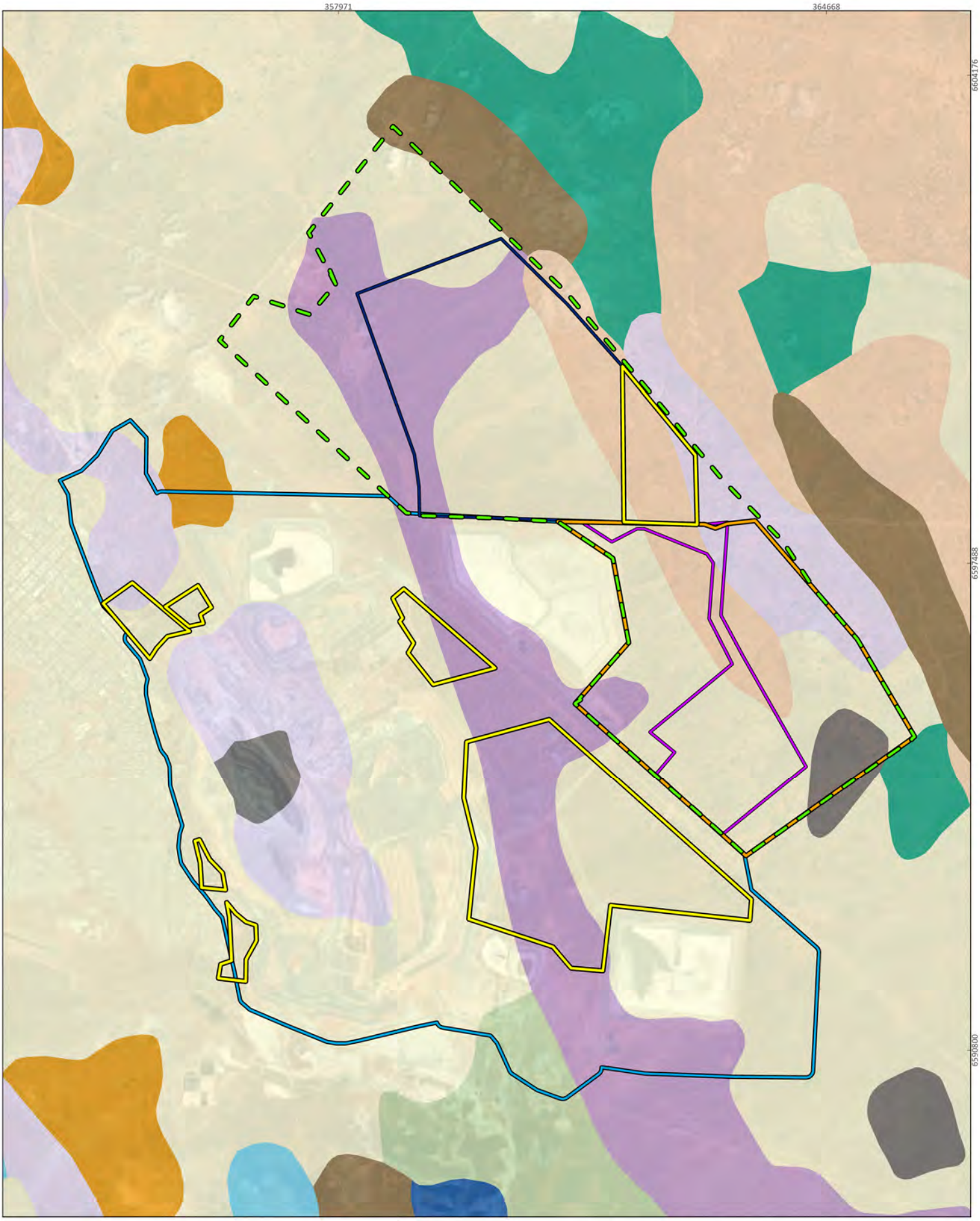
Study areas:
Current survey
Phoenix 2019 SRE survey
Phoenix 2018 level 1 survey
Harewood 2015 level 2 survey

Land system
BB5
Graves System
Gumland System
Moriarty System
Mx43
SV15
Zed System

Figure 3-2

Land systems in the study area

PHOENIX ENVIRONMENTAL SCIENCES



Fimiston report updates
KCGM Operations

Project No	1442
Date	19/04/2023
Drawn by	BK
Map author	PS

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Kilometers

1:67,100 (at A4) GDA 1994 MGA Zone 51

- Fimiston IIE
- Fimiston III

Study areas:

- Current survey
- Phoenix 2019 SRE survey
- Phoenix 2018 level 1 survey
- Harewood 2015 level 2 survey

Surface geology

- Abe
- Ade
- Afe
- Ase
- Aue
- Ave
- Czl
- Qa
- Qdlu
- Qrc
- Qt

Figure 3-3

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 3-4). 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 3-4). 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 3-4).

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 3-4). 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.

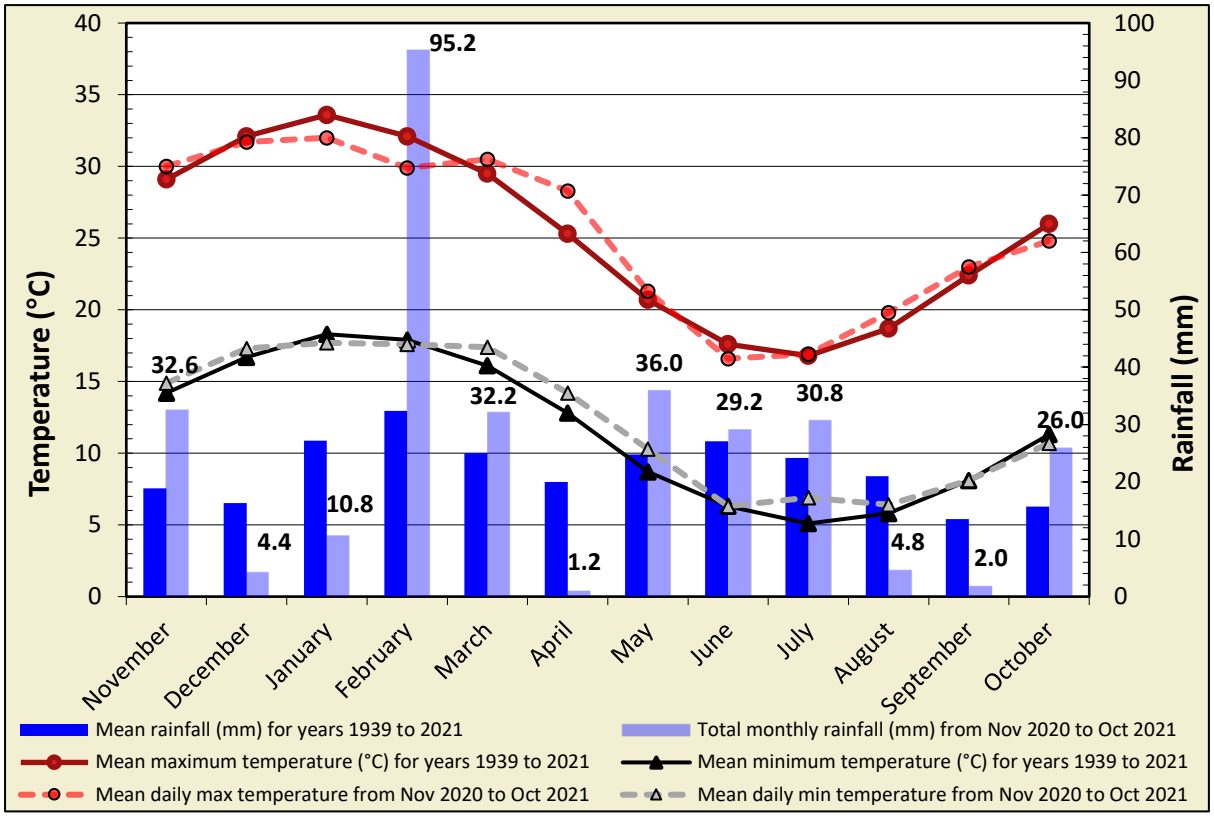

Figure 3-4 **Annual climate and weather data for Kalgoorlie-Boulder Airport (no. 012038) and mean monthly data for the 12 months preceding the survey (BoM 2021)**

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 (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 2016b)
- EPA Technical Guidance: Sampling of short-range endemic invertebrate fauna (EPA 2016c).

4.1 DESKTOP REVIEW

A desktop review was undertaken in 2018 (Phoenix 2018b). 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 fauna and fauna habitat records for the study area (Phoenix 2018a, 2019). 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 Fauna database (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 HISTORICAL SURVEYS

Three field surveys have previously been conducted in the Fimiston Operation Area, Harewood (2015) Level 2 fauna survey of the Fimiston IIE TSF, G-Cell and Fimiston III TSF area; Phoenix (2018a) Level 1 terrestrial fauna survey within proposed infrastructure areas within the Eastern Floodway, and Phoenix (2019) targeted SRE survey for the FIM IIE Project.

The following information was reviewed from the previous field surveys:

- study area
- field survey dates
- site locations
- methods
- survey effort
- results.

4.3 FIELD SURVEY

4.3.1 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 pitfall trap collection	Spring	15-16 October 2021

4.3.2 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 (4.3.2.1)
- active searches (4.3.2.2)
- avifauna surveys (4.3.2.3)
- bat echolocation recordings (4.3.2.4)
- Malleefowl habitat assessment (4.3.2.5)
- SRE invertebrate sampling (4.3.2.6)
- regional targeted surveys for mygalomorph spiders (4.3.3)

4.3.2.1 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 allocation was based on the habitat descriptions and characteristics taken during the field survey. Mapping was based on flora and vegetation mapping undertaken between 2017 and 2024 by Phoenix and an approximately 160 ha section in the southwest of the study area was based on mapping undertaken by Botanica Consulting (2015).

Table 4-2 Terrestrial fauna survey effort

Site	Site type	Study area	Birding (hrs)	Foraging + nocturnal (hrs)	Burrow excavation (#)	Litter sieve (#)	Ultrasonic 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 + targeted SRE	Eastern Floodway	0.8	2.7	3	3		155
PIT02	Basic fauna + targeted SRE	Eastern Floodway	1.4	5.6	7			155
PIT03	Basic fauna + targeted SRE	Eastern Floodway	0.7	0.7 + 1.9	6			145
PIT04	Targeted SRE	Regional		2.1	2			140
PIT05	Targeted SRE	Regional		0.8	1			135
PIT06	Targeted SRE	Regional		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			

Site	Site type	Study area	Birding (hrs)	Foraging + nocturnal (hrs)	Burrow excavation (#)	Litter sieve (#)	Ultrasonic recording (nights)	Wet pitfall trap (nights)
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**

4.3.2.2 Active searches diurnal and nocturnal

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).

4.3.2.3 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.

4.3.2.4 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.

4.3.2.5 Malleefowl habitat assessment

Malleefowl habitat was assessed at each basic fauna site throughout the study area (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.

4.3.2.6 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, three within the study area and three regional sites outside the proposed disturbance areas of the Fimiston Operational Area. Each wet pitfall site comprised 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 retrieve the spider. Sixty burrows were excavated over the course of the survey, including 32 from the targeted regional 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.

4.3.3 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).

4.3.4 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 2016c).

4.3.4.1 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's own genetic database.

4.3.5 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.

4.3.6 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
Brigitte Kovar	BSc (GIS)	GIS, figure production

355000 362500 370000

6601200

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Myg06
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Fim01
PIT01
Fim03
Fim02
Fim04
Fim08
PIT02
BAT02
Fim06
Fim05
Fim07
BAT01
PIT03
Fim10
Fim09

Western Australia
PERTH

Fimiston report updates
KCGM Operations

Project No	1442
Date	5/04/2023
Drawn by	BK
Map author	PS

0 1.5 3
Kilometers

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

- Current study area
- Fimiston IIE
- Fimiston III
- 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 (2018b) identified recorded 254 vertebrate taxa within the desktop search extent (Appendix 3; Table 5-1; Figure 5-1). 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 (2018a) recorded a total of 57 vertebrate species, 22% of the species identified from the desktop review.

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 Western Spiny-tailed Skink (*Egernia stokesii badia*) record is far outside its normal range of occurrence and is inferred to have been passively transported to the Kalgoorlie area with timber, soil or other materials. As this record is based on a museum voucher specimen (WAM R3746) accidental transport is more likely than misidentification.

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 and 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.

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 record is historic and outside the current range for the species. In 2023, an abandoned Malleefowl mound was recorded within the Fim IIE TSF, G- Cell area (Alexander Holm & Associates 2023) (Figure 5-1).

EPBC Protected Matters Search does not return species record locations and may include instances where suitable habitat may occur but the species has not necessarily been observed. Marginal Malleefowl habitat has been recorded east of the study area in the Fim III TSF and Fim IIE TSF and G-Cell areas (Alexander Holm & Associates 2023).

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						
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	Yes	
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	

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6594700
6558850

Fimiston report updates
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Project No	1442
Date	5/04/2023
Drawn by	BK
Map author	PS

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Kilometers

1:366,600 (at A3)
GDA 1994 MGA Zone 51

- Current study area
- Fimiston IIE
- Fimiston III

Species, status

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

Figure 5-1

Desktop records of significant vertebrate fauna (Phoenix 2018b)

PHOENIX ENVIRONMENTAL SCIENCES

5.1.2 SRE and significant invertebrate fauna

The Phoenix (2018b) 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 is 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 Harewood (2015) survey, however were not recorded within the Fimiston Operational Area:

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

The mygalomorph spider *Gaius* 'Kalgoorlie' was previously known from three locations within the Fimiston IIE and Fimiston III 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), reported as *Missulena* 'kalgoorlie'.
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); initially reported in the genus *Aganippe* (for genus-level change see Rix *et al.* 2017)

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
	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
	Kwonkan goongarriensis	Goongarrie, 90 km NNW of Kalgoorlie	Potential	WA Museum, (Main 1983)	Not recorded in study area

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
	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
Class Diplopoda, order Polydesmida (millipedes)					
Paradoxosomatidae	*Antichiropus* 'DIP067' ('broad arrows')	**Fimiston IIE TSF**	Confirmed	Harewood (2015)	Recorded in study area (Harewood 2015) and ca. 60 km north of Kalgoorlie

Higher taxon, family	Taxon	Locality	SRE status	Source	Comment
				WA Museum	
	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

180990
291980
402970
6729400
6618410
6507420
6396430
Idiommata 'kalgoorlie'
Lychas 'annulatus complex'
Idiosoma 'kalgoorlie1'
Gaius 'austini' (kalgoorlie)
Idiommata 'kalgoorlie'
Lychas 'annulatus complex'
Conothele 'MYG554'
Missulena harewoodi
Gaius 'austini' (kalgoorlie)
Idiosoma 'kalgoorlie1'
Lychas 'annulatus complex'
Idiosoma sp. indet.
Conothele 'MYG554' (kalgoorlie)
Antichiropus 'DIP067'
Gaius 'austini' (kalgoorlie)
0
2
4
Kilometers
Western Australia
PERTH
Fimiston report updates
KCGM Operations
Project No 1442
Date 5/04/2023
Drawn by BK
Map author PS
0
25
50
Kilometers
1:1,109,900 (at A3)
GDA 1994 MGA Zone 51

Fimiston IIE
Fimiston III
Current study area
Status
CR
P1
Confirmed
Potential
Uncertain
Widespread
Figure 5-2
Desktop records of SRE invertebrates (Phoenix 2018b)
PHOENIX ENVIRONMENTAL SCIENCES

5.2 HISTORICAL SURVEYS

5.2.1 Harewood (2015) Fauna survey (Level 2 - Phase 1 and 2). Proposed Tails Storage Facility Expansion.

A Level 2 terrestrial fauna survey of a proposed tails storage facility area (TSF expansion) was undertaken in 2015 (Harewood 2015). The study area was approximately 3,260 ha and covered a roughly rectangular area southwest of Yarri Road to southwest of Bulong Road (Figure 1-1).

5.2.1.1 Methods

Field survey dates are provided in Table 5-4.

Table 5-4 Survey dates (Harewood 2015)

Survey type	Season	Dates
Level 2 fauna survey: Phase 1	Summer	24 November – 2 December 2014
Level 2 fauna survey: Phase 2	Autumn	9 – 17 April 2015

Six systematic sites were sampled and camera traps were deployed at 12 sites and bat recorders at nine sites (Table 5-5; Table 5-6; Table 5-7; Figure 6-1).

Table 5-5 Site locations (Harewood 2015)

Site	Latitude	Longitude
TS 1	-30.7326	121.5552
TS 2	-30.7086	121.526
TS 3	-30.7322	121.5326
TS 4	-30.7684	121.5621
TS 5	-30.7444	121.5672
TS 6	-30.7673	121.59
CAM12	-30.7392	121.5428
CAM13	-30.7558	121.5802
CAM14	-30.7182	121.5214
CAM16	-30.7792	121.5796
CAM17	-30.7091	121.525
CAM18	-30.7321	121.5556
CAM19	-30.7679	121.5908
CAM20	-30.7683	121.5625

Site	Latitude	Longitude
CAM22	-30.732	121.533
CAM23	-30.745	121.5673
CAM24	-30.758	121.5622
CAM25	-30.7174	121.5482
Bat1	-30.7319	121.5328
Bat2	-30.7682	121.5904
Bat3	-30.745	121.5672
Bat4	-30.7794	121.5791
Bat5	-30.6951	121.5247
Bat6	-30.7177	121.5016
Bat7	-30.7174	121.5482
Bat8	-30.7584	121.5607
Bat9	-30.7786	121.5799

Field techniques included:

- ground fauna trapping
    - Ground fauna trapping consisting of six sites with 10 trap arrays per site. Each trap array was composed of a 7m drift fence with one central bucket pit and two funnel traps, one at each end of the fence. One small Elliott trap and two cage traps were deployed nearby each trap array and baited with universal bait. Traps were opened for seven nights in Phase 1 and eight nights in Phase 2.
- bird surveys

  - Bird surveys were conducted repeatedly at each of the systematic sites. Birds were also recorded while traversing the study area on foot and by vehicle.

- acoustic bat recordings
  - Acoustic bat recordings were taken using a Wildlife Acoustics SM2+ Bat Detector. The detector was deployed at nine sites, four in the first phase and five in the second for one night at each site.
- motion sensing cameras
  - Motion sensing camera traps were deployed at 12 sites during Phase 1 and collected during Phase 2. One of the cameras was stolen between survey phases.
- targeted and opportunistic surveys
  - At each systematic site microhabitats were actively searched for vertebrate and invertebrate fauna. Non-systematic opportunistic observations of fauna were also recorded.
- potential SRE invertebrates
  - Invertebrates were targeted at systematic and non-systematic sites. Invertebrates in SRE groups that were trapped or collected during active searches were retained and submitted to taxonomists for identification.

Table 5-6 Trapping effort at systematic sites (Harewood 2015)

Phase	Site	Elliott Traps (nights)	Cage Traps (nights)	Funnel Traps (nights)	Bucket Pit Traps (nights)	Total # Trap Nights
PHASE 1 NOV/DEC 2014	TS 1	70	14	280	70	434
	TS 2	70	14	280	70	434
	TS 3	70	14	280	70	434
	TS 4	70	14	280	70	434
	TS 5	70	14	280	70	434
	TS 6	70	14	280	70	434
	Total	**420**	**84**	**1,680**	**420**	**2,604**
PHASE 2 APRIL 2015	TS 1	80	16	320	80	496
	TS 2	80	16	320	80	496
	TS 3	80	16	320	80	496
	TS 4	80	16	320	80	496
	TS 5	80	16	320	80	496
	TS 6	80	16	320	80	496
Total		**480**	**96**	**1,920**	**480**	**2,976**
Grand total		**900**	**180**	**3,600**	**900**	**5,580**

Table 5-7 Trapping effort at non-systematic sites (Harewood 2015)

Sites	Bat recordings (nights)	Camera traps (days)
Bat 5	1	
Bat 6	1	
Cam 12		47
Cam 13		134
Cam 14		59
Cam 16 / Bat 4 and 9	2	stolen
Cam 17 (TS 2)		132
Cam 18 (TS 1)		130
Cam 19 / Bat 2 (TS 6)	1	132
Cam 20 (TS 4)		132
Cam 22 / Bat 1 (TS 3)	1	134
Cam 23 / Bat 3 (TS 5)	1	114
Cam 24 / Bat 8	1	132
Cam 25 / Bat 7	1	135
Total	**9**	**1281**

5.2.1.2 Results

A summary of the vertebrate fauna results is presented in Table 5-8. The Rainbow Bee-eater *Merops ornatus* was the only fauna species of conservation significance recorded during the surveys but is no longer classified as Migratory under the EPBC Act and BC Act.

The survey determined that habitat in the study area was unsuitable or marginally suitable for Malleefowl (Figure 6-3). While there were Malleefowl records as little as 10 km from the study area there were no historical records from the immediate vicinity of the study area and no evidence recorded during the two-season field survey. This suggests that there is no resident breeding population although the area could be used by dispersing individuals.

Table 5-8 Number of vertebrate fauna species recorded (Harewood 2015)

Group	Phase 1	Phase 2	Combined	Conservation significance
Fish	0	1[1]	1[1]	0
Amphibians	1	3	3	0
Reptiles	24	14	28	0
Birds	54	57[1]	64[1]	1
Native non-volent mammals	7	5	7	0
Bats	8	9	10	0
Introduced mammals	4	6	7	0
Total	**98[4]**	**96[8]**	**120[9]**	**1**

Superscript = number of introduced species included in total

Forty-three invertebrate specimens were collected during the field survey; six scorpions, 21 mygalomorph spiders, 11 isopods and five millipedes. The specimens were identified as representing 13 different taxa, two scorpions, nine mygalomorph spiders, one isopod and one millipede (Table 5-9; Figure 5-2).

Table 5-9 SRE invertebrate species recorded (Harewood 2015)

Higher taxon	Species	SRE status	Remarks/sites
Mygalomorphae (trapdoor spiders)			
Nemesiidae	*Aname* `MYG004`	Widespread	TS 3.07
	Kwonkan `MYG175`	Widespread	TS 4.08
Idiopidae	*Gaius* 'kalgoorlie'	Potential	TS 3.02, TS 3.06, TS 3.10, TS 4.05, TS 5.05
	Aganippe 'kalgoorlie 1'	Potential	TS 1.6, TS 5.4
	Aganippe 'MYG256'	Widespread	TS 1.9, TS 5.9, TS 6.10
Actinopodidae	*Missulena* 'kalgoorlie'	Potential	TS 5.4
Barychelidae	*Idiommata* 'kalgoorlie'	Potential	TS 1.1, TS 1.5, TS 2.3
Ctenizidae	*Conothele* 'kalgoorlie'	Potential	TS 1.2, TS 1.4, TS 1.6, TS 4.7
Theraphosidae	*Selenotholus foelschei*	Widespread	TS 2.1, TS 4
Scorpions			
Buthidae	*Lychas* 'annulatus complex'	Potential	TS 2.02, TS 3.5, TS 5.3
	Isometroides 'goldfields1'	Widespread	TS 1.1, TS 2.7, TS 5.2,
Isopods			
Armadillidae	*Buddelundia* '39'	Widespread	TS 2.05
Myriapoda (millipedes)			
Paradoxosomatidae	*Antichiropus* 'broad arrows'	Confirmed	TS 6

5.2.2 Phoenix (2018) Flora and vegetation, and terrestrial fauna survey for proposed infrastructure within the Development Envelope of the Fimiston Gold Mine Operations

A Level 1 terrestrial fauna survey for proposed infrastructure within the Development Envelope of the Fimiston Gold Mine Operations was undertaken in 2018 (Phoenix 2018a). The study area included several infrastructure footprints within the Development Envelope however the majority of sites were outside the study areas so the Development Envelope is used to represent the study area in this report (Figure 1-1).

5.2.2.1 Methods

Field survey dates are provided in Table 5-10.

Table 5-10 Survey dates (Phoenix 2018a)

Survey type	Season	Dates
Level 1 fauna survey: Trip 1	Spring	6 – 8 September 2017
Level 1 fauna survey: Trip 2	Spring	11 – 12 November 2017

Fauna sampling was conducted at 17 sites coinciding with flora and vegetation survey sites within the Development Envelope and two Song Meter bat recording sites (Table 5-11; Figure 6-1). Survey work undertaken comprised:

- habitat assessments
    - Habitat descriptions and characteristics were recorded at all survey sites.

- active searches
    - Active searches were undertaken at all survey sites in any observable microhabitats considered likely to support mammals, reptiles, amphibians and invertebrates. A total of 16.5 hours of searching was conducted over the duration of the field survey.
- avifauna surveys
    - Twenty-minute avifauna surveys were undertaken at each site. A total of 5.6 person hours of avifauna census was undertaken during the field survey and birds were also recorded opportunistically during other field work.
- bat echolocation call recordings
    - Song Meter SM4 recording devices were used to record bat echolocation calls at two sites for one night at each site.
- opportunistic records
    - All sightings of vertebrate fauna species while working and travelling within the study area were recorded.
- SRE foraging
    - SRE foraging was conducted concurrently with vertebrate active searches and utilised the systematic inspection of microhabitats associated with SRE species. A total of 16.5 hours of searching was conducted over the duration of the field survey. Trapdoor spider burrows identified during the searches were excavated if they were considered inhabited.
- SRE litter sifts
    - Up to three combined litter/soil sifts were undertaken at each site where sufficient leaf litter was present. A total of 45 litter sifts were conducted over the field survey.

Table 5-11 Terrestrial fauna survey sites and effort (Phoenix 2018a)

Site	Latitude	Longitude	Type	Vertebrates			SRE invertebrates	
				Active searches (hrs)	Avifauna surveys (hrs)	Song Meter (nights)	Foraging (hrs)	Litter/soil sifts (qty)
MDE006	-30.7993	121.5783	Level 1 fauna	1	0.3		1	3
MDE007	-30.7882	121.5511	Level 1 fauna	1	0.3		1	3
MDE008	-30.7893	121.5662	Level 1 fauna	1	0.3		1	3
MDE010	-30.7833	121.5549	Level 1 fauna	1	0.3		1	3
MDE011	-30.7684	121.5487	Level 1 fauna	1	0.3		1	3
MDE012	-30.777	121.5471	Level 1 fauna	1	0.3		1	3
MDE016	-30.7533	121.5273	Level 1 fauna	1	0.3		1	3
MDE017	-30.7534	121.5301	Level 1 fauna	0.5	0.3		1	
MDE019	-30.7441	121.5225	Level 1 fauna	1	0.3		1	3

Site	Latitude	Longitude	Type	Vertebrates			SRE invertebrates	
				Active searches (hrs)	Avifauna surveys (hrs)	Song Meter (nights)	Foraging (hrs)	Litter/soil sifts (qty)
MDE020B	-30.7396	121.4957	Level 1 fauna	1	0.3		1	2
MDE023	-30.8101	121.5773	Level 1 fauna	1	0.3		1	3
MDE024	-30.8022	121.5519	Level 1 fauna	1	0.3		1	3
MDE025	-30.7898	121.5009	Level 1 fauna	1	0.3		1	3
MDE026	-30.7806	121.542	Level 1 fauna	1	0.3		1	2
MDE027	-30.7797	121.5439	Level 1 fauna	1	0.3		1	3
MDE028	-30.7694	121.5375	Level 1 fauna	1	0.3		1	2
MDE029	-30.7664	121.5446	Level 1 fauna	1	0.3		1	3
SM01	-30.7684	121.549	Song Meter			1		
SM02	-30.79	121.5525	Song Meter			1		
			Total	**16.5**	**5.6**	**2**	**17**	**45**

5.2.2.2 Results

A summary of the vertebrate fauna results is presented in Table 5-12. No conservation significant vertebrate fauna were reported in Phoenix (2018a), however records of the Western Rosella (*Platycercus icterotis*) from the field survey (Figure 5-1) have since been determined to be the inland subspecies (*Platycercus icterotis xanthogenys*) which is listed as P4 by the DBCA.

The single habitat within the Development Envelope, Open eucalypt woodland and Shrubland habitat is suitable for foraging and some suitable nesting habitat with sufficient protective cover and leaf litter was present. The report concluded that Malleefowl are likely not breeding residents of the area as no mounds were detected during the field surveys but may occasionally be present in the study area to forage.

Table 5-12 Number of vertebrate taxa recorded during the survey, by group (Phoenix 2018a)

Taxon	No. species recorded
Reptiles	3
Birds	20
Mammals	12 (including 1 introduced)
Total	**35**

No SRE invertebrates were found during the survey.

5.2.3 Phoenix (2019) Targeted flora and SRE survey for the FIM IIE Project

A Targeted SRE survey for the Fimiston II TSF Extension was undertaken in 2019 (Phoenix 2019). The survey was conducted outside the proposed Fimiston II TSF Extension area along Yarri Road and Bulong Road and unnamed, unsealed roads in the vicinity (Figure 1-1).

5.2.3.1 Methods

Field survey dates are provided in Table 5-13. A total of 11 sites were surveyed and two methods were employed (Table 5-14; Figure 6-1):

- wet pitfall traps
    - Each wet pitfall site comprised 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. The traps were left open for a period of approximately five weeks.
- SRE foraging
    - SRE foraging utilised the systematic inspection of microhabitats associated with SRE species.

Table 5-13 Survey dates (Phoenix 2019)

Survey type	Season	Dates
Targeted SRE survey: Wet pitfall trap deployment	Spring	7 – 9 November 2018
Targeted SRE survey: Wet pitfall trap retrieval	Summer	13 – 14 December 2018

Table 5-14 Survey site locations (Phoenix 2019)

Site	Type	Latitude	Longitude	Wet pitfall trap (nights)	Foraging (hrs)
1225_F01	Targeted SRE	-30.762	121.599		
1225_S01	Targeted SRE	-30.7117	121.4909		1
1225_S02	Targeted SRE	-30.7029	121.5027	36	
1225_S04	Targeted SRE	-30.6925	121.5309	36	
1225_S05	Targeted SRE	-30.6984	121.5404	35	
1225_S06	Targeted SRE	-30.7	121.5634	35	
1225_S07	Targeted SRE	-30.7835	121.5655	35	
1225_S08	Targeted SRE	-30.8042	121.6001	35	
1225_S09	Targeted SRE	-30.7428	121.6213	35	
1225_S10	Targeted SRE	-30.7352	121.6012	36	
1225_S11	Targeted SRE	-30.7606	121.5988	36	

5.2.3.2 Results

Seven species from the target SRE groups were collected in the survey, comprising three trapdoor spiders, two millipedes and two scorpions (Table 5-15; Figure 5-2Figure 6-4).

Table 5-15 SRE taxa from target SRE groups recorded during the survey (Phoenix 2019)

Higher order/family	Species	SRE status	Remarks
Mygalomorphae (trapdoor spiders)			
Idiopidae	*Gaius austini*	Non-SRE	Previously reported as *Gaius* 'kalgoorlie', now formally described as *G. austini* by (Rix *et al.* 2018a), not considered SRE.
Actinopodidae	*Missulena harewoodi*	Potential	Specimen sequenced - match with *M. harewoodi*.
Anamidae	*Teyl '*MYG021'	Non-SRE	Mark Harvey identified as *Teyl* MYG021, recorded throughout the western Goldfields region.
Scorpions			
Buthidae	*Lychas 'bituberculatus* complex'	Potential	Species complex containing multiple taxa, some of which may be SREs
	Lychas 'pilbara1'	Non-SRE	widespread
Myriapoda (millipedes)			
Paradoxosomatidae	*Antichiropus* 'DIP176'	Confirmed	Specimen sequenced - is not conspecific with *Antichiropus* 'Broad arrows' from previous survey.
Siphonotidae	Siphonotidae `sp. indet.`	Confirmed	These are rarely collected in arid/semi-arid areas, however this group is poorly studied and comprises of widespread and Confirmed SRE representatives.

5.3 FIELD SURVEY

5.3.1 Vertebrate fauna

5.3.1.1 Habitats

Three broad fauna habitat types were identified in the study area, comprising of Open woodland, Shrubland and Rehabilitation (Table 5-16; 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.

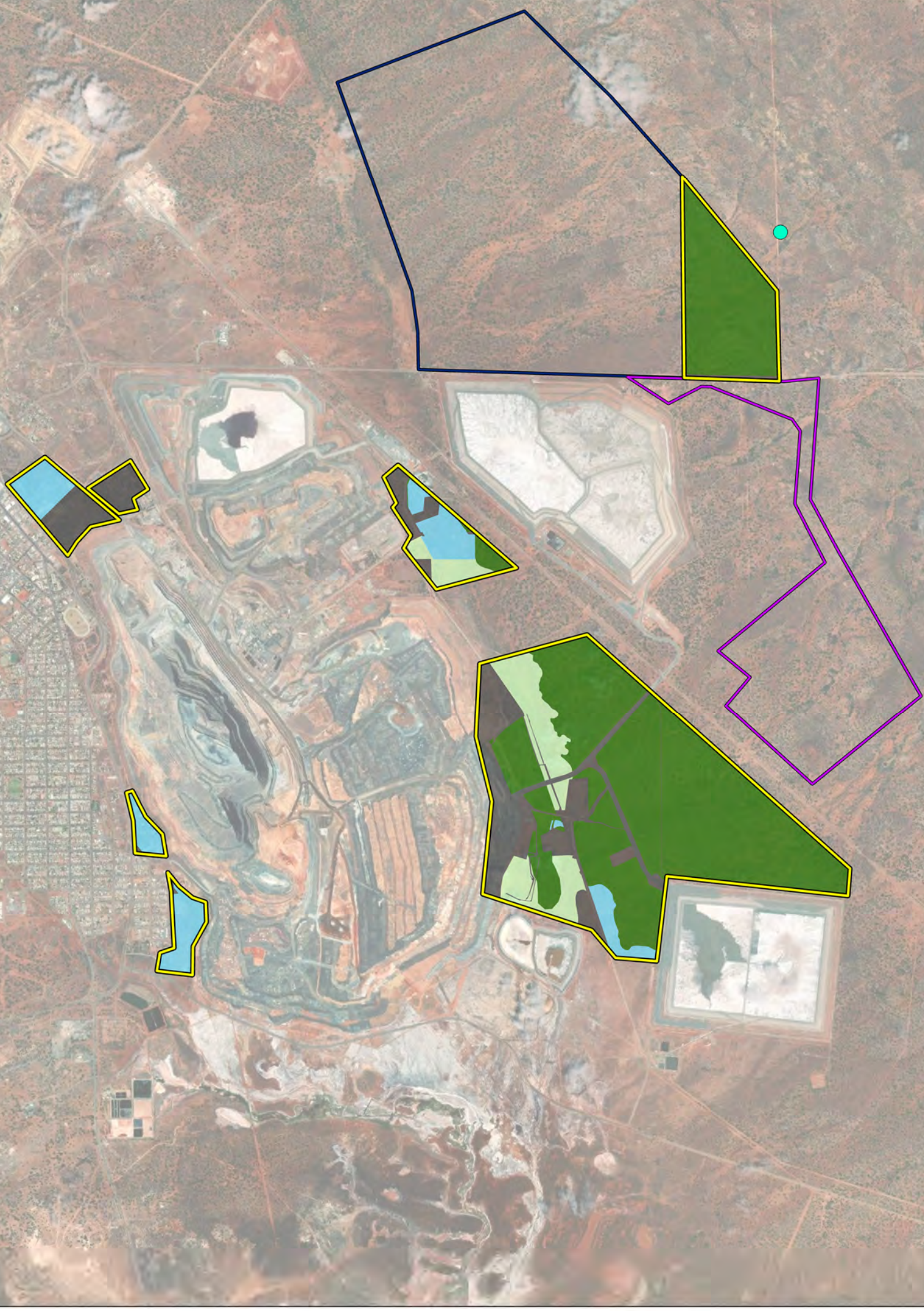
The woodland and shrubland habitats represent foraging habitat for conservation significant vertebrate fauna species Chuditch and Malleefowl. The rehabilitated areas may provide value as foraging or dispersal habitat for vertebrate fauna species.

Table 5-16 Extent and description of each fauna habitat in the study area

Habitat type	Site/s	Description	Extent in study area (ha) and % of study area	Representative photograph
Open woodland	BAT01, BAT02, Fim02, Fim03, Fim05, Fim06, Fim07, Fim08, Fim09PIT03	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 (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 (9.3)	

Habitat type	Site/s	Description	Extent in study area (ha) 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 (10.1)	
Cleared		Cleared for infrastructure or historic purposes.	210.1 (19.1)	
		Total	**1,099.4 (100)**	

354200
359100
364000
6601700
6598800
6595900



Western Australia
PERTH

Fimiston report updates
KCGM Operations

Project No	1442
Date	19/04/2023
Drawn by	BK
Map author	PS

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Kilometers

1:49,000 (at A3)
GDA 1994 MGA Zone 51

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Fimiston IIE
Fimiston III
Current study areas

Species, status

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

Fauna habitat

Cleared
Open Woodland
Rehabilitation
Shrubland

Figure 5-3

Fauna habitats and significant fauna records from the field survey

PHOENIX ENVIRONMENTAL SCIENCES

5.3.1.2 Malleefowl habitat assessment

The Malleefowl habitat assessments undertaken during the basic fauna survey found nine of 15 the sites assessed to be suitable habitat for Malleefowl (Table 5-17). 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 habitat suitable for Malleefowl foraging and dispersal, but it is likely to be unsuitable for breeding.

All three habitats contained areas of suitable and unsuitable Malleefowl habitat. By assigning the highest score across sections of the same habitat types and condition rating, suitable, albeit low quality Malleefowl habitat occupies 735.6 ha (66.9%) of the study area, in areas within the Eastern Floodway and Fimiston south extrapolation area (Figure 5-4).

Table 5-17 Malleefowl habitat assessment scores

Malleefowl habitat quality	Score	Sites	Habitat	Total # of sites (% of sites)	Malleefowl habitat ha and %
Unsuitable	0			0	Cleared 210.1 (19.1)
	1			0	
	2	Fim01, Fim03, Fim04	Open woodland, Shrubland, Rehabilitation	3 (20.0)	153.6 (14.0)
	3	BAT02, Fim02, Fim10	Open woodland, Rehabilitation	3 (20.0)	
Low to medium	4	BAT01, Fim05, Fim06, Fim07, Fim08, Fim09, PIT02, PIT03	Open woodland, Shrubland	8 (53.3)	735.6 (66.9)
	5	PIT01	Rehabilitation	1 (6.7)	
High (critical habitat)	6			0	
	7			0	
	8			0	
			Total	**15**	**1,099.3 (100)**

359100 364000 368900

6606600

6601700

6596800

6591900

6587000

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

Western Australia
PERTH

Fimiston report updates
KCGM Operations

Project No	1442
Date	19/04/2023
Drawn by	BK
Map author	PS

0 1 2
Kilometers

1:60,200 (at A3) GDA 1994 MGA Zone 51

Current study areas
Fimiston IIE
Fimiston III

Malleefowl habitat

Low to medium suitability - foraging and dispersal
Unsuitable
cleared

Figure 5-4

Malleefowl habitat suitability in the study area

PHOENIX ENVIRONMENTAL SCIENCES

5.3.1.3 Vertebrate fauna species

A total of 47 terrestrial vertebrate species representing 25 families and 41 genera were recorded in the study area during the field survey (Table 5-18; Figure 5-3). The assemblage included 44 native species and three introduced species.

Table 5-18 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 5-19; Figure 5-3).

Malleefowl were recorded from fresh tracks at site Myg04, 2.5 km east of FIM IIE, outside the study area. Chuditch was recorded from a scat at site Myg02 in a stand of gimlet eucalypts.

Table 5-19 Details of significant vertebrate fauna recorded during the field survey

Species	Status	Distribution and ecology	Survey records
Malleefowl *Leipoa ocellata*	VU (EPBC & BC Acts)	The Malleefowl is found across the southern half of the Australian continent and is the only Megapode 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. 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.
Chuditch *Dasyurus geoffroii*	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 5-20), four birds and one mammal:

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

Table 5-20 Likelihood of occurrence for significant vertebrate fauna identified in the desktop review

Species	Status	Likelihood of occurrence	Comments	Habitats			
				Open woodland	Shrubland	Cleared	Rehab
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. Suitable foraging and nesting habitat was recorded in the study area in Open woodland and Shrubland habitat.	•	•		

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

5.3.2 SRE and significant invertebrate fauna

5.3.2.1 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 has High potential for SRE invertebrates (Shrubland along drainage line) (Table 5-21; Figure 5-5). 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 and may provide better quality habitat for SRE invertebrate species. The Open woodland, Shrubland, and Rehabilitation habitats were classified as 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 it extends between the northern and southern portions of the Eastern Floodway and to the north of the study area.

Table 5-21 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	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 (61.5)	Low
Shrubland	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	54.8 (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 (4.3)	**High**
Rehabilitation	Fim01, Fim02, Fim10, PIT01	Revegetated with mostly native species, developed into a shrubland or open woodland	111 (10.1)	Low
Cleared			205.8 (19.1)	None
		Total	**1,099.4**	

5.3.2.2 SRE and significant invertebrate fauna records

A total of 272 specimens from 37 SRE taxa were collected within the study area (Table 5-22). 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 5-5; Table 5-23).

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 2019) 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 5-22 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.

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*). *Buddelundia frontosa* was also collected from Open woodland (PIT04) habitat and 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 5-23 Specimens from SRE groups recorded in the field survey. Rows in grey represent previously unknown taxa.

Higher order/Family	Taxa	Locality	Site/s	Habitat				No. specimens	SRE status/ significance	Comments
				L	L	H	L			
				Open woodland	Shrubland	Shrubland drainage	Rehab			
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.
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.

Higher order/Family	Taxa	Locality	Site/s	Habitat				No. specimens	SRE status/ significance	Comments
				L	L	H	L			
				Open woodland	Shrubland	Shrubland drainage	Rehab			
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.
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.

Higher order/Family	Taxa	Locality	Site/s	Habitat				No. specimens	SRE status/ significance	Comments
				L	L	H	L			
				Open woodland	Shrubland	Shrubland drainage	Rehab			
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. Nearest record: Mt Ida 200 km NW Kalgoorlie.
Idiopidae	*Idiosoma* 'sp. indet.'	Eastern Floodway, Regional	PIT02, PIT03 PIT06, Myg01 Myg02, Myg03,	•	•	•		8	Uncertain	Recorded inside and outside the study area.

Higher order/Family	Taxa	Locality	Site/s	Habitat				No. specimens	SRE status/ significance	Comments
				L	L	H	L			
				Open woodland	Shrubland	Shrubland drainage	Rehab			
			Myg06, Myg08							
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	Habitat				No. specimens	SRE status/ significance	Comments
				L	L	H	L			
				Open woodland	Shrubland	Shrubland drainage	Rehab			
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	Habitat				No. specimens	SRE status/ significance	Comments
				L	L	H	L			
				Open woodland	Shrubland	Shrubland drainage	Rehab			
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)										
Camaenidae	*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.

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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*

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Map author	PS

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Kilometers

1:45,600 (at A3) GDA 1994 MGA Zone 51

Current study area
Fimiston IIE
Fimiston III

SRE habitat

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

Figure 5-5

SRE habitats and recorded SRE taxa

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5.4 SURVEY LIMITATIONS

The limitations of the basic terrestrial fauna and SRE survey and targeted SRE survey have been considered in accordance with EPA (EPA 2016b, c, 2020) (Table 5-24).

Table 5-24 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. 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 historical and current 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 3). The most common group was birds (138 taxa), followed by reptiles (74 taxa), mammals (37) and amphibians (5 taxa).

No conservation significant vertebrate fauna species has been recorded from inside the Fimiston Operational Area (Figure 6-2). 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), Eastern Rosella (inland ssp; P4; DBCA), Malleefowl (VU; EPBC & BC Acts), Western Rosella (inland ssp; P4; DBCA), and Chuditch (VU; EPBC & BC Acts).

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. This species was recorded within the overlapping part of Harewood's 2015 study area and Phoenix's 2019 overlapping study area, but outside of Fimiston IIE, Fimiston III and the Eastern Floodway (Figure 6-2).

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.

Malleefowl habitat suitability assessments showed the study area contains habitat marginally suitable for foraging and dispersal only and is likely to be considered unsuitable for breeding or mound construction (Figure 6-3). A key feature of Malleefowl breeding habitat is thick, vision obscuring vegetation that provides plentiful leaf litter (and sandy soils) for building nesting mounds. 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. Harewood (2015) also noted marginally suitable habitat present throughout Fim III TSF, Fim IIE TSF, and G-Cell, however; a subsequent more detailed targeted survey assessed the suitability of Malleefowl habitat within the Fimiston Operational Area (Alexander Holm & Associates 2023). This more recent assessment took into account additional factors, such as presence and degree of disturbances (vehicle tracks, livestock grazing and clearing), constraints to movement (roads, rails, fences and mining infrastructure), and Malleefowl activity which was obtained from data collected during the 2023 survey. The results indicated marginal habitat suitability in parts of Fim III TSF, Fim IIE TSF, and G-Cell, suitable only for foraging and dispersal.

Previous surveys show Malleefowl was recorded from a fresh track outside the study area, approximately 2.5 km east of FIM IIE (Figure 6-2). A long abandoned Malleefowl mound was recorded in the FIM IIE TSF, G-Cell during the recent targeted Malleefowl mound survey conducted in March 2023; however, no recent evidence was recorded (Alexander Holm & Associates 2023). These results confirm the presence of Malleefowl within the vicinity of the FS Project, with actual usage inside the Fimiston Operational Area likely to be vagrant foraging or dispersal, although considered unlikely due to day-to-day operational activities.

Chuditch was recorded from one scat outside the Fimiston Operational Area, approximately 7 km east north-east (Figure 6-2). 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 all historical and current surveys within the Fimiston Operational Area, comprising of one Confirmed SRE species and 25 Potential SRE species (Figure 6-4). In addition, one P1 species, *Jalmenus aridus* – Inland Hairstreak butterfly, was recorded. The discovery of *Jalmenus aridus* is discussed in detail in a separate confidential memo (Phoenix 2022c), due to the significance of this record as all previously known populations of *Jalmenus aridus* have disappeared since its discovery in 1983, and having 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 2018b), 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 from within the DE (*Austrohorus* 'sp. Fi01', *Nesidiochernes* 'sp. Fi01' and *Spherillo* 'sp. indet. A1') (Figure 6-4). 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.

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Myg06
Myg05
TIN-S04
TIN-S05
TIN-S06
Bat5
TIN-S02
PIT05
CAM17
Site 2
TIN-S01
CAM14
CAM25
Bat6
Myg04
Bat1
CAM22
Site 3
CAM18
Site 1
S10
TIN-S10
MDE020B
MDE021
CAM12
Myg03
Myg02
Myg01
Site 5
PIT04
MDE019
TIN-S09
Bat3
CAM23
MDE016
MDE017
PIT06
Fim01
CAM13
Myg08
PIT01
CP002
Bat8
CAM24
TIN-S11
Fim02
Myg07
F01
Fim03
MDE029
MDE011
Site 6
MDE028
Site 4
CAM19
CAM20
Fim04
Bat2
CP001
Fim08
BAT02
Fim06
Bat9
Fim05
CAM16
PIT02
Bat4
Fim07
TIN-S07
MDE026
MDE012
MDE027
MDE010
PIT03
MDE025
MDE007
BAT01
Fim10
Fim09
SM02
MDE008
MDE006
MDE024
TIN-S08
MDE023

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Map author	PS

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Kilometers

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Fimiston IIE
Fimiston III

Study areas:
Current study areas
Phoenix 2019 SRE survey
Phoenix 2018 level 1 survey
Harewood 2015 level 2 survey

Survey sites:
Current survey sites
2019 survey sites
2018 survey sites
Harewood 2015 sites

Figure 6-1

Consolidated survey sites

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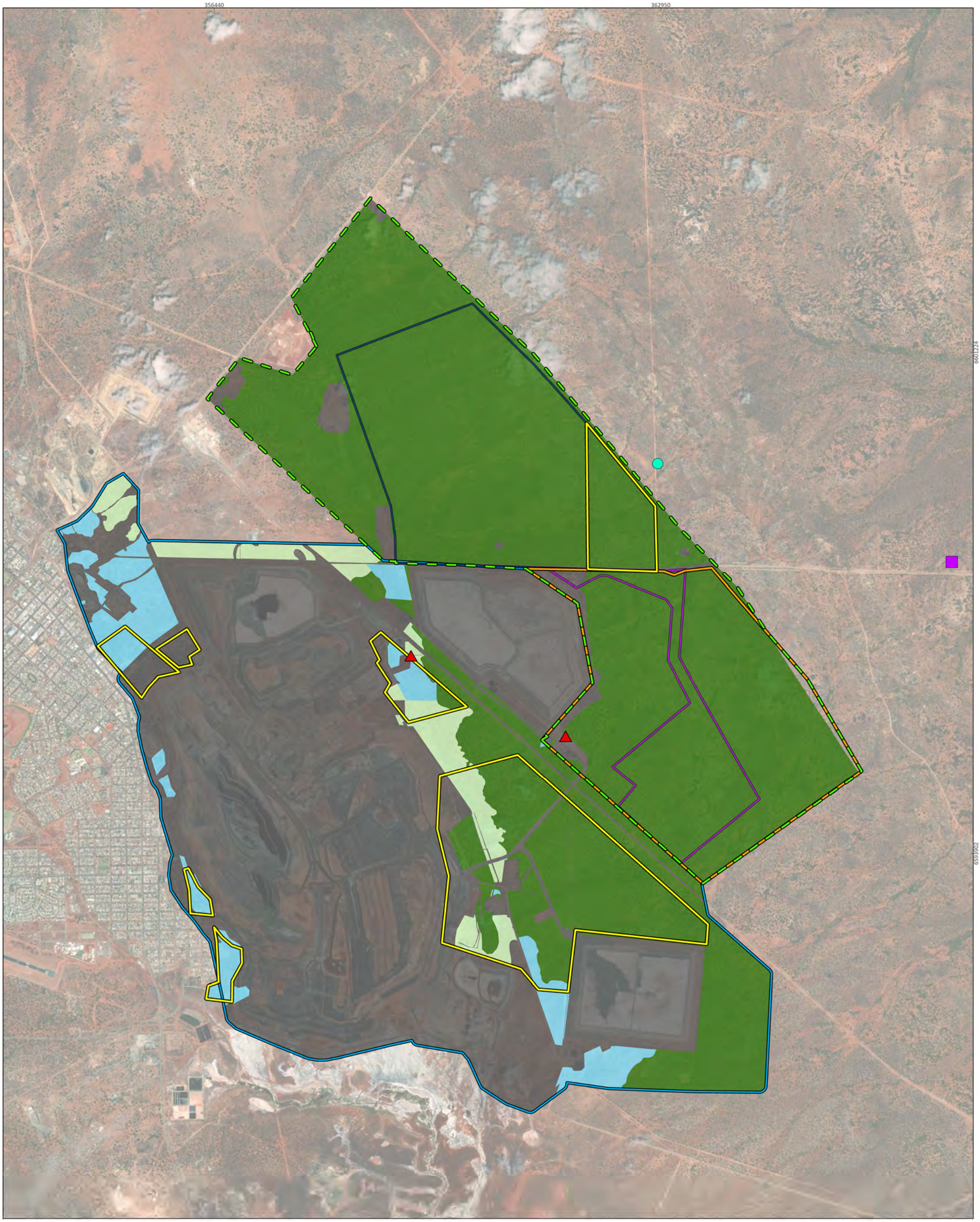

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Kilometers

1:50,300 (at A3) GDA 1994 MGA Zone 51

Fimiston IIE
Fimiston III

Study areas:
Current study areas
Phoenix 2019 SRE survey
Phoenix 2018 level 1 survey
Harewood 2015 level 2 survey

Fauna habitat
Cleared
Open Woodland
Rehabilitation
Shrubland

Species, status
Dasyurus geoffroii, VU (scat)
Leipoa ocellata, VU (tracks)
Platycercus icterotis xanthogenys, P4 (sighting)

Figure 6-2

Consolidated fauna habitats and significant fauna records

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359100
364000
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- Current study areas
- Fimiston IIE
- Fimiston III

Malleefowl habitat

- Low to medium suitability - foraging and dispersal
- Unsuitable
- cleared
- Marginal suitability - foraging and dispersal

Figure 6-3

Consolidated Malleefowl habitat suitability

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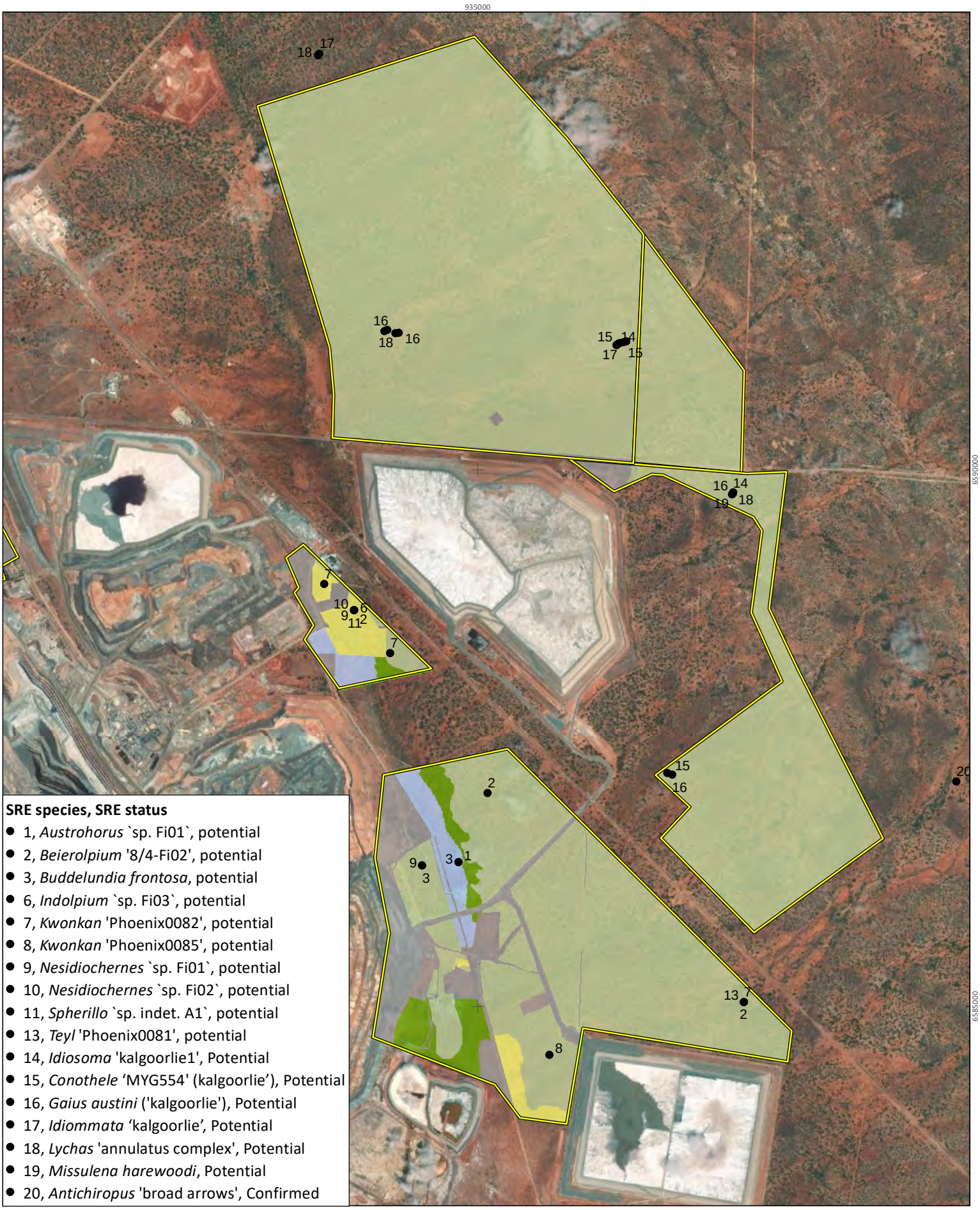

SRE species, SRE status

- 1, *Austrohorus* `sp. Fi01`, potential
- 2, *Beierolpium* '8/4-Fi02', potential
- 3, *Buddelundia frontosa*, potential
- 6, *Indolpium* `sp. Fi03`, potential
- 7, *Kwonkan* 'Phoenix0082', potential
- 8, *Kwonkan* 'Phoenix0085', potential
- 9, *Nesidiochernes* `sp. Fi01`, potential
- 10, *Nesidiochernes* `sp. Fi02`, potential
- 11, *Spherillo* `sp. indet. A1`, potential
- 13, *Teyl* 'Phoenix0081', potential
- 14, *Idiosoma* 'kalgoorlie1', Potential
- 15, *Conothele* 'MYG554' (kalgoorlie'), Potential
- 16, *Gaius austini* ('kalgoorlie'), Potential
- 17, *Idiommata* 'kalgoorlie', Potential
- 18, *Lychas* 'annulatus complex', Potential
- 19, *Missulena harewoodi*, Potential
- 20, *Antichiropus* 'broad arrows', Confirmed

Fimiston South Project
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Map author	AJ

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Kilometers

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- Study area

SRE habitat

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

Figure 6-4

Consolidated SRE habitats and recorded SRe taxa within the study area

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6.2 CONCLUSION

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

Impacts to SRE invertebrates are considered low, with species assemblages represented outside of the study area. Only one Confirmed SRE occurs within the study area, *Missulena harewoodi*, a mygalomorph spider. This species is known from three locations, two of which are outside of the Fimiston Operational Area, including a female excavated, from a burrow indicating suitable breeding habitat outside. Several Potential SRE's occur within the study area, including three Potential SRE species known only from the Fimiston Operational Area. These three species are morpho-species (undescribed species), of which two are known from rehabilitation indicating wider habitat tolerances. One Potential SRE species (*Austrohorus* 'sp. Fi01') is known only from the Woodland along drainage line habitat within the study area, however outside of the impact area.

Development in close proximity to the conservation significant invertebrate species, *Jalmenus aridus*, Inland Hairstreak butterfly (P1), is not advised. This species currently lacks critical ecological and distributional knowledge, however recent surveys have significantly increased the known populations of this species from a single population at Fimiston to nine populations within 100 km of the Fimiston indicating it is much more common and widespread than currently known and previously recorded. Further monitoring of this population and other populations is required to understand the ecology and habitat requirements and tolerances of this species.

Current and long historic disturbances already exist within close proximity to this population indicating some degree of resilience is present, however, any further development activity in close proximity to this population should be carefully considered, and not undertaken during the breeding season.

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Appendix 1 Survey site locations

Site name	Site type	Latitude	Longitude
BAT01	Basic fauna	-30.7877	121.5699
BAT02	Basic fauna	-30.7765	121.5437
Fim01	Basic fauna	-30.7536	121.5278
Fim02	Basic fauna	-30.7584	121.5302
Fim03	Basic fauna	-30.7592	121.5345
Fim04	Basic fauna	-30.7696	121.5374
Fim05	Basic fauna	-30.7769	121.5384
Fim06	Basic fauna	-30.7760	121.5524
Fim07	Basic fauna	-30.7817	121.5547
Fim08	Basic fauna	-30.7706	121.5444
Fim09	Basic fauna	-30.7923	121.5515
Fim10	Basic fauna	-30.7906	121.5446
PIT01	Basic fauna and Targeted SRE	-30.7557	121.5308
PIT02	Basic fauna and Targeted SRE	-30.7765	121.5419
PIT03	Basic fauna and Targeted SRE	-30.7871	121.5702
PIT04	Targeted SRE	-30.7428	121.6260
PIT05	Targeted SRE	-30.7029	121.5668
PIT06	Targeted SRE	-30.7534	121.6416
Myg01	Targeted SRE	-30.7433	121.6388
Myg02	Targeted SRE	-30.7423	121.6129
Myg03	Targeted SRE	-30.7416	121.5839
Myg04	Targeted SRE	-30.7287	121.5681
Myg05	Targeted SRE	-30.6885	121.5660
Myg06	Targeted SRE	-30.6740	121.5477
Myg07	Targeted SRE	-30.7646	121.6474
Myg08	Targeted SRE	-30.7557	121.6477

Site details			
Site	**1442 BAT01**	**Position (WGS84)**	-30.787699, 121.569929
Topography	drainage line	**Soil texture**	clay loam
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	13 Sep 2021	13 Sep 2021
1	Site description	0.00	13 Sep 2021	13 Sep 2021
1	Ultrasonic recording	161.02	13 Sep 2021	20 Sep 2021

Site description - visit 1 (13 Sep 2021)

Open eucalyptus woodland of gimlet in tree and mallee form over mid level senna, santalum, eremophila and acacia over low mixed shrubs and herbs on clay in drainage line.

Habitat	open woodland		
Disturbance	Grazing-medium, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	3
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	5		

Site details			
Site	**1442 BAT02**	**Position (WGS84)**	-30.776247, 121.543709
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	15 Sep 2021	15 Sep 2021
1	Site description	160.72	13 Sep 2021	20 Sep 2021
1	Ultrasonic recording	160.72	13 Sep 2021	20 Sep 2021

Site description - visit 1 (13 Sep 2021)

Open euc woodland of salmon gum and gimlet over eremophila, senna, acacia and santalum over red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	60	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	2
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim01**	**Position (WGS84)**	-30.753591, 121.527789
Topography	plain	**Soil texture**	clay loam, clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	14 Sep 2021	14 Sep 2021
1	Burrow excavation	0.00	14 Sep 2021	14 Sep 2021
1	Foraging	2.17	14 Sep 2021	14 Sep 2021
1	Site description	0.00	14 Sep 2021	14 Sep 2021

Site description - visit 1 (14 Sep 2021)

Open euc woodland of gimlet and salmon gum over eremophila, senna, acacia, currajong. Over red-brown clay loam soil.

Habitat	open woodland		
Disturbance	Current operations, Evidence of feral animals, Exploration (drill pads and access tracks), Grazing-medium, Historic clearing, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Poor	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	2
Shrub cover (%)	70	**Litter cover (%)**	25
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim02**	**Position (WGS84)**	-30.758421, 121.530234
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.77	14 Sep 2021	14 Sep 2021
1	Foraging	0.37	14 Sep 2021	14 Sep 2021
1	Site description	0.00	14 Sep 2021	14 Sep 2021

Site description - visit 1 (14 Sep 2021)

Open euc woodland of gimlet and salmon over eremophila, acacia and other mixed shrubs over low shrubs over low shrubs on red-brown clay. Clear furrows of ground scarification for rehab.

Habitat	open woodland		
Disturbance	Exploration (drill pads and access tracks), Grazing-medium, Historic clearing, Litter, Livestock tracks, Revegetation, Vehicle tracks		
Vegetation condition	Poor	**Fire age**	moderate (>5 years)
Total veg. cover (%)	90	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	2
Shrub cover (%)	70	**Litter cover (%)**	70
Grass cover (%)	0		
Herb cover (%)	1		

Site details			
Site	**1442_Fim03**	**Position (WGS84)**	-30.759175, 121.534461
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.13	14 Sep 2021	14 Sep 2021
1	Burrow excavation	0.00	14 Sep 2021	14 Sep 2021
1	Foraging	2.00	14 Sep 2021	14 Sep 2021
1	Litter sieve	0.00	14 Sep 2021	14 Sep 2021
1	Site description	0.00	14 Sep 2021	14 Sep 2021

Site description - visit 1 (14 Sep 2021)

Open euc woodland of tall gimlet and salmon gum over eremophila, acacia, exocarpos and santalum on red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	40	**Litter distribution**	under vegetation
Tree cover (%)	50	**Litter depth(cm)**	2
Shrub cover (%)	50	**Litter cover (%)**	20
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim04**	**Position (WGS84)**	-30.769612, 121.537375
Topography	drainage line	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.73	15 Sep 2021	15 Sep 2021
1	Foraging	1.20	15 Sep 2021	15 Sep 2021
1	Site description	0.00	15 Sep 2021	15 Sep 2021

Site description - visit 1 (15 Sep 2021)

Tall shrubs of acacia and senna over mixed ground cover shrubs on red-brown clay.

Habitat	shrubland		
Disturbance	Evidence of feral animals, Grazing-medium, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	90	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	2
Shrub cover (%)	60	**Litter cover (%)**	10
Grass cover (%)	0		
Herb cover (%)	5		

Site details			
Site	**1442_Fim05**	**Position (WGS84)**	-30.776871, 121.538392
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	brown-grey, orange	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.83	15 Sep 2021	15 Sep 2021
1	Burrow excavation	0.00	15 Sep 2021	15 Sep 2021
1	Foraging	1.83	15 Sep 2021	15 Sep 2021
1	Litter sieve	0.00	15 Sep 2021	15 Sep 2021
1	Site description	0.00	15 Sep 2021	15 Sep 2021

Site description - visit 1 (15 Sep 2021)

Open woodland of gimlet and salmon gum over senna, acacia, exocarpos and eremophila with scattered sparse grass and herbs on brown-grey-orange clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Historic clearing, Litter, Livestock tracks, Revegetation, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	85	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	3
Shrub cover (%)	70	**Litter cover (%)**	40
Grass cover (%)	1		
Herb cover (%)	1		

Site details			
Site	**1442_Fim06**	**Position (WGS84)**	-30.776044, 121.552438
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	16 Sep 2021	16 Sep 2021
1	Burrow excavation	0.00	16 Sep 2021	16 Sep 2021
1	Foraging	1.30	16 Sep 2021	16 Sep 2021
1	Litter sieve	0.00	16 Sep 2021	16 Sep 2021
1	Site description	0.00	16 Sep 2021	16 Sep 2021

Site description - visit 1 (16 Sep 2021)

Open woodland of gimlet and salmon gum over acacia, eremophila and senna shrubs with scattered tall casuarina on red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	75	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	3
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim07**	**Position (WGS84)**	-30.781743, 121.55465
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	16 Sep 2021	16 Sep 2021
1	Foraging	1.30	16 Sep 2021	16 Sep 2021
1	Litter sieve	0.00	16 Sep 2021	16 Sep 2021
1	Site description	0.00	16 Sep 2021	16 Sep 2021

Site description - visit 1 (16 Sep 2021)

Open woodland of salmon gum over scattered tall shrubs of casuarina and medium tall exocarpos over acacia and eremophila shrubs on red-brown clay. One small 20cm high, isolated patch of triodia found while foraging.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	35	**Litter depth(cm)**	3
Shrub cover (%)	65	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim08**	**Position (WGS84)**	-30.770565, 121.544443
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	16 Sep 2021	16 Sep 2021
1	Burrow excavation	0.00	16 Sep 2021	16 Sep 2021
1	Foraging	2.47	16 Sep 2021	16 Sep 2021
1	Litter sieve	0.00	16 Sep 2021	16 Sep 2021
1	Site description	0.00	16 Sep 2021	16 Sep 2021

Site description - visit 1 (16 Sep 2021)

Open woodland of salmon gum and gimlet over eremophila, acacia, senna and scattered exocarpos on red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	3
Shrub cover (%)	70	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim09**	**Position (WGS84)**	-30.792273, 121.551458
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.70	16 Sep 2021	16 Sep 2021
1	Burrow excavation	0.00	16 Sep 2021	16 Sep 2021
1	Foraging	1.10	16 Sep 2021	16 Sep 2021
1	Litter sieve	0.00	16 Sep 2021	16 Sep 2021
1	Site description	0.00	16 Sep 2021	16 Sep 2021

Site description - visit 1 (16 Sep 2021)

Open euc woodland of salmon gum and lesouefi over exocarpos, eremophila, senna and acacia on red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Exploration (drill pads and access tracks), Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	3
Shrub cover (%)	70	**Litter cover (%)**	50
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1442_Fim10**	**Position (WGS84)**	-30.790635, 121.544635
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.67	19 Sep 2021	19 Sep 2021
1	Foraging	0.50	19 Sep 2021	19 Sep 2021
1	Site description	0.00	19 Sep 2021	19 Sep 2021

Site description - visit 1 (19 Sep 2021)

Historically cleared and reveged Eremophila shrubland with scattered small eucs and senna and greybush over ptilotus and other mixed low shrubs on red-brown clay.

Habitat	shrubland		
Disturbance	Current operations, Erosion Channels, Evidence of feral animals, Historic clearing, Litter, Revegetation		
Vegetation condition	Poor	**Fire age**	moderate (>5 years)
Total veg. cover (%)	90	**Litter distribution**	under vegetation
Tree cover (%)	5	**Litter depth(cm)**	2
Shrub cover (%)	95	**Litter cover (%)**	30
Grass cover (%)	0		
Herb cover (%)	5		

Site details			
Site	**1443_Myg01**	**Position (WGS84)**	-30.743312, 121.638834
Topography	drainage line	**Soil texture**	gravel / alluvial, clay
Slope	gentle	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	17 Sep 2021	17 Sep 2021
1	Foraging	3.10	17 Sep 2021	17 Sep 2021
1	Site description	0.00	17 Sep 2021	17 Sep 2021

Site description - visit 1 (17 Sep 2021)

Open woodland of gimlet over eremophila on red-brown clay with ironstone gravel.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	20	**Litter depth(cm)**	2
Shrub cover (%)	80	**Litter cover (%)**	20
Grass cover (%)	0		
Herb cover (%)	1		

Site details			
Site	**1443_Myg02**	**Position (WGS84)**	-30.742252, 121.612856
Topography	drainage line	**Soil texture**	clay
Slope	gentle	**Rock type**	ferrous - ironstone, quartz
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	17 Sep 2021	17 Sep 2021
1	Foraging	3.93	17 Sep 2021	17 Sep 2021
1	Site description	0.00	17 Sep 2021	17 Sep 2021

Site description - visit 1 (17 Sep 2021)

Open euc woodland of gimlet, salmon gum and scattered casuarina over eremophila, acacia, pearl bluebush and greybush on red-brown clay with small ironstone rocks and gravel.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	75	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	3
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1443_Myg03**	**Position (WGS84)**	-30.741605, 121.583872
Topography	drainage line	**Soil texture**	clay
Slope	gentle	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	17 Sep 2021	17 Sep 2021
1	Foraging	2.10	17 Sep 2021	17 Sep 2021
1	Site description	0.00	17 Sep 2021	17 Sep 2021

Site description - visit 1 (17 Sep 2021)

Open euc woodland of gimlet lesouefi and salmon gum over eremophila, senna, acacia, pearl bluebush and greybush on red-brown clay with scattered small ironstone rocks.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	45	**Litter depth(cm)**	2
Shrub cover (%)	55	**Litter cover (%)**	30
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1443_Myg04**	**Position (WGS84)**	-30.728651, 121.568095
Topography	drainage line	**Soil texture**	clay
Slope	gentle	**Rock type**	calcrete, ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	18 Sep 2021	18 Sep 2021
1	Foraging	1.87	18 Sep 2021	18 Sep 2021
1	Site description	0.00	18 Sep 2021	18 Sep 2021

Site description - visit 1 (18 Sep 2021)

Open euc woodland of salmon gum and lesouefi over senna, greybush, acacia and eremophila over mixed ground cover of flowering herbs and scattered small grasses on red-brown clay with scattered clusters of small rocks.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	3
Shrub cover (%)	70	**Litter cover (%)**	40
Grass cover (%)	1		
Herb cover (%)	5		

Site details			
Site	**1443_Myg05**	**Position (WGS84)**	-30.688455, 121.56597
Topography	plain	**Soil texture**	gravel / alluvial, clay
Slope	negligible	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	18 Sep 2021	18 Sep 2021
1	Foraging	2.20	18 Sep 2021	18 Sep 2021
1	Site description	0.00	18 Sep 2021	18 Sep 2021

Site description - visit 1 (18 Sep 2021)

Medium tall open woodland of gimlet, salmon gum and lesouefi over predominately eremophila, mixed with pearl bluebush, greybush and senna over scattered ptilotus on red-brown clay with scattered ironstone gravel.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	50	**Litter depth(cm)**	2
Shrub cover (%)	50	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1443_Myg06**	**Position (WGS84)**	-30.674018, 121.547664
Topography	plain	**Soil texture**	gravel / alluvial, clay
Slope	negligible	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	18 Sep 2021	18 Sep 2021
1	Foraging	2.67	18 Sep 2021	18 Sep 2021
1	Site description	0.00	18 Sep 2021	18 Sep 2021

Site description - visit 1 (18 Sep 2021)

Tall open euc woodland of salmon gum over low shrubs of eremophila, pearl bluebush, greybush and senna on red-brown clay with ironstone gravel.

Habitat	open woodland		
Disturbance	Historic clearing, Litter, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	60	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	3
Shrub cover (%)	70	**Litter cover (%)**	30
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**1443_Myg07**	**Position (WGS84)**	-30.76463, 121.647442
Topography	plain	**Soil texture**	gravel / alluvial, clay
Slope	negligible	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Foraging	1.47	19 Sep 2021	19 Sep 2021
1	Site description	0.00	19 Sep 2021	19 Sep 2021

Site description - visit 1 (19 Sep 2021)

Medium tall open euc woodland of gimlet, salmon gum and lesouefi over mostly eremophila with greybush, pearl bluebush and exocarpos on red-brown clay with a surface layer of ironstone gravel.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	50	**Litter depth(cm)**	3
Shrub cover (%)	50	**Litter cover (%)**	40
Grass cover (%)	5		
Herb cover (%)	0		

Site details			
Site	**1443_Myg08**	**Position (WGS84)**	-30.755666, 121.647678
Topography	drainage line	**Soil texture**	clay
Slope	gentle	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	19 Sep 2021	19 Sep 2021
1	Foraging	1.63	19 Sep 2021	19 Sep 2021
1	Site description	0.00	19 Sep 2021	19 Sep 2021

Site description - visit 1 (19 Sep 2021)

Medium tall open euc woodland of gimlet and salmon gum over eremophila, greybush, senna and acacia on red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	60	**Litter depth(cm)**	3
Shrub cover (%)	40	**Litter cover (%)**	50
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**PIT01**	**Position (WGS84)**	-30.755707, 121.530776
Topography	plain	**Soil texture**	sandy clay, clay loam, loam, clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.77	14 Sep 2021	14 Sep 2021
1	Burrow excavation	0.00	14 Sep 2021	14 Sep 2021
1	Foraging	2.70	14 Sep 2021	14 Sep 2021
1	Litter sieve	0.00	14 Sep 2021	14 Sep 2021
1	Site description	0.00	14 Sep 2021	14 Sep 2021
1	Wet pitfall trap	3,720.00	14 Sep 2021	15 Oct 2021

Site description - visit 1 (14 Sep 2021)

Open euc woodland of gimlet over eremophila, senna and brachychiton over mixed low shrubs on red-brown sandy clay loam.

Habitat	open woodland		
Disturbance	Current operations, Evidence of feral animals, Exploration (drill pads and access tracks), Grazing-medium, Historic clearing, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	90	**Litter distribution**	under vegetation
Tree cover (%)	30	**Litter depth(cm)**	3
Shrub cover (%)	70	**Litter cover (%)**	60
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**PIT02**	**Position (WGS84)**	-30.77645, 121.541902
Topography	floodplain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	1.43	14 Sep 2021	14 Sep 2021
1	Burrow excavation	-0.02	15 Sep 2021	15 Sep 2021
1	Foraging	5.60	15 Sep 2021	15 Sep 2021
1	Site description	0.00	14 Sep 2021	14 Sep 2021
1	Wet pitfall trap	3,720.00	14 Sep 2021	15 Oct 2021

Site description - visit 1 (14 Sep 2021)

Acacia, senna and eremophila shrubland over red-brown clay.

Habitat	shrubland		
Disturbance	Evidence of feral animals, Grazing-low, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	95	**Litter distribution**	under vegetation
Tree cover (%)	0	**Litter depth(cm)**	2
Shrub cover (%)	100	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**PIT03**	**Position (WGS84)**	-30.787115, 121.570212
Topography	drainage line	**Soil texture**	clay loam
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Birding	0.70	15 Sep 2021	15 Sep 2021
1	Burrow excavation	0.00	16 Sep 2021	16 Sep 2021
1	Foraging	0.70	15 Sep 2021	15 Sep 2021
1	Foraging nocturnal	1.87	15 Sep 2021	15 Sep 2021
1	Site description	0.00	14 Sep 2021	14 Sep 2021
1	Wet pitfall trap	3,480.00	16 Sep 2021	15 Oct 2021

Site description - visit 1 (14 Sep 2021)

Open eucalyptus woodland of gimlet in tree and mallee form over mid level senna, sentalum, eremophila and acacia over low mixed shrubs and herbs on clay in drainage line.

Habitat	open woodland		
Disturbance	Grazing-medium, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	3
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	5		

Site details			
Site	**PIT04**	**Position (WGS84)**	-30.74281, 121.625997
Topography	plain	**Soil texture**	clay
Slope	negligible	**Rock type**	none
Soil colour	red-brown	**Rock cover (%)**	0

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	17 Sep 2021	17 Sep 2021
1	Foraging	2.13	17 Sep 2021	17 Sep 2021
1	Site description	0.00	17 Sep 2021	17 Sep 2021
1	Wet pitfall trap	3,360.00	17 Sep 2021	15 Oct 2021

Site description - visit 1 (17 Sep 2021)

Open woodland of gimlet with some salmon gum over eremophila, exocarpos, greybush and pearl bluebush on red-brown clay.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	3
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**PIT05**	**Position (WGS84)**	-30.702921, 121.566795
Topography	drainage line	**Soil texture**	clay
Slope	gentle	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	18 Sep 2021	18 Sep 2021
1	Foraging	0.83	18 Sep 2021	18 Sep 2021
1	Site description	0.00	18 Sep 2021	18 Sep 2021
1	Wet pitfall trap	3,240.00	18 Sep 2021	15 Oct 2021

Site description - visit 1 (18 Sep 2021)

Low open euc woodland of lesouefi over eremophila, senna, pearl bluebush, greybush and acacia on red-brown clay with scattered small rocks.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-low, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	80	**Litter distribution**	under vegetation
Tree cover (%)	50	**Litter depth(cm)**	2
Shrub cover (%)	50	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Site details			
Site	**PIT06**	**Position (WGS84)**	-30.75342, 121.641547
Topography	plain	**Soil texture**	gravel / alluvial, clay
Slope	negligible	**Rock type**	ferrous - ironstone
Soil colour	red-brown	**Rock cover (%)**	1

Sample and effort summary

Visit	Sample method	Sample quant. (hrs)	Date start	Date stop
1	Burrow excavation	0.00	19 Sep 2021	19 Sep 2021
1	Foraging	2.00	19 Sep 2021	19 Sep 2021
1	Site description	0.00	19 Sep 2021	19 Sep 2021
1	Wet pitfall trap	3,120.00	19 Sep 2021	15 Oct 2021

Site description - visit 1 (19 Sep 2021)

Open euc woodland of tall gimlet and salmon gum over tall shrubs of exocarpos and medium shrubs of eremophila, senna and acacia on red-brown clay with a surface layer of ironstone gravel.

Habitat	open woodland		
Disturbance	Evidence of feral animals, Grazing-medium, Litter, Livestock tracks, Vehicle tracks		
Vegetation condition	Good	**Fire age**	moderate (>5 years)
Total veg. cover (%)	70	**Litter distribution**	under vegetation
Tree cover (%)	40	**Litter depth(cm)**	3
Shrub cover (%)	60	**Litter cover (%)**	40
Grass cover (%)	0		
Herb cover (%)	0		

Appendix 3 Vertebrate species records from desktop review and this survey

Family	Species	Common name	Status				Source										
			EPBC Act	WC Act	DBCA Priority Fauna	Naturalised	DBCA (2017a)	DoEE (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	Status				Source										
			EPBC Act	WC Act	DBCA Priority Fauna	Naturalised	DBCA (2017a)	DoEE (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*						●							●			

Family	Species	Common name	Status				Source										
			EPBC Act	WC Act	DBCA Priority Fauna	Naturalised	DBCA (2017a)	DoEE (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	*Pseudechis australis*	Mulga Snake					●					●		●		●	
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*						●							●			

Family	Species	Common name	Status				Source										
			EPBC Act	WC Act	DBCA Priority Fauna	Naturalised	DBCA (2017a)	DoEE (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	*Ctenotus uber*	Spotted Ctenotus					●					●		●		●	
Scincidae	*Cyclodomorphus melanops elongatus*	Slender Blue-tongue					●							●			
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*						●			●		●	●	●		●	●

Family	Species	Common name	Status				Source										
			EPBC Act	WC Act	DBCA Priority Fauna	Naturalised	DBCA (2017a)	DoEE (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
Varanidae	*Varanus caudolineatus*						●					●		●		●	
Varanidae	*Varanus gouldii*	Gould's Monitor					●					●	●	●	●	●	
Varanidae	*Varanus tristis*	Black-headed Monitor					●										
Aves																	
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					●										

Family	Species	Common name	Status				Source										
			EPBC Act	WC Act	DBCA Priority Fauna	Naturalised	DBCA (2017a)	DoEE (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	*Anas gracilis*	Grey Teal					●				●	●				●	
Anatidae	*Anas rhynchotis*	Australasian Shoveler					●										
Anatidae	*Anas superciliosa*	Pacific Black Duck					●					●				●	
Anatidae	*Aythya australis*	Hardhead					●										
Anatidae	*Biziura lobata*	Musk Duck					●										
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					●					●		●		●	

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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					●				●						
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					●										

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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					●			●		●	●		●	●	●
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					●				●	●			●	●	●

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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					●			●	●	●	●	●	●	●	●
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					●					●				●	

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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					●				●						
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 xanthogenys*	Western Rosella (inland)			P4		●								●	●	
Psittacidae	*Platycercus varius*	Mulga Parrot					●					●		●		●	

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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.				●									
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					●										

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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					●					●		●		●	
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					●			●		●		●		●	

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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					●				●	●		●	●	●	●
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					●					●		●	●	●	●