Appendix H: Supporting Biodiversity Survey (Fauna Survey for Mungari Gold Operations Cutters Ridge Project)

PHOENIX
ENVIRONMENTAL SCIENCES

Fauna survey for Mungari Gold Operations Cutters Ridge Project

Prepared for Evolution Mining Ltd

February 2019

Draft Report

Fauna survey for the Mungari Operations – Cutters Ridge Project

Prepared for Evolution Mining Ltd

Draft Report

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EXECUTIVE SUMMARY

Evolution Mining Ltd (EVO) operates the Mungari Gold Operations (MGO) , including the Frog's Leg and White Foil gold projects, located approximately 20 km west of Kalgoorlie. EVO is seeking to develop the Cutters Ridge Project (the Project), located in the vicinity of existing operations.

In September 2018, EVO commissioned Phoenix Environmental Sciences Pty Ltd (Phoenix) to undertake a Level 1 fauna and targeted Malleefowl survey to support environmental approvals for the Project. The study area for the survey was 1,176.5 ha, comprising Cutters Ridge area plus a road corridor between Cutters Ridge and the Mungari Mill (collectively the study area).

The scope of works for the survey was as follows:

- conduct a desktop assessment to define the potential terrestrial fauna values of the study area, including vertebrate fauna and short range endemic (SRE) invertebrate fauna
- complete a combined Level 1 fauna and targeted Malleefowl (*Leipoa ocellata*) field survey
- prepare a comprehensive technical report outlining survey outcomes
- prepare and provide all spatial data collected during the survey.

The desktop assessment for vertebrate fauna identified 22 species of conservation significance potentially occurring in the study area. This included eight species listed as Threatened, Specially Protected or Conservation Dependent under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or State *Biodiversity Conservation Act 2016* (BC Act), 14 listed as Migratory under the EPBC Act and/or BC Act and two listed as Priority fauna by the Department of Biodiversity, Conservation and Attractions (DBCA).

Twelve confirmed and seven potential SRE taxa were identified in the desktop review, and a further 24 taxa of uncertain status (i.e. female or juvenile specimens). Of the 12 confirmed or potential SRE taxa, four are named species (*Austrosuccinea aridicola*, *Jalmenus aridus*, *Missulena harewoodi* and *Ogyris subterrestris petrina*), the remaining are only named to morphospecies codes as applied by the WA Museum until they are formerly described. One invertebrate species identified in the desktop review is listed as Threatened under the EPBC and BC Acts (*Ogyris subterrestris petrina*) and one listed as Priority by DBCA (*Jalmenus aridus*).

The field survey was undertaken over nine consecutive days from 2–10 October 2018. The survey included assessment and mapping of broad fauna habitats, active searches for vertebrate and SRE fauna, avifauna surveys, bat echolocation recordings, and litter/soil sieving for SRE fauna and targeted searches for significant taxa, in particular Malleefowl. Thirty-seven terrestrial fauna sites and three bat echolocation call recording sites were surveyed in accordance with relevant Environmental Protection Authority (EPA) guidelines.

Four broad fauna habitats were identified within the study are: open eucalypt woodland, shrubland, chenopod shrubland and salt lake, in addition to a small portion of existing cleared areas. Open eucalypt woodland was the dominant habitat, occupying approximately 80.7% (949.54 ha) of the study area, followed by shrubland habitat (14.3 %), with the remaining broad fauna habitats occupying less than 5%. All fauna habitats mapped during the field survey have the potential to support conservation significant species; however, all are well represented within the broader vicinity of the study area and the Coolgardie bioregion.

A total of 75 vertebrate fauna species were recorded during the field survey including 52 birds, 13 reptiles and ten mammals. One conservation significant fauna species was recorded, Malleefowl (*Leipoa ocellata*; Vulnerable EPBC/BC Acts), once from secondary evidence (old disused mound) within

the study area and once from direct observation of an individual within 500 m outside the study area. The open eucalypt woodland and shrubland habitats provide suitable foraging habitat for Malleefowl, but suitable nesting habitat within the study area was sparse and patchy, often occurring in small isolated patches with no connectivity. Suitable nesting habitat was observed in areas outside the study area; nesting is more likely to occur in these areas than in the study area; however, the species may forage in the study area if nesting nearby.

Suitable habitat was recorded for a further 15 conservation significant species within the study area, primarily migratory shorebirds which may utilise the saltlake and chenopod shrubland to forage when inundated following rainfall events.

No SRE invertebrates were collected during the field survey, the lack of which is consistent with the low density of SREs identified in the desktop assessment; however, this may also reflect limited regional collecting effort, or indicate a low likelihood of SREs occuring locally. There is limited presence of suitable SRE habitats in the study area, characterised mainly by open eucalypt woodlands and shrublands which are widespread and homogeneous more broadly outside of the study area. The most potentially prospective SRE habitat within the study area was saltlake habitat and associated chenopod shrubland; however, this habitat represents only a small portion of the study area and sampling of this habitat could not be undertaken during the field survey due to inundation. The hydrological cycle of the saltlake is unknown but it is is evidently subject to complete inundation at times, which may render it unfavourable for specialised saltlake SREs, particularly burrowing species.

1 INTRODUCTION

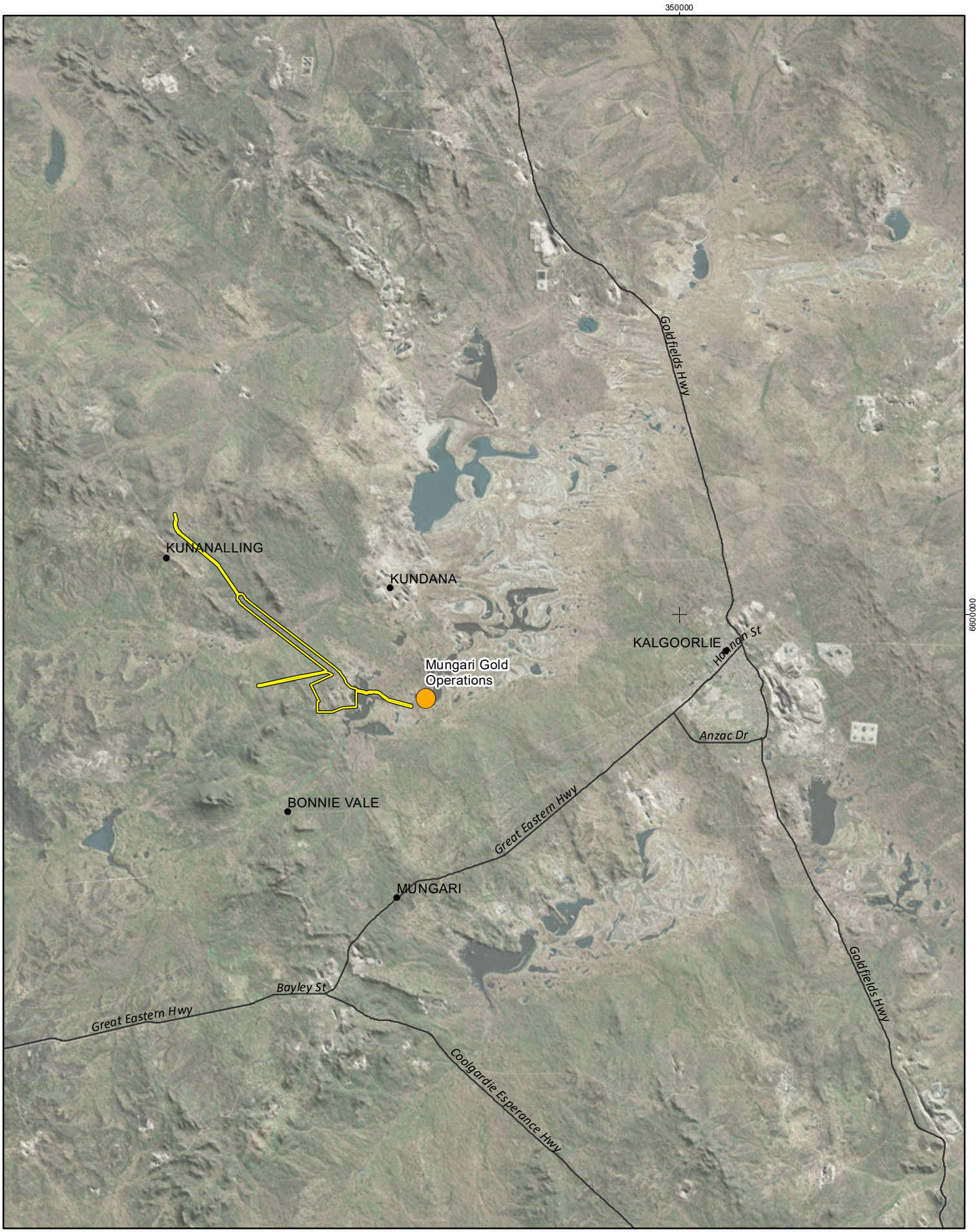
Evolution Mining Ltd (EVO) operates the Mungari Gold Operations (MGO), including the Frog's Leg and White Foil gold projects. MGO is located in the Goldfields region, approximately 20 km west of Kalgoorlie (Figure 1-1).

Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by EVO to undertake a Level 1 fauna survey and targeted Malleefowl survey for the Cutters Ridge Project (the Project), which included the Cutters Ridge mining area and a road corridor between Cutters Ridge and Mungari Mill (near White Foil) covering a total of 1,176.50 ha (collectively the study area), both located within the current MGO area (Figure 1-1).

1.1 SCOPE OF WORK

The scope of works for the Level 1 fauna and targeted Malleefowl survey of the study area was as follows:

- conduct a desktop assessment of relevant existing available fauna information within 40 km of the study area in order to define the key biological values likely to occur and which will require investigation during field surveys
- complete a combined Level 1 fauna and targeted Malleefowl (*Leipoa ocellata*) survey for the study area in accordance with relevant legislation and guidelines
- prepare a comprehensive technical report outlining survey methodologies and outcomes
- prepare and provide all spatial data collected during the survey.



Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

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Kilometres

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Mungari Gold Operations

Study area

Figure 1-1

Location of the Mungari Gold Operations and study area

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2 LEGISLATIVE CONTEXT

The protection of flora and fauna in Western Australia (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 the Environment and Energy (DoEE). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a Matter of National Environmental Significance (NES), require approval from the Australian Government Minister for the Environment through a formal referral process. The EPBC Act provides for the listing of Threatened native fauna as matters of NES.

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 (Mig.) 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).

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

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened fauna species in the following categories:

- critically endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future[2]
- endangered (EN) – species facing a very high risk of extinction in the wild in the near future[2]
- vulnerable (VU)– species facing a high risk of extinction in the wild in the medium-term future[2].

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

- species of special conservation interest – 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
- cetaceans
- species subject to international agreement
- the category of species otherwise in need of special protection.

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 rare or 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 list are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.1 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 Threatened Ecological Community and its listing is otherwise in accordance with the ministerial guidelines. At the time of preparing this report, no listings for critical habitat had been made under the BC Act.

2.2.2 Other significant fauna and fauna habitats

Under the EPA's environmental factor guideline (EPA 2016a), terrestrial fauna may be considered significant for a range of reasons other than listing as a Threatened or Priority species. EPA (2016a) identifies the following attributes that may constitute significant fauna:

- species with restricted distribution

[2] As determined in accordance with criteria set out in the ministerial guidelines.

- 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.

Fauna habitats may be significant if they provide habitat important to the life history of a significant species, i.e. breeding, feeding, roosting or congregation areas, or where they are unique or isolated habitats, for example wetlands, in the landscape or region (EPA 2016a).

2.2.3 Short range endemic invertebrates

Short range endemic (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; Ponder & Colgan 2002). Short range endemism in terrestrial invertebrates is believed to have evolved through two primary processes (Harvey 2002), relictual short range endemism – where drying climate has forced range contraction into small pockets with remaining moist conditions (e.g. south-facing rock faces or slopes of mountains or gullies) – and habitat specialist SREs that may have settled in particular isolated habitat types (e.g. rocky or granite 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.There can be uncertainty in categorising a specimen as SRE due to a number of 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 (Western Australian Museum 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.

The EPA's environmental factor guideline for Terrestrial Fauna (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 environmental impact assessments (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. The likelihood of SRE occurrence therefore needs to be considered early in the environmental scoping stage of any proposal (EPA 2016c).

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The study area is located in the Eastern Goldfields subregion of the Coolgardie bioregion (DSEWPaC 2012) which is characterised by (Cowan 2001) as:

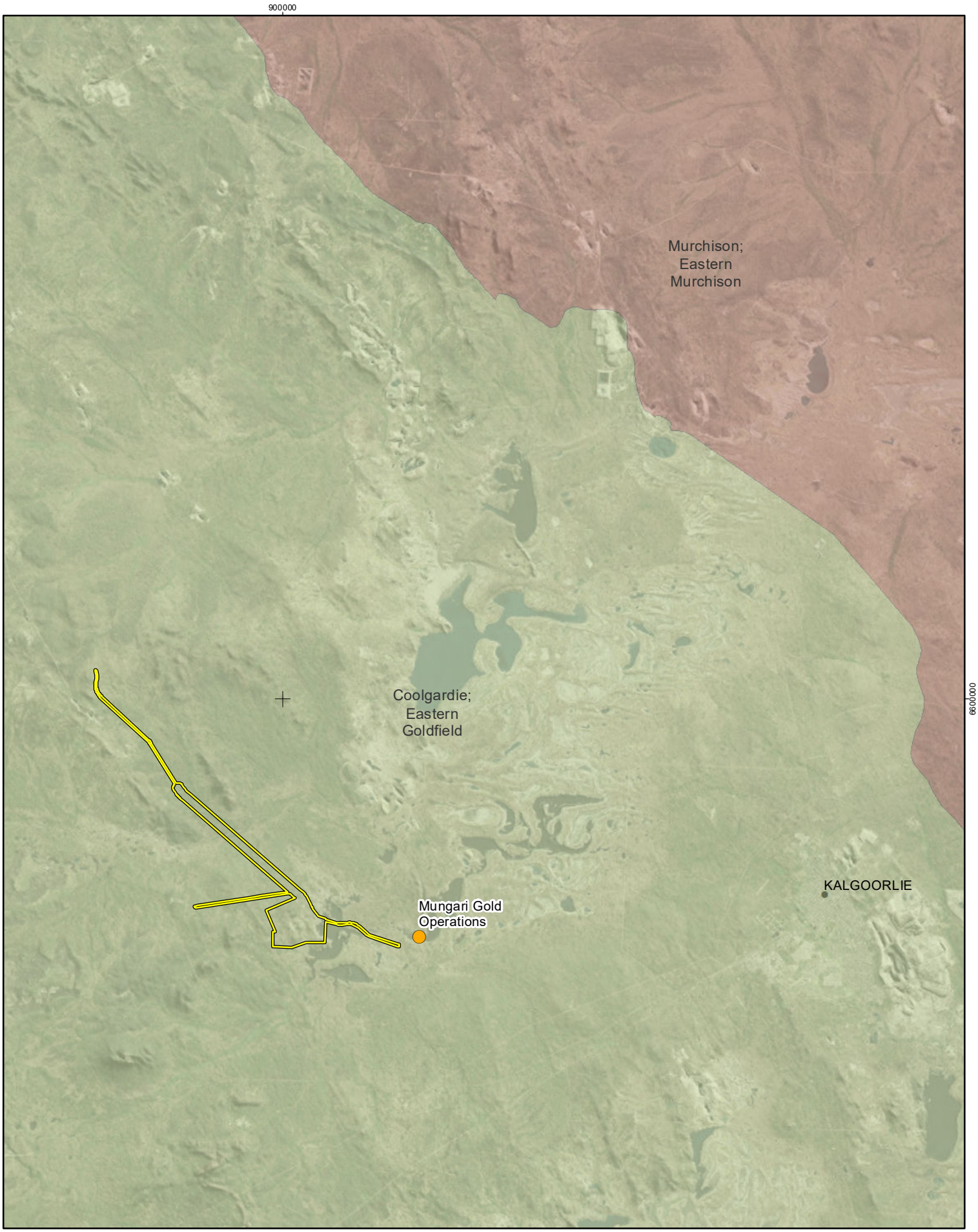
- gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite
- tertiary soils dominated by calcareous earths overlay eroded gneisses and granites
- a series of large playa lakes, including Lake Lefroy, indicate the remnants of an ancient major drainage line in the western half
- vegetation consisting of mallees, *Acacia* thickets and shrub-heaths on sandplains and dwarf shrublands of samphire persisting on salt lakes, surrounded by diverse *Eucalyptus* woodlands, which also occur on ranges and in valleys.
- in the western half, a series of large playa lakes indicate the remnants of ancient major drainage lines
- arid to semi-arid climate with 200–300 mm of mostly summer rainfall.

Rare features within the subregion include highly diverse floristic species and ecosystem diversity, in particular *Eucalyptus* spp., *Acacia* spp. and ephemeral flora communities of the Fraser Range vegetation complex and Woodline Hills and several notable wetlands including freshwater lakes, large salt lakes, claypans, and freshwater swamps such as Rowles Lagoon, Clear and Muddy Lakes and Swan Lake (Cowan 2001).

3.2 LAND SYSTEMS

According to Department of Agriculture and Food Western Australia mapping, three land systems occur in the study area (Figure 3-2):

- **BB5** Rocky ranges and hills of greenstones-basic igneous rocks, representing 218.71 ha (18.53%) of the study area
- **Mx43** Gently undulating valley plains and pediments; some outcrop of basic rock, representing 707.11 ha (59.92%) of the study area
- **SV15** Salt lakes and their associated areas, representing 254.34 ha (21.55%) of the study area.



Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

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Mungari Gold Operations
Study area

IBRA bioregion; subregion

Coolgardie; Eastern Goldfield (COO03)
Murchison; Eastern Murchison (MUR01)

Figure 3-1

IBRA region of the study area

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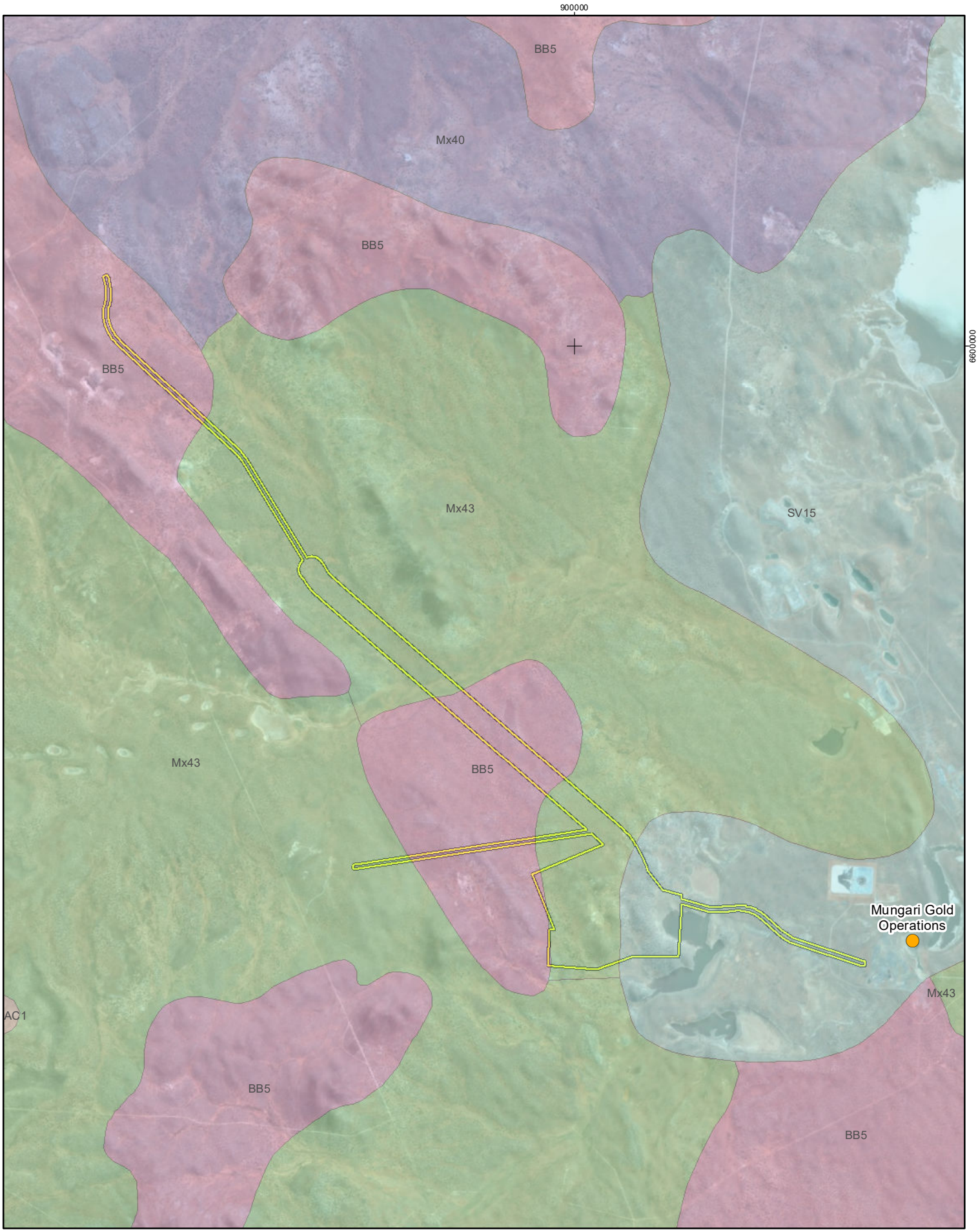

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Map author	GW, RE

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Mungari Gold Operations
Study area

Land system

- AC1
- BB5
- Mx40
- Mx43
- SV15

Figure 3-2

Land systems of the study area

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3.3 LAND USE AND CONSERVATION RESERVES

The dominant land use within the Eastern Goldfields subregion is Unallocated Crown Land (UCL) or Crown reserve and grazing-native pasture-leasehold and to a lesser extent conservation reserves and mining tenements (Cowan 2001).

The study area is not situated within any conservationn reserves; however, eight reserves or former pastoral leases acquired by the DBCA for conservation occur within 40 km of the study area (Figure 1-1). Of these, the closest is Kurrawang Nature Reserve is, located approximately 12 km southeast of the study area. The former Credo pastoral lease tenement which also encompases the Rowles Lagoon Conservation Park is located approximately 27 km northwest of the study area. The former pastoral lease was acquired by the DBCA in 2007 and is in the process of being gazetted into the reserves system to be managed for conservation. Several smaller Timber Reserves occur to the east and south of the study area (Figure 1-1).

3.4 CLIMATE AND WEATHER

The Eastern Goldfields subregion has an arid to semi-arid climate with 200–300 mm of annual rainfall which occurs mostly over winter months (Cowan 2001).

The nearest Bureau of Meteorology (BoM) weather station is located at Kalgoorlie-Boulder Airport (Latitude**:** 30.78°S Longitude**:** 121.45°E) approximately 20 km east-southeast of the study area. Kalgoorlie-Boulder Airport records the highest maximum mean monthly temperature (33.6°C) in January, the lowest maximum mean annual temperature (16.7°C) in July (BoM 2018) (Figure 3-3). The highest minimum mean monthly temp (18.3°C) is recorded in January with the lowest (5.0°C) recorded in July (BoM 2018) (Figure 3-3). Average annual rainfall is 266.3 mm with January, February and June recording the highest monthly averages (26.8, 30.4 and 27.7 mm respectively) (BoM 2018) (Figure 3-3).

Daily mean temperatures and rainfall for Kalgoorlie-Boulder Airport in the 12 months preceding the survey were comparable to annual long-term averages (Figure 3-3). Mean maximum temperatures were slightly above average for most months, with the exception of April and July – which were considerably higher – and January, February and October which were slightly below average (Figure 3-3). Mean minimum temperatures were slightly above the average in the 12 months preceeding the survey (Figure 3-3). Annual rainfall (November 2017 to October 2018) prior to the current survey was above average, with Kalgoorlie-Boulder Airport receiving 274.4 mm of rainfall comparedto the long term annual average of 266.9 mm (BoM 2018) (Figure 3-3).

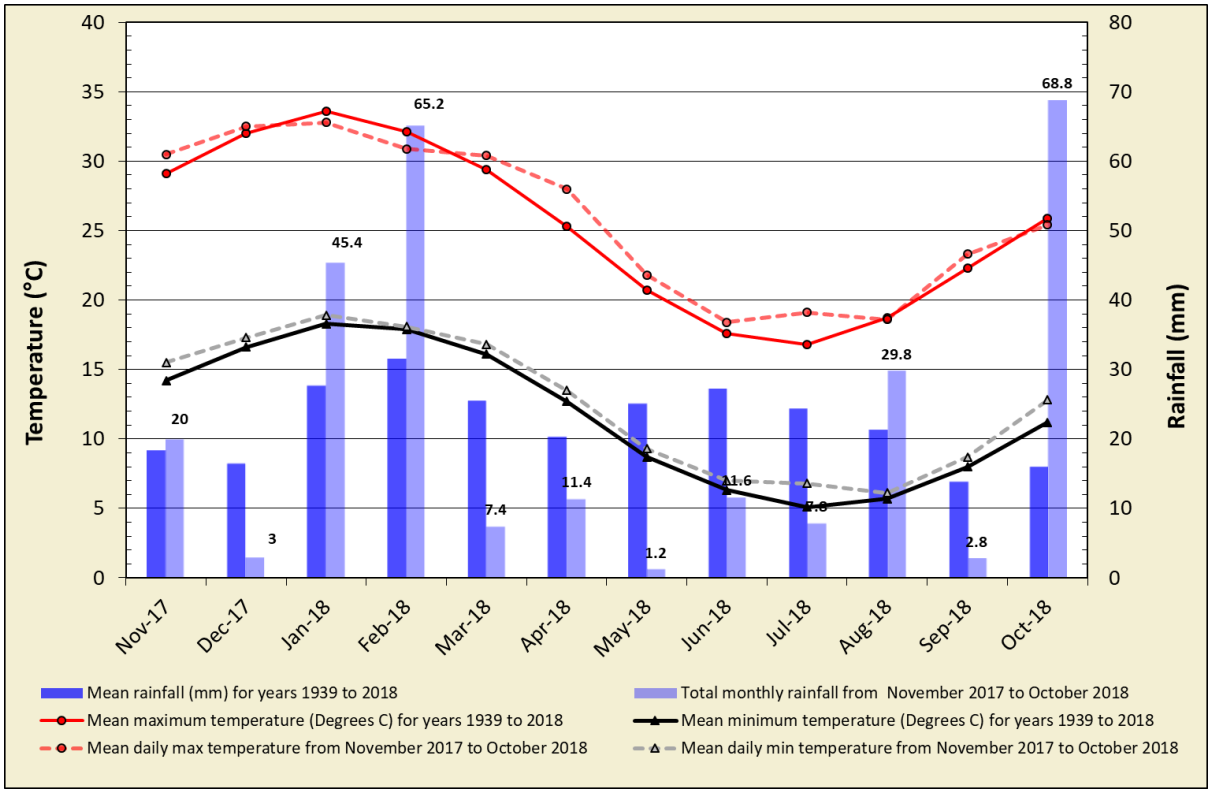


Figure 3-3 **Annual climate data and mean monthly data for the 12 months preceding the field survey for Kalgoorlie-Boulder Airport (BoM 2018)**

4 METHODS

The biological survey was conducted in accordance with relevant survey guidelines, including:

- *Environmental Factor Guideline: Terrestrial fauna* (EPA 2016a)
- *Technical Guidance: Terrestrial fauna surveys* (EPA 2016d)
- *Technical Guidance: Sampling methods for terrestrial vertebrate fauna* (EPA 2016b)
- *Technical Guidance: Sampling of short range endemic invertebrate fauna* (EPA 2016c).

4.1 DESKTOP ASSESSMENT

Desktop review methods entailed:

- a review of existing environmental information relevant to the biological values of the study area including
    - base environmental datasets to define the physical characteristics of the study area
    - searches of relevant biological databases
    - literature reviews of available technical reports from projects adjacent to the study area, or within the area of the desktop review
- review of existing vegetation mapping
- assessment of 'likelihood of occurrence' of listed species and communities.

Database searches and a literature review were undertaken to identify the significant fauna values that may occur within the study area. The database searches undertaken are detailed in Table 4-1. A literature search was conducted for accessible biological reports of terrestrial fauna surveys conducted within the vicinity of the study area to build on the potential species lists developed from the database searches (

Table 4-2).

Table 4-1 Database searches conducted for the desktop assessment

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (2018a)	EPBC Act Threatened Fauna	Approximate centre point of study area (121.1729°, -30.7654°) with 40 km buffer
DPaW Threatened and Priority Fauna Database (DBCA 2019)	Threatened and Priority fauna	As above.
DPaW NatureMap Database (DBCA 2018a)	Threatened and Priority fauna	As above.
BirdLife Australia BirData Database (Birdlife Australia 2018)	Avifauna	As above.
WA Museum Arachnid and Myriapod Database	Arachnid and Myriapod SREs	100km^2 search area encompassing the study area between -30.30°, 120.65° (northwest corner) and -31.30°, 121.65° (southeast corner)
WA Museum Mollusca Database	Mollusc SREs	As above

Table 4-2 Survey reports and datasets incorporated in the desktop assessment

Report author	Survey type	Project
McKenzie & Hall (1992)	Level 2 fauna surveys	Eastern Goldfields Biological Survey
Botanica (2014)	Desktop fauna assessment	Tailings Storage Facility Expansion (KCGM)
Harewood (2015)	Level 2 terrestrial fauna survey	Proposed Tails Storage Facility Expansion (KCGM)
Phoenix (2018a)	Gap analysis, Level 1 terrestrial fauna survey and data consolidation	Fimiston Gold Mine Operations (KCGM)

4.1.1 Likelihood of occurrence assessment

The potential for occurrence in the study area of any significant fauna identified in the database searches was assessed. The assessment was based on reviewed information relating to habitat preference (soils, landforms, elevation and vegetation associations) and locality records from the database searches.

All significant fauna species identified in the database searches were assessed for their potential to occur in the study area based on their known biology and habitat preferences, habitats identified in the study area and records of these species from nearby projects. The likelihood of occurrence for species was then verified during the field survey and re-assessed if required based on field survey data.

The fauna assessments assigned each taxon to one of four ratings:

- recorded – species recorded within the study area by current or previous survey
- likely – study area within known range of species; suitable or optimal habitat occurring within the study area and/or with current and/or previous records in the vicinity of the study area
- possible – within known range of species; suitable habitat present within study area, though not optimal; no records in the vicinity of the study area
- unlikely – outside of the species current known range; no records in the vicinity of the study area and/or no suitable habitat present within the study area. Also includes species considered locally or regionally extinct in relation to the study area due to historic declines.

4.2 FIELD SURVEY

Field work for the terrestrial fauna survey was conducted over nine consecutive days from 2–10 October 2018.

A total of 37 Level 1 sites were surveyed within the study area (Figure 4-1; Table 4-3). Survey methods for terrestrial vertebrates comprised of the following:

- habitat assessment (for details see section 4.2.1)
- active searches (see 4.2.2)
- avifauna surveys (see 4.2.3)

- bat echolocation recordings (see 4.2.4)
- targeted Malleefowl transect surveys (see4.2.5).

Additional survey methods were employed at each of the Level 1 surveys sites targeting SRE invertebrate groups. Collecting methods consisted of two proven, industry-recognised sampling techniques to target SRE taxa consistent with EPA (2016c):

- active foraging (see 4.2.6)
- litter/soil sieving (see 4.2.7).

Dry pitfall trapping is generally used to collect live scorpions by installing a small plastic cup in front of a scorpion burrow. No scorpion burrows were detected during the field survey and therefore this method was not utilised.

Specimens collected were transported life the laboratory and subsequently fixed in absolute ethanol (EtOH) to preserve tissue for future molecular analyses.

4.2.1 Habitat assessment

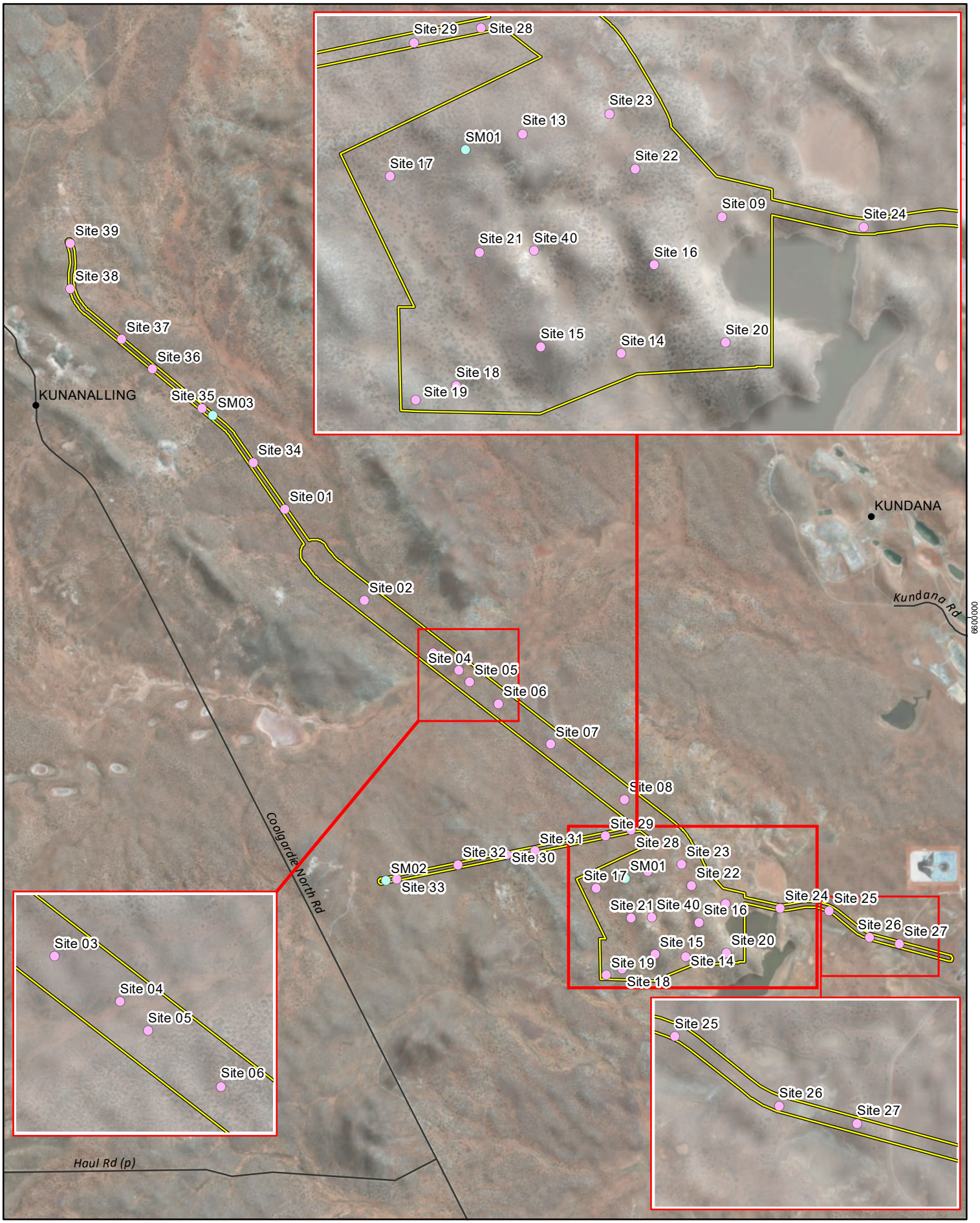
Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support conservation significant terrestrial fauna species were identified based on known habitats of such species within the Coolgardie bioregion. Tentative sites corresponding with flora and vegetation survey quadrats 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 37 Level 1 survey sites (Figure 4-1; Appendix 1).

4.2.2 Active searches

Active searches were undertaken at each of the Level 1 survey sites (Figure 4-1; Table 4-3) and primarily targeted diurnal herpetofauna and mammals from direct sightings and secondary evidence. Searches focussed primarily on conservation significant species identified in the desktop review as potentially occurring within the study area.

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 pebble mounds or nests. One person hour was spent active searching at each site for a total of 37 hours over the duration of the field survey (Table 4-3).



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Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	12-Feb-19
Drawn by	IH
Map author	GW, RE

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Kilometres

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Study area
Fauna site type
Level 1 fauna
SongMeter recording

Figure 4-1

Survey site locations

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Table 4-3 Terrestrial fauna survey site locations and survey effort

Site	Site type	Latitude	Longitude	Vertebrate fauna			SRE invertebrate fauna	
				Active searches (hr)	Avifauna (min)	SongMeter (night)	Active foraging (hr)	Litter/soil sieves (qty)
Site 01	Level 1 fauna	-30.7012	121.1139	1	20		.5	2
Site 02	Level 1 fauna	-30.7165	121.1288	1	20		.5	3
Site 03	Level 1 fauna	-30.7255	121.1419	1	20		.5	2
Site 04	Level 1 fauna	-30.7285	121.1467	1	20		.5	3
Site 05	Level 1 fauna	-30.7304	121.1488	1	20		.5	2
Site 06	Level 1 fauna	-30.7341	121.1542	1	20		.5	1
Site 07	Level 1 fauna	-30.741	121.1641	1	20		.5	3
Site 08	Level 1 fauna	-30.7504	121.1782	1	20		.5	2
Site 09	Level 1 fauna	-30.768	121.1972	1	20		.5	0
Site 13	Level 1 fauna	-30.7624	121.1824	1	20		.5	3
Site 14	Level 1 fauna	-30.7767	121.1895	1	20		.5	0
Site 15	Level 1 fauna	-30.7762	121.1835	1	20		.5	0
Site 16	Level 1 fauna	-30.771	121.1921	1	20		.5	2
Site 17	Level 1 fauna	-30.765	121.1724	1	20		.5	1
Site 18	Level 1 fauna	-30.7786	121.1771	1	20		.5	0
Site 19	Level 1 fauna	-30.7795	121.1741	1	20		.5	3
Site 20	Level 1 fauna	-30.7761	121.1973	1	20		.5	0
Site 21	Level 1 fauna	-30.77	121.179	1	20		.5	0
Site 22	Level 1 fauna	-30.7648	121.1908	1	20		.5	2
Site 23	Level 1 fauna	-30.7612	121.1889	1	20		.5	0
Site 24	Level 1 fauna	-30.7688	121.2078	1	20		.5	0
Site 25	Level 1 fauna	-30.7693	121.2171	1	20		.5	0
Site 26	Level 1 fauna	-30.7739	121.2248	1	20		.5	0
Site 27	Level 1 fauna	-30.7751	121.2306	1	20		.5	3
Site 28	Level 1 fauna	-30.7555	121.1794	1	20		.5	0
Site 29	Level 1 fauna	-30.7564	121.1744	1	20		.5	3
Site 30	Level 1 fauna	-30.7591	121.1554	1	20		.5	2
Site 31	Level 1 fauna	-30.7587	121.1608	1	20		.5	1
Site 32	Level 1 fauna	-30.7608	121.146	1	20		.5	3
Site 33	Level 1 fauna	-30.763	121.1341	1	20		.5	1
Site 34	Level 1 fauna	-30.6934	121.1079	1	20		.5	3
Site 35	Level 1 fauna	-30.6842	121.0983	1	20		.5	0
Site 36	Level 1 fauna	-30.6776	121.0888	1	20		.5	2
Site 37	Level 1 fauna	-30.6725	121.083	1	20		.5	0
Site 38	Level 1 fauna	-30.664	121.0734	1	20		.5	3
Site 39	Level 1 fauna	-30.6564	121.0735	1	20		.5	2

Site	Site type	Latitude	Longitude	Vertebrate fauna			SRE invertebrate fauna	
				Active searches (hr)	Avifauna (min)	SongMeter (night)	Active foraging (hr)	Litter/soil sieves (qty)
Site 40	Level 1 fauna	-30.77	121.1831	1	20		.5	0
SM01	SongMeter recording	-30.7634	121.1781			1		
SM02	SongMeter recording	-30.7632	121.1321			1		
SM03	SongMeter recording	-30.6855	121.1003			1		
Total				**37**	**740**	**3**	**18.5**	**52**

4.2.3 Avifauna surveys

Twenty-minute avifauna surveys were undertaken at each of the Level 1 survey sites (Figure 4-1; Table 4-3). 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 approximately 12 person hours of avifauna census was undertaken during the field survey (Table 4-3).

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

4.2.4 Bat echolocation recordings

SongMeter SM2 recording devices were used to record bat echolocation calls at three opportunistic sites during the field survey (Figure 4-1; Table 4-3). Recording devices were deployed at each site for one night of recording for between eight and 12 continuous hours per night. Devices were aimed at a 45° angle to the ground. Areas of habitat likely to have increased insect activity and to attract bats (i.e. likely foraging areas or movement corridors) and potential roosting sites.

4.2.5 Targeted Malleefowl transects

Transect searches for Malleefowl were undertaken throughout the study area. Searches were undertaken across the entire study area to search for any evidence of occurrence including tracks, mounds and/or remains.

Spacing of transects varied depending on suitability of habitat and visibility resulting from changes in the structure and density of vegetation. Broad transect searches were undertaken across the entire study area; where suitable habitat was observed, transect distance was reduced to thoroughy cover areas of suitable habitat. Broad transects ranged between 20–100 m depending on the habitat type and quality for Malleefowl, with broader transects walked in areas of unsuitable or open habitat where visibility was high. Where areas of suitable habitat was observed, narrower transects ranging between 5–25 m were walked depending on visibility of intervening areas. Additional opportunistic searches were also undertaken while moving between sites.

4.2.6 Active foraging for SREs

Active foraging for SRE invertebrate groups comprised 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, and spinifex bases were inspected thoroughly. Rocks and rock crevices were inspected, particularly for pseudoscorpions.

A standardised approach was undertaken whereby each site was sampled for 0.5 person hour (concurrently with active searches for vertebrate fauna), a total search effort of approximately 18.5 hours (Table 4-3). Trapdoor spider burrows identified during the searches were excavated if they were considered inhabited. Excavation involved removing soil from around the burrow to carefully expose the burrow chamber and remove the spider.

4.2.7 Litter/soil sieving for SREs

Up to three combined litter/soil sifts were undertaken at each site where sufficient leaf litter was present. At sites with insufficient leaf litter, number of sifts varied from none to three. In total, 52 sifts were undertaken (Table 4-3). 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 slaters.

4.3 SURVEY PERSONNEL

The personnel involved in the survey are presented (Table 4-4).

Table 4-4 Project team

Name	Qualifications	Role/s
Dr Grant Wells	PhD. (Botany)	Project manager
Mr Ryan Ellis	Dip. (Cons. & Land Mgmt.) BESc. (Wildlife & Cons. Biol.)	Field survey, fauna taxonomy and reporting
Mrs Karen Crews	BSc. (Env. Biol.) (Hons)	Report review
Mr Jarrad Clark	BSc. (Env. Mgmt)	Bat echolocation call analysis
Mr Ian Hay	BAppSc. (Surveying and Mapping)	GIS and spatial data aalysis

5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Vertebrate fauna

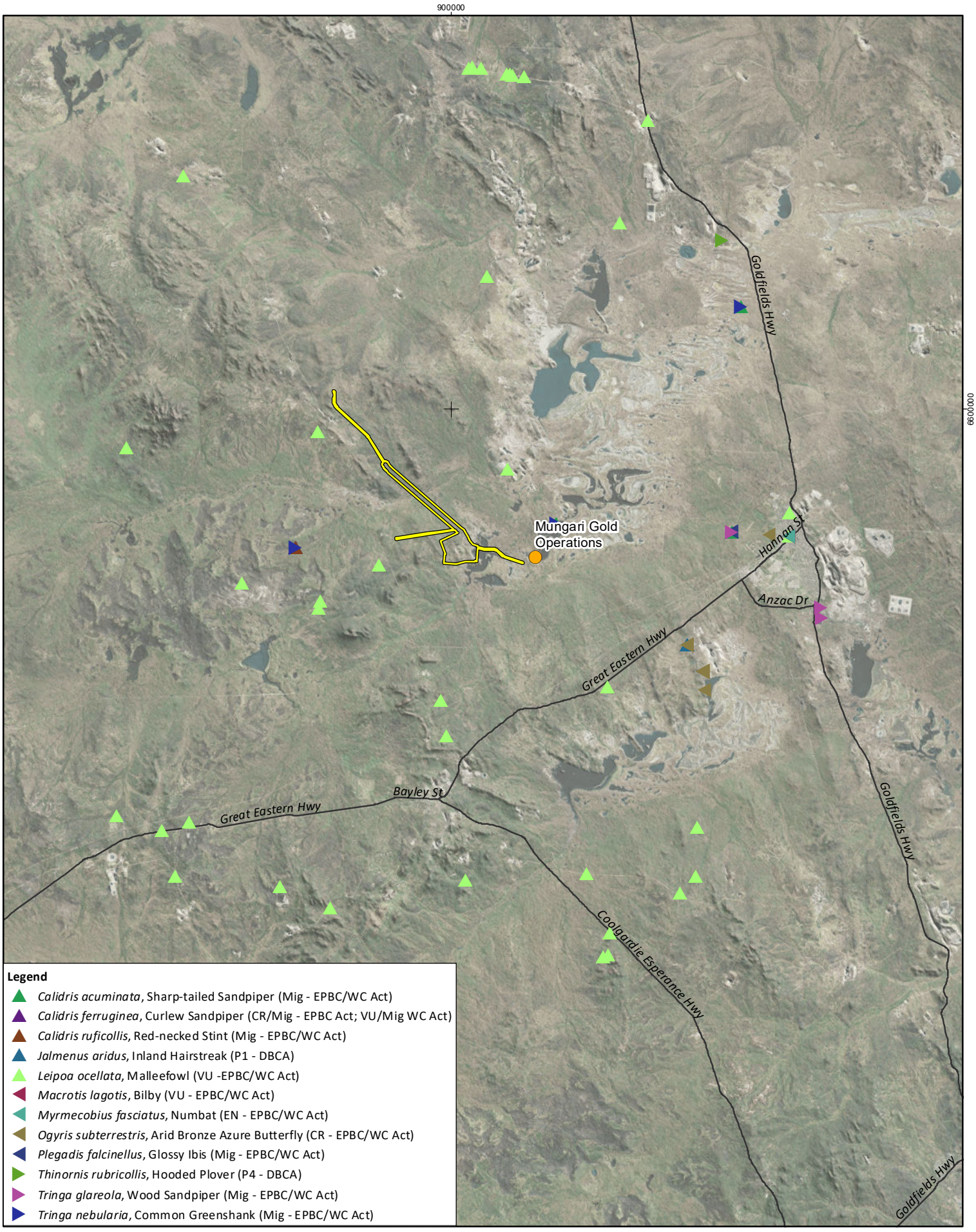
Records for 274 terrestrial vertebrate fauna species and subspecies were identified as potentially occurring within the study area in the desktop review. This comprised six frogs, 72 reptiles (including one introduced species), 158 birds (including three introduced) and 38 mammals (including ten introduced) (Appendix 2).

A total of 22 species of conservation significance were identified in the desktop review, comprising eight species listed under the EPBC Act and/or BC Act as Threatened, Conservation Dependent or Specially Protected (Table 5-1; Figure 5-1). Fourteen species are listed as Migratory under the EPBC Act and BC Act (Table 5-1). A further two species are listed as Priority species by the DBCA (Table 5-1).

Table 5-1 Conservation significant vertebrate fauna species identified in the desktop review

Species	Common name	Conservation status[1]		
		EPBC Act	BC Act	DBCA
Birds				
Apus pacificus	Fork-tailed Swift	Mig.	Mig.	
Thinornis rubricollis	Hooded Plover			P4
Falco peregrinus	Peregrine Falcon		SP	
Glareola maldivarum	Oriental Pratincole	Mig.	Mig.	
Leipoa ocellata	Malleefowl	VU	VU	
Motacilla cinerea	Grey Wagtail	Mig.	Mig.	
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	EN	EN	
Pezoporus occidentalis	Night Parrot	EN	CR	
Actitis hypoleucos	Common Sandpiper	Mig.	Mig.	
Calidris acuminata	Sharp-tailed Sandpiper	Mig.	Mig.	
Calidris alba	Sanderling	Mig.	Mig.	
Calidris ferruginea	Curlew Sandpiper	CR/Mig.	VU/Mig.	
Calidris melanotos	Pectoral Sandpiper	Mig.	Mig.	
Calidris ruficollis	Red-necked Stint	Mig.	Mig.	
Calidris subminuta	Long-toed Stint	Mig.	Mig.	
Tringa brevipes	Grey-tailed Tattler	Mig.	Mig.	P4
Tringa glareola	Wood Sandpiper	Mig.	Mig.	
Tringa nebularia	Common Greenshank	Mig.	Mig.	
Plegadis falcinellus	Glossy Ibis	Mig.	Mig.	
Mammals				
Dasyurus geoffroii	Chuditch	VU	VU	
Myrmecobius fasciatus	Numbat	EN	EN	
Macrotis lagotis	Bilby	VU	VU	

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



Legend

- *Calidris acuminata*, Sharp-tailed Sandpiper (Mig - EPBC/WC Act)
- *Calidris ferruginea*, Curlew Sandpiper (CR/Mig - EPBC Act; VU/Mig WC Act)
- *Calidris ruficollis*, Red-necked Stint (Mig - EPBC/WC Act)
- *Jalmenus aridus*, Inland Hairstreak (P1 - DBCA)
- *Leipoa ocellata*, Malleefowl (VU -EPBC/WC Act)
- *Macrotis lagotis*, Bilby (VU - EPBC/WC Act)
- *Myrmecobius fasciatus*, Numbat (EN - EPBC/WC Act)
- *Ogyris subterrestris*, Arid Bronze Azure Butterfly (CR - EPBC/WC Act)
- *Plegadis falcinellus*, Glossy Ibis (Mig - EPBC/WC Act)
- *Thinornis rubricollis*, Hooded Plover (P4 - DBCA)
- *Tringa glareola*, Wood Sandpiper (Mig - EPBC/WC Act)
- *Tringa nebularia*, Common Greenshank (Mig - EPBC/WC Act)

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Map author	GW, RE

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Kilometres

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Study area

Figure 5-1

DBCA records of significant vertebrate fauna

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5.1.2 SRE invertebrate fauna

The desktop review identified records of 12 confirmed SRE taxa and seven potential SRE taxa from the within the SRE desktop search area (Table 5-2; Figure 5-2). A further 24 taxa of uncertain SRE status were identified. None of the records have been collected within the study area and the nearest is a millipede located approximately 12.8 km east-southeast of the study area, *Antichiropus* 'DIP065' (Table 5-2; Figure 5-2).

Of the 19 confirmed or potential SRE taxa, only four are named species (*Missulena harewoodi* and *Austrosuccinea aridicola*), while the remaining ten taxa are named only to morphospecies codes as applied by the WA Museum. The majority of taxa records of uncertain SRE status are unidentifiable ("sp. indet.", i.e. female or juvenile specimens) or could not be identified to species or morphospecies, and may represent new species or other species listed in the same genus where records exist (Table 5-2).

Two conservation significant SRE species were returned in the desktop review. The Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) (EPBC Act, WC Act – CR) has been 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 therefore a confirmed SRE. The Inland Hairstreak (*Jalmenus aridus*) (DBCA – P1), originally described from Lake Douglas, ca. 12 km SW of Kalgoorlie (Graham & Moulds 1988) and is considered a potential SRE. The larvae of *J. aridus* feed on the leaves and flowers of *Senna nemophila* and *Acacia tetragonophylla*. The caterpillars are attended by the ant species *Froggatella kirbii*.

Table 5-2 Confirmed and potential SRE taxa identified in the desktop review from WA Museum records

Family	Species	SRE category
Araneae (spiders)		
Actinopodidae	*Missulena harewoodi*	Potential
	Missulena sp.	Uncertain
Barychelidae	*Idiommata* 'kalgoorlie'	Potential
	Idiomata sp.	Uncertain
Clubionidae	*Clubiona* sp.	Uncertain
Ctenizidae	*Conothele* 'MYG549'	Confirmed
	Conothele 'MYG554'	Confirmed
Dipluridae	*Cethegus* 'sp.'	Uncertain
Halonoproctidae	*Conothele* sp.	Uncertain
Idiopidae	*Idiosoma* 'MYG244'	Confirmed
	Idiosoma `*Aganippe*` sp.	Uncertain
	Idiosoma `*Aganippe*` `kalgoorlie`	Uncertain
	Idiosoma `*Aganippe*` `occidentalis sp. group`	Uncertain
	Idiosoma `*Aganippe*` `sp. indet.`	Uncertain
	Idiosoma `*Aganippe*` `sp. nov.`	Uncertain
Nemesiidae	*Aname* sp.	Uncertain
	Aname 'sp. nov. curved embolus'	Potential
	Aname `MYG001 group`	Uncertain
	Kwonkan sp.	Uncertain
	Proshermacha 'MYG435'	Potential

Family	Species	SRE category
	Proshermacha `sp. indet.`	Uncertain
	Teyl sp.	Uncertain
	Teyl 'MYG412'	Potential
	Teyloides 'MYG441'	Potential
Diplopoda (millipedes)		
Paradoxosomatidae	*Antichiropus* 'broad arrows'	Confirmed
	Antichiropus 'DIP065'	Confirmed
	Antichiropus 'DIP067'	Confirmed
	Antichiropus 'kalgoorlie'	Confirmed
	Antichiropus 'sp. indet'	Uncertain
	Antichiropus nadinae Car & Harvey, 2014	Confirmed
Gastropoda (snails)		
Cameinidae	*Sinumelon* cf. *jimberlanensis*	Confirmed
Pupillidae	*Pupilla* cf. ficulnea	Confirmed
Succineidae	*Austrosuccinea aridicola* Iredale, 1939	Confirmed
Lepidoptera (butterflies and moths)		
Lycaenidae	*Jalmenus aridus*	Possible/P1
	Ogyris subterrestris petrina	Confirmed/VU
Pseudoscorpiones (pseudoscorpions)		
Cheliferoidea	*Nesidiochernes* `sp. indet.`	Uncertain
Chthonioidea	*Austrochthonius* `sp. indet. or sp. nov?`	Uncertain
	Austrochthonius `sp. indet.`	Uncertain
Garypoidea	*Synsphyronus* `sp.`	Uncertain
	Beierolpium `sp. 8/4`	Uncertain
Sternophoroidea	*Afrosternophorus* sp.	Uncertain
Scorpiones (scorpions)		
Buthidae	*Isometroides* `goldfields1`	Uncertain
	Isometroides `n. sp.`	Uncertain

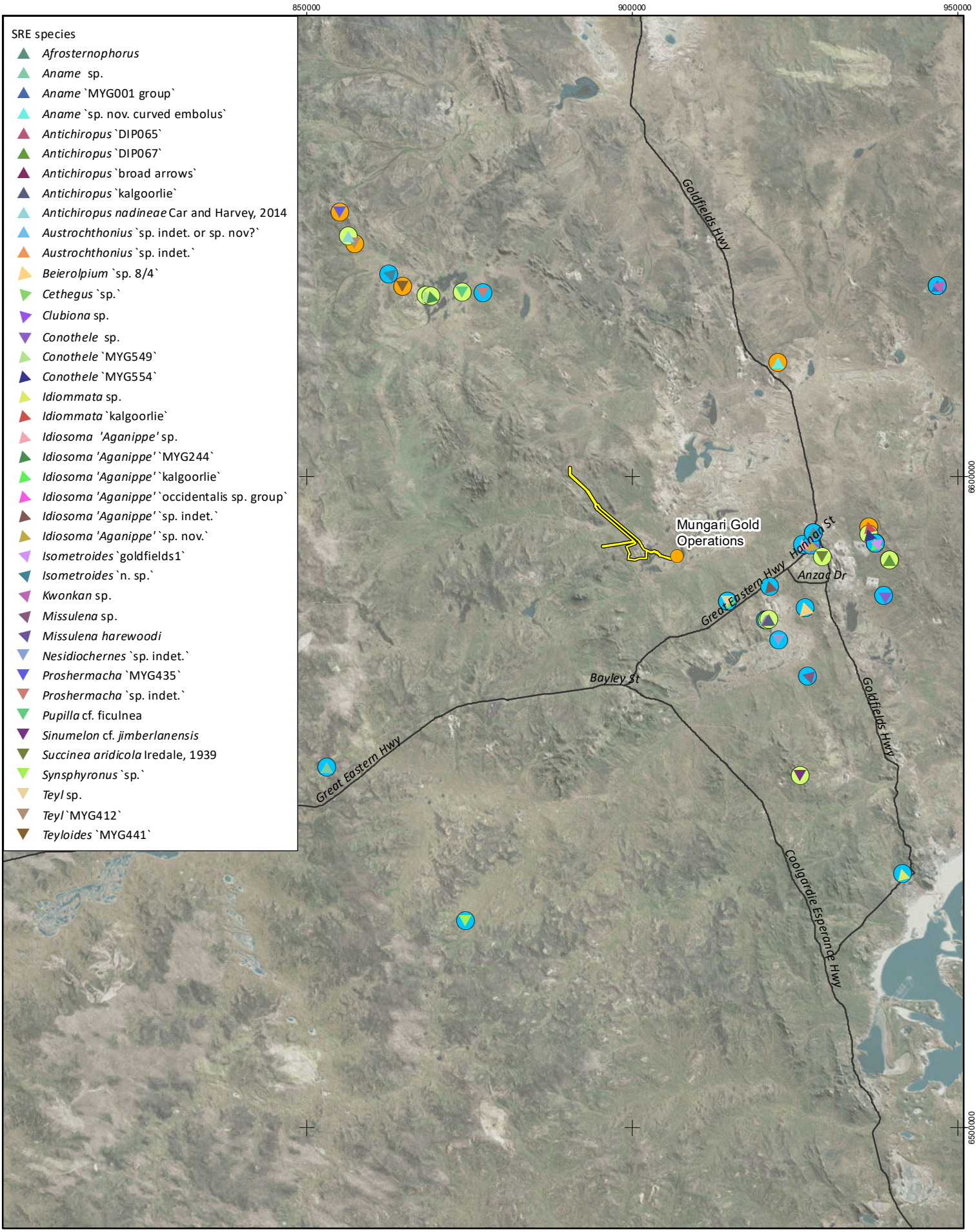

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Figure 5-2

WA Museum records of SRE invertebrate fauna

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5.2 FIELD SURVEY

5.2.1 Fauna habitats

Four broad fauna habitats were identified within the study area, open eucalypt woodland, shrubland, chenopod shrubland and salt lake (Table 5-3; Figure 5-3). Open eucalypt woodland was the dominant habitat, occupying approximately 80.7% (949.54 ha) of the study area, followed by shrubland habitat (14.3 %), with the remaining broad fauna habitats occupying less than 5% of the study area (Table 5-3; Figure 5-3). Distribution of fauna habitats within the study area was variable with scattered larger areas of a single homogeneous habitat type, as well as areas comprising a mosaic of habitats, particularly in the southern and eastern extents (Figure 5-3).

Due to the intermixing of some habitats or gradual transitions from one to the other, fauna habitat boundaries have been mappedbroadly, particularly in areas where there was a gradual transition from open eucalypt woodland to shrubland where the intervening area between comprised a mosaic of each.

Table 5-3 Fauna habitat descriptions and extent in the study area

Habitat description	Corresponding vegetation types and mapping units	Fauna sites	Area (ha)	% of study area
Open eucalypt woodland Structure and species diversity often variable, though often comprising of scattered eucalypts to 15 m over mixed large shrubs to 3 m, when present, over mixed small to medium shrubs to 2 m, and occasionally sparse grasses to 0.5 m on clay loam to gravelly clay loam substrate.	EcDlOm, EcEsOm, EgAhOm, ElEaAv, EsEsAb, EtEsOm	01, 02, 04, 06, 07, 08, 13, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 32, 34, 35, 36, 37, 38, 39	949.54	80.7%
Shrubland Consisting of a mosaic of differing structures and density, shrubland comprised of mixed shrub species up to 3 m, often dominated by *Acacia* and/or *Casuarina* species, with density ranging from open shrubland to scattered sparse areas of dense vegetation with understorey ranging between areas of open to dense medium to tall shrub cover on clay loam to gravelly clay loam substrate.	AbDlPo, CoAtEd, CpEsEd, CsAvDc	03, 05, 15, 25, 26, 31, 33	168.66	14.3%
Chenopod shrubland Dominated by *Tecticornia* species with height and density variable, though often low (<.3 m) and open. Occasionally with scattered isolated individual or small patches of small to medium shrubs on clay loam substrates. Often on low lying plain areas that are inundated following rainfall events. Some areas, particularly close to edges of salt lakes, inundated at time of field survey.	MhTiDc, *Tecticornia* spp. shrublands (Tp, TuED, Tu, Ts, Ti, Td, TpDcEp, AvDc)	09, 14, 24, 40	35.53	3.3%
Saltlake Salt lake with vegetation largely absent with the exception of individual or small patches of small *Tecticornia* shrubs, particularly on shorelines where	Lake	–	15.47	1.3%

Habitat description	Corresponding vegetation types and mapping units	Fauna sites	Area (ha)	% of study area
salt lake transitions into chenopod shrubland. Study area intersects only a small portion of the salt lake. Largely inundated following rainfall prior and during the field survey.				
Cleared Existing cleared areas from current and previous operations, i.e. tracks and clearing from previous exploration and mining.	Cleared	–	4.29	0.4%
Total			**1,176.50**	**100%**

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Significant fauna records
Leipoa ocellata, Malleefowl (VU EPBC and WC Acts)

Fauna habitat
Chenopod shrubland
Cleared
Open eucalypt woodland
Saltlake
Shrubland

Figure 5-3

Fauna habitats and significant fauna records in the study area

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5.2.2 Vertebrate fauna

A total of 75 terrestrial vertebrate fauna species were recorded during the field survey (Table 5-4; Appendix 2). This represents just over 27% of the species identified as potentially occurring from the desktop review (Table 5-4). Birds were the most diverse class of vertebrates recorded, consistent with the results of the desktop review. Of the 10 mammal species recorded during the field survey, three were introduced species. Three species recorded during the field survey were not returned in the desktop review, one reptile (Marbled Gecko) and two bats (White-striped Free-tailed Bat, South-western Free-tailed Bat).

Table 5-4 Number of vertebrate taxa recorded and potentially occurring in the Project area

Taxa	No. of species recorded during field survey	No. of species potentially occurring from desktop
Amphibians	0	6
Reptiles	13	72 (inc. 1 introduced)
Birds	52	158 (inc. 3 introduced)
Mammals - native	10 (inc. 3 introduced)	38 (inc. 10 introduced)
Total	**75**	**274**

The lower number of reptiles and absence of frog records is likely to be attributed to the cooler temperatures experienced during the field survey.

5.2.3 Significant vertebrate fauna

One conservation significant species was recorded during the field survey, Malleefowl (VU). The species was recorded once from secondary evidence (old defunct mound) within the western portion of the study area and once from direct observation of a single individual crossing a track within 500 m of the eastern boundary of the study area (Figure 5-3). Suitable habitat was recorded for a further 15 of the 22 significant species identified in the desktop review, primarily migratory shorebirds that may occur in saltlake and associated fringing samphire shurblands following rainfall events (Table 5-5).

A single Malleefowl mound was recorded within a small and narrow patch of thick tall shrub; however, recent rainfall appeared to have partially flooded the area and washed a large portion of leaf litter out of the patch of thicker shrub vegetation. The mound was in poor condition and showed no apparent signs of recent usage with evidence of disturbance from recent rainfall and surface water movement, and diggings into the mound by other species. The mound also had a large branch that had fallen over it; however, it was not apparent when this may have occurred (i.e. after recent rainfall and storms or naturally from termites) as termites and other signs of decomposition were present in parts of the branch. A number of egg fragments were located in the centre of the mound at a depth of approximately 30–40 cm from the disturbed surface, indicating the mound has been successfully used by the species in the past.

The species was also recorded from a direct observation of an individual crossing a gravel track outside of the study area, between two linear sections of the study area in its western portion. The sighting was in shrubland habitat, approximately 1 km west-northwest of the mound (Figure 5-3).

Suitable foraging habitat for Malleefowl was recorded throughout the majority of the study area, particularly in open woodland and shrubland habitats. Nesting habitat was sparse within the study

area but the species may nest in areas of adjacent suitable habitat, which was observed outside of the study area, and occasionally move into the study area to forage.

Saltlake and associated fringing chenopod shrubland habitat within the study area may provide suitable foraging and possibly roosting habitat for a number of migratory shorebirds and waterbirds identified in the desktop review. Occurrence of these species is most likely to follow rainfall events when habitats are inundated with shallow water which provides foraging habitat for many species.

Peregrine Falcon may occasionally occur to forage within the study area and surrounds due to the species large foraging range. No suitable hollows or other nesting opportunities were observed within the study area during the field survey.

Fork-tailed Swift are likely to forage in the airspace above the study area; however, it is unlikely to land or nest as the species is almost exclusively aerial (DoEE 2018b).

The remaining six significant species identified in the desktop review as potentially occurring in the study area are considered unlikely to occur due to the absence of suitable habitat or, in respect to mammals, are considered regionally extinct in the vicinity of the study area due to historic declines and database records representing historic records (Table 5-5).

5.2.4 SRE invertebrate fauna

No SRE invertebrates were collected during the field survey. Numerous abandoned or damaged mygalomorph spider burrows were located during the field survey; however, only a single burrow excavated contained a specimen, which was identified as a common and widespread species of *Gaius, G. villosus*.

Table 5-5 Likelihood of occurrence for conservation significant fauna in the Project area

Species	Common Name	Conservation status			Likelihood of occurrence	Fauna habitats				Summary of records and occurrence	Nearest record (Birdlife Australia 2018; DBCA 2018a, b)
		EPBC Act	WC Act	DBCA		Open eucalypt woodland	Shrubland	Chenopod shrubland	Saltlake		
Birds											
Apus pacificus	Fork-tailed Swift	Mig	Mig		Possible	●	●	●	●	Species forages in variety of habitats including those within the study area; unlikely to land or nest.	>40 km
Thinornis rubricollis	Hooded Plover			P4	Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~32.5 km northeast
Falco peregrinus	Peregrine Falcon		SP		Possible	●	●	●	●	May occasionally occur within study area to forage. Nesting may occur where suitable hollows form or abandoned nests of other raptor species occur.	>40 km
Glareola maldivarum	Oriental Pratincole	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	>40 km
Leipoa ocellata	Malleefowl	VU	VU		Recorded	●	●			Recorded once from old defunct mound and individual recorded near study area. Likely to occasionally occur to forage throughout the majority of the study area, particularly in shrubland and eucalypt woodland habitats. Nesting may occasionally occur in areas of suitable habitat; however, suitable nesting habitat sparse in the study area	>40 km

Species	Common Name	Conservation status			Likelihood of occurrence	Fauna habitats				Summary of records and occurrence	Nearest record (Birdlife Australia 2018; DBCA 2018a, b)
		EPBC Act	WC Act	DBCA		Open eucalypt woodland	Shrubland	Chenopod shrubland	Saltlake		
										(i.e. rocky substrates or lack of suitable understory cover).	
Motacilla cinerea	Grey Wagtail	Mig	Mig		Unlikely					Suitable habitat not present within study area.	>40 km
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	EN	EN		Unlikely					Study area outside of species current known distribution.	>40 km
Pezoporus occidentalis	Night Parrot	EN	CR		Unlikely					Suitable habitat not present within study area.	>40 km
Actitis hypoleucos	Common Sandpiper	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	>40 km
Calidris acuminata	Sharp-tailed Sandpiper	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~5 km northeast
Calidris alba	Sanderling	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	>40 km
Calidris ferruginea	Curlew Sandpiper	CR/ Mig	VU/ Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~9.5 km west
Calidris melanotos	Pectoral Sandpiper	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	>40 km

Species	Common Name	Conservation status			Likelihood of occurrence	Fauna habitats				Summary of records and occurrence	Nearest record (Birdlife Australia 2018; DBCA 2018a, b)
		EPBC Act	WC Act	DBCA		Open eucalypt woodland	Shrubland	Chenopod shrubland	Saltlake		
Calidris ruficollis	Red-necked Stint	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~10 km west
Calidris subminuta	Long-toed Stint	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	>40 km
Tringa brevipes	Grey-tailed Tattler	Mig	Mig	P4	Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	>40 km
Tringa glareola	Wood Sandpiper	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~20 km east
Tringa nebularia	Common Greenshank	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~4.8 km northeast
Plegadis falcinellus	Glossy Ibis	Mig	Mig		Possible			●	●	May occur in saltlake and chenopod shrubland to forage, particularly when inundated following rainfall events.	~20 km east
Mammals											
Dasyurus geoffroii	Chuditch	VU	VU		Unlikely					Study area outside of species current known distribution. Considered regionally extinct in the vicinity of the study area (Burbidge 2004; Van Dyck & Strahan 2008).	>40 km

Species	Common Name	Conservation status			Likelihood of occurrence	Fauna habitats				Summary of records and occurrence	Nearest record (Birdlife Australia 2018; DBCA 2018a, b)
		EPBC Act	WC Act	DBCA		Open eucalypt woodland	Shrubland	Chenopod shrubland	Saltlake		
Myrmecobius fasciatus	Numbat	EN	EN		Unlikely					Study area outside of species current known distribution. Considered regionally extinct in the vicinity of the study area (Burbidge 2004; Van Dyck & Strahan 2008)	~2.6 km southeast (historic)
Macrotis lagotis	Bilby	VU	VU		Unlikely					Study area outside of species current known distribution. Considered regionally extinct in the vicinity of the study area (Burbidge 2004; Van Dyck & Strahan 2008).	~25.5 km east (historic)

[1] CR – Critically Endangered; EN – Endangered; VU – Vulnerable; SP – Specially Protected; Mig — Migratory; P2–P4 —Priority 2–4.

5.3 SURVEY LIMITATIONS

The limitations of the survey have been considered (Table 5-6) in accordance with EPA technical guidance (EPA 2016c, d).

Table 5-6 Survey limitations

Limitations	Limitation for this survey?	Comments
Competency/experience of survey personnel, including taxonomy	No	The field personnel and report author have extensive experience in terrestrial fauna surveys within the region and across WA.
Scope and completeness	No	All target groups, significant species and habitats within the study area were surveyed in accordance with the scope of work.
Intensity / effort and extent	No	The survey intensity was appropriate for the areas that were surveyed and significant species targeted.
Proportion of fauna identified, recorded and/or collected	No	All fauna was identified to species level in the field with the exception of analysis of bat echolocation call recordings which were analysed on return to Perth.
Availability of adequate contextual information	No	Numerous surveys have previously been undertaken within the broader vicinity of the study area to provide contextual information for the Project.
Timing, weather, season, cycle	No	Weather preceding and during the survey was comparable to annual averages for previous years. Above average rainfall was recorded in the month preceeding the survey.
Disturbances which affected the results of the survey	Partial	No disturbances occurred during the field survey which are considered to have impacted the overall results for vertebrate fauna. Heavy rainfall prior to and during the survey may have affected the number of taxa recorded and hindered the collection of SRE invertebrate taxa, particularly in saltlake and associated riparian habitats which were inundated.
Remoteness and/or access problems	No	All areas of the study area were accessible by vehicle or on foot.

6 DISCUSSION

In assessing development proposals, the EPA has the objective for the factor Terrestrial Fauna is its protection so that biological diversity and ecological integrity are maintained (EPA 2016a). Considerations for terrestrial fauna in environmental impact assessment (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). At the Federal level, the Commonwealth publishes guidelines on assessing significance of impacts to matters of NES (Department of the Environment 2013). Accordingly, the aim of this assessment was to determine the conservation significant (i.e. EPBC Act and BC Act listed) terrestrial fauna present or likely to be present within the study area to enable impact assessment, identification of opportunities to apply the EPA mitigation hierarchy (avoidance< minimization< rectification) and management actions to be identified.

6.1 VERTEBRATE FAUNA

Four broad fauna habitats were identified within the study area during the field survey, open eucalypt woodland, shrubland, chenopod shrubland and saltlake, with open eucalypt woodland occupying approximately 80.7% (949.54 ha) of the study area (Table 5-3). All fauna habitats mapped within the study area were considered to be broad habitats well represented in the wider vicinity and more broadly across parts of the the Eastern Goldfields subregion.

In accordance with EPA (2016a), fauna habitats may be significant if they provide habitat important to the life history of a significant species or are unique or isolated habitats in a landscape (see section 2.2.2). All four habitats of the study area have the potential to support significant fauna species to varying extents but do not necessarily meet these significance criteria. Up to 16 significant vertebrate fauna species were considered to have potential to occur in the study area based on habitat suitability, proximity of desktop records and current distributions.

The open eucalypt woodland and shrubland habitats provide foraging habitat value for Malleefowl (VU), the only recorded conservation significant species from the survey. Suitable nesting habitat within the study area was sparse and patchy, often occurring in small isolated patches with no connectivity. Numerous patches of suitable nesting habitat were observed in areas outside the study area; nesting is more likely to occur in these areas than in the study area; however, the species may forage in the study area if nesting nearby. Therefore, the eucalypt woodland and shrubland habitats of the study area may be significant habitat for Malleefowl if the species is found to be nesting in the vicinity and utilising the study area as important foraging habitat.

The saltlake and associated chenopod shrubland habitats may provide feeding habitat for the 12 migratory shorebirds identified in the desktop review (Oriental Pratincole, Common Sandpiper, Sharp-tailed Sandpiper, Sanderling, Curlew Sandpiper, Pectoral Sandpiper, Red-necked Stint, Long-toed Stint, Grey-tailed Tattler, Grey-tailed Tattler, Common Greenshank and Glossy Ibis) and the Hooded Plover (P4) intermittently during inundation events, although none were observed during the survey when the lake and part of the adjacent chenopod shrublands were inundated. Only a small extent of the saltlake is present in the study area and this lake is part of a series of regional saltlakes that include the 33 km^2 White Flag Lake, 13 km to the north. Similar feeding habitat is likely to be extensive within this lake system during inundation events.

Roosting habitat within the chenopod shrublands bordering the saltlake is limited in the study area and the lake is probably too small to accommodate migratory shorebirds in nationally significant numbers as defined by DEWHA (2009). Taking the extent of the regional lake system into account relative and the limited roosting habitat present in the study area, the saltlake and chenopod

shrublands of the study area are considered unlikely to represent significant habitat for migratory shorebirds but they may utilise these habitats.

The two remaining significant species that were considered to possibly occur within the study area, Peregrine Falcon (SP) and Fork-tailed Swift (Mig), inhabit a broad range of habitats and may occur only occasionally to forage in the study area. No suitable hollows or other nesting opportunities for Peregrine Falcon were observed within the study area during the field survey. Therefore the habitats of the study area are not considered significant habitats for these species.

The remaining six significant species identified in the desktop review were considered unlikely to occur in the study area due to the absence of suitable habitat or, in respect to mammals, are regionally extinct in the vicinity of the study area due to historic declines and database records representing historic records (Table 5-5).

6.2 SRE INVERTEBRATE FAUNA

Only a single mygalomorph burrow containing a specimen was excavated during the field survey, which was identified as a non-SRE species. Numerous abandoned or damaged burrows were observed during the field survey which failed to yield specimens where excavation was attempted.

The lack of SRE invertebrates detected during the survey reflects limited presence of suitable SRE habitats in the study area. Specialist habitats in the Goldfields and neighbouring regions known to harbour SREs include salt lakes including their riparian zone (e.g. Framenau & Hudson 2017; López-López *et al.* 2016; Phoenix 2017), drainage lines (e.g. Phoenix 2012), rocky outcrops and dense woodlands (e.g. Car & Harvey 2014). In contrast, the study area is characterised mainly by open eucalypt woodlands and shrublands which are considered less conducive for the evolution of short range endemism (see section 2.2.3), although diversity and endemism in invertebrates of the Goldfields woodlands has been highlighted in several recent studies on particular groups, e.g. Idiopidae trapdoor spiders, *Antichiropus* millipedes and Bothriembryon snails (several publications in Framenau & Harms 2017).

The most potentially prospective SRE habitat in the study area was the saltlake habitat and associated chenopod shrubland. Several salt lake specialists that burrow into the lake playa or inhabit the fringing riparian vegetation, include species with restricted distributions (e.g. some tiger beetles, wolf spiders in the genus *Tetralycosa*), in some cases from single salt lakes including Lake Lefroy (Framenau & Hudson 2017; Hudson & Adams 1996; Kamoun & Hogenhout 1996; Pearson & Vogler 2001; Phoenix 2018b).

Widespread sampling of the saltlake habitat was not possible during the survey due to inundation following rainfall preceeding and during the field survey. Significant wet periods may pose a problem for salt lake terrestrial fauna which are in danger of drowning or are pushed to the narrow edge of the lake and subject to predatory pressure (Framenau & Hudson 2017). The hydrological cycle of the saltlake is unknown but it is is evidently subject to complete inundation, it may be unfavourable for burrowing SREs. In the event that conditions were favourable for saltlake specialists, the extent of saltlake, as well as the fringing chenopod shrubland habitat in the study area represent only a small portion of this lake, and it is therefore unlikely that any SRE taxa would be restricted to the study area.

The lack of any SRE records from the field survey is consistent with the poor density of SREs from the desktop review, which only returned 12 confirmed SRE taxa and seven potential (Table 5-2). Although this may also reflect an overall low regional collecting effort, it also suggests a low likelihood of SREs to occur locally, most likely due to the widespread and homogeneous habitats such as open eucalypt woodland which largely dominate the study area.

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Appendix 1 Fauna survey site descriptions

Site:	**001 (Fauna site) (-30.701213, 121.113942)**
Habitat description:	Open eucalypt woodland on plain with scattered eucalypts to 10 m and clumps of mallee eucalypts to 6 m over sparse understory with scattered small to medium shrubs to 1.5 m on clay loam substrate with gravelly surface.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), vehicle tracks

Site:	**002 (Fauna site) (-30.716537, 121.128832)**
Habitat description:	Open eucalypt woodland with scattered eucalypts to 12 and small mallee patches to 8 m over sparse open understory of sparsely scattered medium to large shrubs to 2.5 m over scatterd small shrubs to 1.5 m on clay loam substrate with gravelly surface.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Site:	**003 (Fauna site) (-30.725488, 121.141873)**
Habitat description:	Open shrubland on plain with sparsely scattered eucalypts to 12 m over scattered *Casuarina* to 6 m over mised open shrub understory with scattered patches of small to medium shrubs to 1.5 m on clay loam substrate with gravelly surface.
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Site:	**004 (Fauna site) (-30.728455, 121.146702)**
Habitat description:	Narrow strip eucalypt woodland with tree eucalypts to 10 m and mallee eucalypts to 8 m over patchy open and dense understory of tall shrubs to 3 m over sparse cover of small shrubs to 1 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks

Site:	**005 (Fauna site) (-30.730389, 121.14879)**
Habitat description:	Shrubland on plain with scattered *Casuarina* to 8 m over patchy open and dense understory with tall shrubs to 3 m over medium shrubs to 2 m with sparse small shrub understory on clay loam substrate. Understory patchy with some very dense areas along main track, though largely open throughout the area.
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Site:	**006 (Fauna site) (-30.734118, 121.154193)**
Habitat description:	Open woodland with scattered tree eucalypts to 12 m and mallee eucalypts to 8 m over open shrub understory with medium shrubs to 1.5 m over scattered small shrubs to 1 m and hummock grasses to .5 m on sandy clay substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	sandy clay
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	vehicle tracks

Site:	**007 (Fauna site) (-30.740964, 121.164107)**
Habitat description:	Open eucalypt woodland on plain with scattered eucalypts to 12 m over sparse understory of sparsely scattered medium to large shrubs to 3 m over scattered small shrubs to 1 m on sandy clay substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	sandy clay
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks

Site:	**008 (Fauna site) (-30.750417, 121.178174)**
Habitat description:	Open woodland with scattered mallee eucalypts to 8 m over scattered patches of tall shrubs to 3 m over scattered small shrubs to 1.5 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks

Site:	**009 (Fauna site) (-30.767994, 121.197215)**
Habitat description:	*Tecticornia* shrubland on shore of saltlake with sparsely scattered casuarinas to 6 m over sparsely scattered medium shrubs to 2 m over sparsely scattered low *Tecticornia* shrubs to .5 m on clay loam substrate with gravelly surface.
Habitat type:	chenopod shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	quartz;
Fire age:	>5 years
Disturbance:	none

Site:	**010 (Fauna site) (-30.755893, 121.23421)**
Habitat description:	Open eucalypt woodland on plain with scattered tree and mallee eucalypts to 12 and 8 m over patchy shrub understory with scattered small to medium shrubs to 2.5 m on clay loam substrate. Scattered areas of sparse open shrub understory and dense in patches.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), livestock tracks, vehicle tracks

Site:	**011 (Fauna site) (-30.757355, 121.241078)**
Habitat description:	Open eucalypt woodland with scattered tree and mallee eucalypts to 10 m over open shrub understory with sparsely scattered medium shrubs to 2.5 m over patchy small shrubs to1.5 m om clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), vehicle tracks

Site:	**012 (Fauna site) (-30.761358, 121.244025)**
Habitat description:	Open eucalypt woodland with large existing and current cleared areas for exploration activities with sparsely scattered eucalypts to 12 m over sparse patchy understory of amall regrowth shrubs to 1 m on disturbed clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	current operations, exploration (drill pads and access tracks), vehicle tracks

Site:	**013 (Fauna site) (-30.762379, 121.182392)**
Habitat description:	Open eucalypt woodland with scattered eucalypts to 10 m over sparsely scattered patches of medium to large shrubs to 3 m over scatterd small shrubs to 1 m and hummock grasses to .5 m on gravelly clay loam substrate.
Habitat type:	open woodland
Topography:	undulating plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**014 (Fauna site) (-30.776723, 121.189511)**
Habitat description:	Low open *Tecticornia* shrubland with sparsely scattered medium shrubs to 2 m over low open *Tecticornia* shrub cover with mixed species to .5 m on clay loam substrate with gravelly surface.
Habitat type:	chenopod shrubland
Topography:	salt lake (playa)
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	vehicle tracks

Site:	**015 (Fauna site) (-30.776229, 121.183472)**
Habitat description:	Shrubland on stony hill with scatterd medium to large shrubs to 3 m over scattered small shrubs to 1.5 m and herbs to .3 m on stony clay loam substrate. Vegetation patchy with areas of sparse vegetation and scattered clusters of vegetation.
Habitat type:	shrubland
Topography:	hill slope
Slope:	moderate
Soil:	clay loam, rocks
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), vehicle tracks

Site:	**016 (Fauna site) (-30.771042, 121.192127)**
Habitat description:	Open eucalypt woodland on stony hill with scattered eucalypts to 10 m on sparsely scattered small to medium shrubs to 2.5 m on rocky substrate.
Habitat type:	open woodland
Topography:	hill top
Slope:	moderate
Soil:	rocks
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**017 (Fauna site) (-30.764962, 121.172396)**
Habitat description:	Open eucalypt woodland on plain with scattered tree and mallee eucalypts to 15 m and 8 m over patchy shrub understory with scattered patches of medium to large shrubs to 3 m over scattered small shrubs to 1.5 m on clay loam substrate. Shrub understory largely open with scattered small patches of denser cover of small to large shrubs.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**018 (Fauna site) (-30.778619, 121.177109)**
Habitat description:	Open eucalypt woodland with scatterd tree eucalypts to 20 m over low open shrub understory with sparsely scattered small to medium shrubs to 1.5 m over low tecticornia shrubs to .75 m on clay loam substrate
Habitat type:	open woodland
Topography:	undulating plain
Slope:	negligible
Soil:	clay loam
Soil colour:	brown
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**019 (Fauna site) (-30.779455, 121.174069)**
Habitat description:	Mallee woodland on low hill with scattered mallee eucalypts to 8 m over sparsely scatterd medium to large shrubs to 3 m over sparsely scattered small shrubs to 1 m and scattered hummock grasses to .4 m on gravelly clay loam substrate.
Habitat type:	mallee woodland
Topography:	undulating plain
Slope:	gentle
Soil:	gravel–alluvial, clay loam
Soil colour:	brown
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**020 (Fauna site) (-30.776086, 121.197272)**
Habitat description:	Open eucalypt woodland on stony hill with scattered eucalypts to 12 m over sparse undretory with sparsely scattered small shrubs to 1.5 m on stony substrate.
Habitat type:	open woodland
Topography:	hill top
Slope:	moderate
Soil:	clay loam, rocks
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**021 (Fauna site) (-30.769976, 121.178983)**
Habitat description:	Open eucalypt woodland on plain with sparsely scattered eucalypts to 15 m over open shrubland understory of sparsely scattered medium to large shrubs to 3 m over scatterd small shrubs to 1.5 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Site:	**022 (Fauna site) (-30.764832, 121.190819)**
Habitat description:	Open eucalypt woodland on low stony hill with scattered eucalypts to 10 m over sparsely scattered medium to large shrubs to 3 m over scattered patchy small shrubs to 1.5 m on stony clay loam substrate.
Habitat type:	open woodland
Topography:	hill top
Slope:	gentle
Soil:	clay loam, rocks
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	vehicle tracks

Site:	**023 (Fauna site) (-30.761228, 121.188915)**
Habitat description:	Open eucalypt woodland on low stony hill with sparsely scattered eucalypts to 10 m over sparsely scattered shrub understory of small shrubs to 1.5 m on stony clay loam substrate.
Habitat type:	open woodland
Topography:	hill slope
Slope:	moderate
Soil:	clay loam, rocks
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	historic operations, vehicle tracks

Site:	**024 (Fauna site) (-30.76878, 121.207817)**
Habitat description:	Low *Tectirocnia* shrubland on fringe of seasonally wet shallow lake with even cover of small *Tecticornia* shrubs to .25 m on waterlogged clay loam substrate. Inundated from rainfall during field survey.
Habitat type:	chenopod shrubland
Topography:	seasonally wet area
Slope:	negligible
Soil:	clay loam
Soil colour:	brown
Rock type:	none
Fire age:	>5 years
Disturbance:	vehicle tracks

Site:	**025 (Fauna site) (-30.769294, 121.217118)**
Habitat description:	Shrubland on plain with sparsely scattered *Casuarina* to 6 m over patchy shrubland understory with scattered patches of medium shrubs to 2.5 m over scattered small shrubs to 1.5 m on sandy loam substrate.
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red-brown
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**026 (Fauna site) (-30.773905, 121.224832)**
Habitat description:	Low *Tecticornia* shrubland with even cover of *Tecticornia* shrubs to 1 m and fringing vegetation with sparsely scattered eucalypts to 10 m over narrow thickets of *Melaleuca* to 3 m over sparsely scattered patches of small shrubs to 1 m around *Tecticornia* shrubland on sandy loam substrate.
Habitat type:	shrubland
Topography:	seasonally wet area
Slope:	negligible
Soil:	sandy loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), livestock tracks, vehicle tracks

Site:	**027 (Fauna site) (-30.77513, 121.230604)**
Habitat description:	Open eucalypt woodland on plain with sparsely scattered eucalypts to10 m over sparsely scattered casuarinas to 6 m over scattered and patchy small to medium shrubs to 2 m on sandy loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), livestock tracks, vehicle tracks

Site:	**028 (Fauna site) (-30.755523, 121.179369)**
Habitat description:	Open eucalypt woodland with scattered eucalypts to 12 m over patchy scattered small to medium shrubs to 2.5 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**029 (Fauna site) (-30.756381, 121.174353)**
Habitat description:	Eucalypt woodland with evenly scattered eucalypts to 10 m over low open shrubland of scattered small shrubs to 1 m on clay loam substrate.
Habitat type:	woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**031 (Fauna site) (-30.75874, 121.160812)**
Habitat description:	Shrubland on plain with scattered casuarinas to 6 m over scatered tall shrubs to 3 m over patchy areas of medium shrubs to 2.5 m and scattered small shrubs to 1.5 m on sandy clay loam substrate. Scattere patches of dense vegetation and areas with sparse vegetation in vegetation corridor across study area corridor.
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	sandy loam, clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**032 (Fauna site) (-30.760767, 121.146043)**
Habitat description:	Mallee woodland on plain with scattered mallee and tree eucalypts to 8 m over scattered medium shrubs to 2.5 m over scattered patches of small shrubs to 1.5 m and hummock grasses to .5 m on sandy loam substrate.
Habitat type:	woodland
Topography:	plain
Slope:	negligible
Soil:	sandy loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	historic clearing, vehicle tracks

Site:	**033 (Fauna site) (-30.762972, 121.134103)**
Habitat description:	Shrubland on plain with scattered patches of tall *Casuarina* shrubs to 4 m over patchy shrub understory with scattered small to medium shrubs to 2 m on clay loam substrate.
Habitat type:	shrubland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), historic clearing, vehicle tracks

Site:	**034 (Fauna site) (-30.693403, 121.107884)**
Habitat description:	Eucalypt woodland on plain with scattered eucalypts to 12 m over patchy shrub understory with scattered smal to medium shrubs to 2.5 m on clay loam substrate.
Habitat type:	woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Site:	**035 (Fauna site) (-30.684213, 121.098348)**
Habitat description:	Open eucalypt woodland with scattered eucalypts to 10 m over patchy shrub understory with scattered small to medium shrubs to 2 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	none

Site:	**036 (Fauna site) (-30.677554, 121.088833)**
Habitat description:	Open eucalypt woodland on plain with scattered tree eucalypts to 12 m and mallee eucalypts to 8 m over scattered patches of small to medium shrubs to 2 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	historic clearing, livestock tracks, vehicle tracks

Site:	**037 (Fauna site) (-30.672536, 121.08295)**
Habitat description:	Open eucalypt woodland on low undulating plain with sparsely scattered eucalypts to 12 m over sparse shrub understory with sparsely scattered small to medium shrubs to 2.5 m on clay loam substrate with gravelly surface.
Habitat type:	open woodland
Topography:	undulating plain
Slope:	gentle
Soil:	gravel-alluvial, clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	historic clearing

Site:	**038 (Fauna site) (-30.663983, 121.073408)**
Habitat description:	Open eucalypt woodland with scattered tree eucalypts to 12 m over scattered mallee eucalypts to 6 m and sparsely scattered large shrubs to 3 m over scattered small to medium shrubs to 2.5 m on gravelly clay loam substrate. Area heavily disturbed from historic mining activities.
Habitat type:	open woodland
Topography:	undulating plain
Slope:	negligible
Soil:	gravel-alluvial, clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), historic operations, livestock tracks, vehicle tracks

Site:	**039 (Fauna site) (-30.656449, 121.073534)**
Habitat description:	Open eucalypt woodland with sparsely scattered tree eucalypts to 12 m over scattered patches of mallee eucalypts to 8 m over scattered small shrubs to 1.5 m on gravelly clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	gravel-alluvial, clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	historic operations, livestock tracks, vehicle tracks

Site:	**040 (Fauna site) (-30.769975, 121.18309)**
Habitat description:	*Tecticornia* shrubland on low lying floodplain with sparsely scattered patches of tree and mallee eucalypts to 8 m over patchy low *Tecticornia* shrubs to .75 m on clay loam substrate. Area surrounded by open eucalypt woodland on low stony hills.
Habitat type:	chenopod shrubland
Topography:	floodplain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	exploration (drill pads and access tracks), livestock tracks, vehicle tracks

Site:	**SM01 (Audio recording) (-30.763444, 121.17809)**
Habitat description:	Open eucalypt woodland with scattered eycalypts to 12 m over patchy shrubland understory with scattered medium to large shrubs to 3 m over scatteresmall shrubs to 1.5 m on clay loam substrate.
Habitat type:	open woodland
Topography:	undulating plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Site:	**SM02 (Audio recording) (-30.763156, 121.1321)**
Habitat description:	Open eucalypt woodland with scattered tree and mallee eucalypts to 8 m over sparsely scattered medium to large shrubs to 2.5 m over scattered small shrubs to 1.5 m on clay loam substrate.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red-orange
Rock type:	none
Fire age:	>5 years
Disturbance:	vehicle tracks

Site:	**SM03 (Audio recording) (-30.685494, 121.100267)**
Habitat description:	Open eucalypt woodland in plain with scattered eucalypts to 12 m over patchy shrub understory of scattered small shrubs to 1.5 m on clay loam substrate. Vehicle track dissects site creating a possible movement corridor with some small pools of water from recent rain.
Habitat type:	open woodland
Topography:	plain
Slope:	negligible
Soil:	clay loam
Soil colour:	red–orange
Rock type:	none
Fire age:	>5 years
Disturbance:	livestock tracks, vehicle tracks

Appendix 2 Vertebrate fauna species records from the desktop review and field survey

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Amphibians									
Hylidae	*Litoria moorei*	Motorbike Frog					●		
Limnodynastidae	*Neobatrachus kunapalari*	Kunapalari Frog					●		
Limnodynastidae	*Neobatrachus pelobatoides*	Humming 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*						●		
Agamidae	*Ctenophorus maculatus*	Spotted Military 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 cephalus*	Pebble Dragon					●		
Agamidae	*Tympanocryptis lineata*						●		

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Boidae	*Morelia spilota imbricata*	Carpet Python					●		
Carphodactylidae	*Nephrurus vertebralis*						●		
Cheluidae	*Chelodina colliei*						●		
Diplodactylidae	*Diplodactylus granariensis granariensis*						●		
Diplodactylidae	*Diplodactylus pulcher*						●		
Diplodactylidae	*Hesperoedura reticulata*						●		
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	*Furina ornata*	Moon Snake					●		
Elapidae	*Neelaps bimaculatus*	Black-naped Snake					●		
Elapidae	*Parasuta gouldii*						●		
Elapidae	*Parasuta monachus*						●		
Elapidae	*Pseudechis australis*	Mulga Snake					●		
Elapidae	*Pseudonaja mengdeni*	Western Brown Snake					●		
Elapidae	*Pseudonaja modesta*	Ringed Brown Snake					●		

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Elapidae	*Pseudonaja nuchalis*	Gwardar					●		
Elapidae	*Simoselaps bertholdi*	Jan's Banded Snake					●		
Elapidae	*Suta fasciata*	Rosen's Snake					●		
Gekkonidae	*Christinus marmoratus*	Marbled Gecko							●
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	*Lialis burtonis*						●		
Pygopodidae	*Pygopus lepidopodus*	Common Scaly Foot					●		
Pygopodidae	*Pygopus nigriceps*						●		
Scincidae	*Cryptoblepharus buchananii*						●		●
Scincidae	*Cryptoblepharus plagiocephalus*						●		
Scincidae	*Ctenotus atlas*						●		
Scincidae	*Ctenotus leonhardii*						●		
Scincidae	*Ctenotus schomburgkii*						●		●
Scincidae	*Ctenotus uber uber*	Spotted Ctenotus					●		●
Scincidae	*Cyclodomorphus melanops elongatus*	Slender Blue-tongue					●		
Scincidae	*Egernia depressa*	Southern Pygmy Spiny-tailed Skink					●		

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Scincidae	*Egernia formosa*						●		
Scincidae	*Egernia richardi*						●		
Scincidae	*Eremiascincus richardsonii*	Broad-banded Sand Swimmer					●		
Scincidae	*Hemiergis initialis 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	*Tiliqua occipitalis*	Western Bluetongue					●		●
Scincidae	*Tiliqua rugosa*						●		●
Varanidae	*Varanus caudolineatus*						●		
Varanidae	*Varanus gouldii*	Bungarra or Sand Monitor					●		●
Varanidae	*Varanus tristis*	Racehorse Monitor					●		●
Birds									
Acanthizidae	*Acanthiza apicalis*	Broad-tailed Thornbill					●	●	
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill					●	●	●
Acanthizidae	*Acanthiza uropygialis*	Chestnut-rumped Thornbill					●	●	●

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Acanthizidae	*Aphelocephala leucopsis*	Southern Whiteface					●	●	
Acanthizidae	*Gerygone fusca*	Western Gerygone					●	●	
Acanthizidae	*Hylacola cauta whitlocki*	Shy Heathwren					●		●
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat					●	●	●
Acanthizidae	*Smicrornis brevirostris*	Weebill					●	●	●
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk					●	●	
Accipitridae	*Accipiter fasciatus*	Brown Goshawk					●	●	
Accipitridae	*Aquila audax*	Wedge-tailed Eagle					●	●	●
Accipitridae	*Elanus caeruleus*	Black-shouldered Kite					●	●	●
Accipitridae	*Haliastur sphenurus*	Whistling Kite					●	●	
Accipitridae	*Hieraaetus morphnoides*	Little Eagle					●	●	
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar					●	●	
Anatidae	*Anas gracilis*	Grey Teal					●	●	●
Anatidae	*Anas platyrhynchos*	Mallard					●	●	
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					●	●	

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Anatidae	*Tadorna tadornoides*	Australian Shelduck					●	●	
Anhingidae	*Anhinga novaehollandiae*	Australasian Darter					●	●	
Apodidae	*Apus pacificus*	Fork-tailed Swift	Mig. (EPBC & WC Acts)		●				
Ardeidae	*Ardea alba*	Great Egret			●			●	
Ardeidae	*Ardea modesta*	great egret					●		
Ardeidae	*Ardea novaehollandiae*	White-faced Heron						●	
Ardeidae	*Ardea pacifica*	White-necked Heron					●	●	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow					●	●	
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow					●	●	
Artamidae	*Artamus personatus*	Masked Woodswallow					●	●	
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike					●	●	●
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike					●	●	●
Campephagidae	*Lalage tricolor*	White-winged Triller					●	●	
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar					●	●	
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover					●	●	●
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel					●	●	●
Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel					●	●	
Charadriidae	*Peltohyas australis*	Inland Dotterel						●	
Charadriidae	*Thinornis rubricollis*	Hooded Plover	P4 (DBCA)		●	●	●		
Charadriidae	*Vanellus tricolor*	Banded Lapwing					●	●	
Cinclosomatidae	*Cinclosoma castanotus*	Chestnut Quail-thrush						●	●
Climacteridae	*Climacteris affinis*	White-browed Treecreeper					●	●	

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
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 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					●	●	●
Elapidae	*Pseudonaja affinis*	Dugite			●				●
Estrilidae	*Taeniopygia guttata*	Zebra Finch					●	●	●

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Falconidae	*Falco berigora*	Brown Falcon					●	●	
Falconidae	*Falco cenchroides*	Australian Kestrel					●	●	
Falconidae	*Falco longipennis*	Australian Hobby					●	●	
Falconidae	*Falco peregrinus*	Peregrine Falcon	OS (WC Act)					●	
Glareolidae	*Glareola maldivarum*	Oriental Pratincole	Mig. (EPBC & WC Acts)					●	
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher					●	●	
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher					●	●	●
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow					●	●	
Hirundinidae	*Hirundo neoxena*	Welcome Swallow					●	●	
Hirundinidae	*Petrochelidon ariel*	Fairy Martin					●	●	
Hirundinidae	*Petrochelidon nigricans*	Tree Martin					●	●	
Laridae	*Larus novaehollandiae*	Silver Gull						●	
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren					●	●	
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairy-wren					●	●	
Maluridae	*Malurus splendens*	Splendid Fairy-wren					●	●	●
Megapodiidae	*Leipoa ocellata*	Malleefowl	VU (EPBC & WC Acts)		●	●	●	●	●
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater					●	●	●
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird					●	●	●
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater					●		
Meliphagidae	*Epthianura albifrons*	White-fronted Chat					●	●	●
Meliphagidae	*Epthianura tricolor*	Crimson Chat					●		●
Meliphagidae	*Gavicalis virescens*	Singing Honeyeater						●	●

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
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					●	●	●
Meliphagidae	*Sugomel niger*	Black Honeyeater						●	
Meropidae	*Merops ornatus*	Rainbow Bee-eater			●		●	●	●
Motacillidae	*Anthus australis*	Australian Pipit					●	●	
Motacillidae	*Motacilla cinerea*	Grey Wagtail	Mig. (EPBC & WC Acts)		●				
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella					●	●	
Otididae	*Ardeotis australis*	Australian Bustard					●	●	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush					●	●	●
Pachycephalidae	*Oreoica gutturalis gutturalis*	Crested Bellbird (southern)					●		●
Pachycephalidae	*Pachycephala inornata*	Gilbert's Whistler					●	●	
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler						●	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler					●	●	●
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote					●	●	
Pardalotidae	*Pardalotus striatus*	Striated Pardalote					●	●	●
Petroicidae	*Drymodes brunneopygia*	Southern Scrub-robin					●	●	
Petroicidae	*Eopsaltria griseogularis*	Western Yellow Robin					●	●	

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Petroicidae	*Microeca fascinans*	Jacky Winter					●	●	
Petroicidae	*Petroica goodenovii*	Red-capped Robin					●	●	●
Phalacrocoracidae	*Phalacrocorax melanoleucos*	Little Pied Cormorant						●	
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant					●	●	
Phasianidae	*Coturnix pectoralis*	Stubble Quail					●	●	
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	*Calyptorhynchus latirostris*		EN (EPBC & WC Acts)				●	●	
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet						●	
Psittacidae	*Melopsittacus undulatus*	Budgerigar					●	●	
Psittacidae	*Nymphicus hollandicus*	Cockatiel					●		
Psittacidae	*Pezoporus occidentalis*	Night Parrot	EN (EPBC Act); CR (WC Act)		●				
Psittacidae	*Platycercus varius*	Mulga Parrot					●	●	
Psittacidae	*Platycercus zonarius*	Australian Ringneck					●	●	●
Psittacidae	*Polytelis anthopeplus*	Regent Parrot					●		●
Rallidae	*Fulica atra*	Eurasian Coot					●	●	
Rallidae	*Porzana fluminea*	Australian Spotted Crake					●		
Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen					●	●	

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt					●		●
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt					●	●	
Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet					●		
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Mig. (EPBC & WC Acts)		●		●	●	
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	Mig. (EPBC & WC Acts)		●	●	●	●	
Scolopacidae	*Calidris alba*	Sanderling	Mig. (EPBC & WC Acts)				●	●	
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	CR/Mig. (EPBC Act); VU/Mig. (WC Act)		●	●	●	●	
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	Mig. (EPBC & WC Acts)		●			●	
Scolopacidae	*Calidris ruficollis*	Red-necked Stint	Mig. (EPBC & WC Acts)			●	●	●	
Scolopacidae	*Calidris subminuta*	Long-toed Stint	Mig. (EPBC & WC Acts)					●	
Scolopacidae	*Tringa brevipes*	Grey-tailed Tattler	Mig. (EPBC); P4/Mig. (DBCA)				●		
Scolopacidae	*Tringa glareola*	Wood Sandpiper	Mig. (EPBC & WC Acts)			●	●	●	
Scolopacidae	*Tringa nebularia*	Common Greenshank	Mig. (EPBC & WC Acts)		●	●	●	●	
Strigidae	*Ninox boobook*	Boobook Owl						●	
Sylviidae	*Cincloramphus cruralis*	Brown Songlark						●	
Sylviidae	*Cincloramphus mathewsi*	Rufous Songlark						●	
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill					●	●	

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	Mig. (EPBC & WC Acts)			●			
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis					●	●	
Turnicidae	*Turnix velox*	Little Button-quail					●		
Tytonidae	*Tyto alba*	Barn Owl					●	●	
Zosteropidae	*Zosterops lateralis*	Grey-breasted White-eye					●	●	
Mammals									
Bovidae	*Bos taurus*	European Cattle		*			●		●
Bovidae	*Capra hircus*	Goat		*	●		●		
Bovidae	*Ovis aries*	Sheep					●		
Burramyidae	*Cercartetus concinnus*	Western Pygmy-possum					●		
Canidae	*Canis lupus dingo*	Dingo		*			●		
Canidae	*Canis lupus familiaris*	Dog		*	●				●
Canidae	*Vulpes vulpes*	Red Fox		*	●				
Dasyuridae	*Antechinomys laniger*	Kultarr					●		
Dasyuridae	*Dasyurus geoffroii*	Chuditch	VU (EPBC & WC Acts)		●				
Dasyuridae	*Ningaui ridei*	Wongai Ningaui					●		
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					●		

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
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 erubescens*	Euro					●		
Macropodidae	*Macropus rufus*	Red Kangaroo					●		●
Molossidae	*Austronomus australis*	White-striped Free-tailed Bat							●
Molossidae	*Mormopterus kitcheneri*	South-western Free-tailed Bat							●
Muridae	*Mus musculus*	House Mouse		*	●		●		
Muridae	*Notomys mitchellii*	Mitchell's Hopping-mouse					●		●
Muridae	*Pseudomys albocinereus*	Ash-grey Mouse					●		
Muridae	*Pseudomys bolami*	Bolam's Mouse					●		
Muridae	*Pseudomys hermannsburgensis*	Sandy Inland Mouse					●		
Myrmecobiidae	*Myrmecobius fasciatus*	Numbat	EN (EPBC & WC Acts)			●	●		
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna					●		●
Thylacomyidae	*Macrotis lagotis*	Bilby	VU (EPBC & WC Acts)			●	●		
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat					●		●
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat					●		
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat					●		

Family	Species	Common name	Conservation status	Naturalised	EPBC Protected Matters Database	DBCA Threatened Species Database	NatureMap	BirdData	This survey
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					●		

Appendix I: Supporting Biodiversity Survey (Detailed flora and vegetation survey conducted for Evolution Mining Ltd, for the Cutter's Ridge Project)

PHOENIX
ENVIRONMENTAL SCIENCES

Flora and vegetation survey for Mungari Gold Operations Cutters Ridge Project

Prepared for Evolution Mining Ltd

May 2019

Final Report

Biological survey for Mungari Gold Operations Cutters Ridge Project

Prepared for Evolution Mining Ltd

Final Report

Authors: Grant Wells, Alice Watt

Reviewer: Karen Crews

Date: 15 May 2019

Submitted to: Kara Postle

Version history			
Name	**Task**	**Version**	**Date**
G.B. Wells	Draft for internal review	0.1	1/2/2019
K. Crews	Draft for client comments	0.2	12/2/2019
K. Crews	Final for client submission	1	15/5/2019

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Project code: 1204-MUN-EVO-BOT

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EXECUTIVE SUMMARY

Evolution Mining Ltd (EVN) operates the Mungari Gold Operations (MGO) located in the Goldfields region, approximately 20 km west of Kalgoorlie. Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by EVN to undertake a detailed flora and vegetation survey of the Cutters Ridge area plus a road corridor between Cutters Ridge and the Mungari Mill (collectively the study area).

The scope of works for the flora and vegetation survey was as follows:

- conduct a desktop assessment to define the potential botanical values of the study area
- complete a two season detailed flora and vegetation field survey
- prepare a comprehensive technical report outlining survey outcomes
- prepare and provide all spatial data collected during the survey.

The study area for the survey was 1,176.5 ha in size. The desktop assessment indicated that the study area occurred in a floristically diverse region and identified 48 significant flora that may potentially occur, comprised of two Threatened species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and State *Biodiversity Conservation Act 2016* (BC Act), *Gastrolobium graniticum* and *Thelymitra stellata*, 17 Priority 1 taxa, six Priority 2 taxa, 19 Priority 3 taxa and four Priority 4 taxa. None of the records of significant flora were located within the study area. No TECs listed under the EPBC Act or at the State level, nor any PECs listed by DBCA, were returned in database search results and none of the previous flora and vegetation surveys reviewed identified any vegetation types considered to have conservation significance.

Survey design, methodology and report-writing adhered to relevant principles and guidelines. Field work for flora and vegetation surveys was conducted over two trips, on 13-15 June and 2-9 October and involved a combination of sampling within bounded vegetation quadrats located in representative native vegetation, relevés (unbound areas), searches for significant species and vegetation. A total of 38 quadrats, three transects and six relevés were sampled throughout the study area. Quadrat and transect data were analysed (separately) and sites grouped by hierarchical cluster analyses (UPGMA). Vegetation types were then defined by clusters of quadrats, supplemented by field observations based on species composition, structure and dominance at the stratum level.

A total of 215 flora taxa representing 36 families and 81 genera were recorded in the study area, of which eight could not be definitively identified to species level but did not resemble any of the recorded species. A further ten specimens could not be identified to species level but were considered to represent one of the species recorded elsewhere. The assemblage included 189 perennial species and 26 annual or short-lived species, 208 native species and seven introduced species none of which were a Declared Pest or a weed of national significance. The most prominent families recorded were Chenopodiaceae (56 species), Fabaceae (20 species), Scrophulariaceae (19 species), Myrtaceae (18 species) and Asteraceae (17 species).

No Commonwealth or State listed Threatened flora were recorded in the study area during the survey. Four Priority flora, *Eremophila praecox* (P1), *Allocasuarina eriochlamys* subsp. *grossa* (P3), *Austrostipa blackii* (P3) and *Calandrinia* ?*quartzitica*/*C.* ?*lefroyensis* (P1) were recorded in the study area. The specimen of the *Calandrinia* taxon could not be definitively identified due to the seeds being too immature but was shown to Frank Obbens, the taxonomic specialist for *Calandrinia*, who identified it as either one of the two Priority species (P1).

Eremophila praecox, *Allocasuarina eriochlamys* subsp. *grossa* were identified in the field and therefore plant counts obtained for these species. The *Austrostipa blackii* and the *Calandrinia* specimens were not recognised as significant species in the field and therefore the size and distribution of the

populations in the study area is unknown. Both the specimens were collected during a quadrat survey with a recorded foliage cover of 0.1% indicating the species was rare in the quadrat.

The study area represented a range extension for *Calandrinia* sp. Gypsum which was subsequently considered a significant flora for the study area.

Assessment of the likelihood of occurrence in the study area for the remaining 45 significant flora identified from the desktop assessment determined six as possible and 39 unlikely. Of those considered to possibly occur, one was Priority 1, one was Priority 2, three were Priority 3 and one was Priority 4.

A total of 19 vegetation types were defined for the study area based on statistical analyses that comprised nine *Tecticornia* spp. shrublands, one chenopod shrubland, two shrublands and seven woodlands. One *Tecticornia* spp. shrubland (MhTiDc) that occurred on undulating sandy plain adjacent a salt lake was clearly distinguishable and was mapped as a distinct vegetation type. All remaining *Tecticornia* shrublands occurred on salt lake playa and it was not possible from aerial imagery or in the field to readily distinguish boundaries between the different vegetation types defined from the statistical analysis and subsequently these vegetation types were mapped as a single mosaic.

The majority of the vegetation in the study area (86.69%) was recorded to be in Excellent to Pristine condition. A small proportion of the study area (0.37%) was recorded to be Completely Degraded, i.e. these areas had been cleared and were virtually devoid of any native vegetation. The remaining 12.94% of the study area was in Good to Very Good condition with disturbance primarily in the form of weed infestations, grazing damage from livestock, vehicle tracks and historic clearing.

None of the vegetation types represented a listed TEC or PEC. Five vegetation types defined for the study area EcDlOm, AbDlPo, CsAvDc, -EtEsOm and MhTiDc, were considered significant vegetation as they represent a refuge for significant flora species. In addition, the shrubland AbDlPo had a limited distribution that was completely encompassed within the study area; however, this vegetation type did align with vegetation recorded outside the current study area in a previous survey for MGO indicating a broader distribution in the surrounding area. All other vegetation types defined for the study area had distributions that extended out of the study area and aligned with vegetation types from other studies indicating a broader distribution in the surrounding area.

1 INTRODUCTION

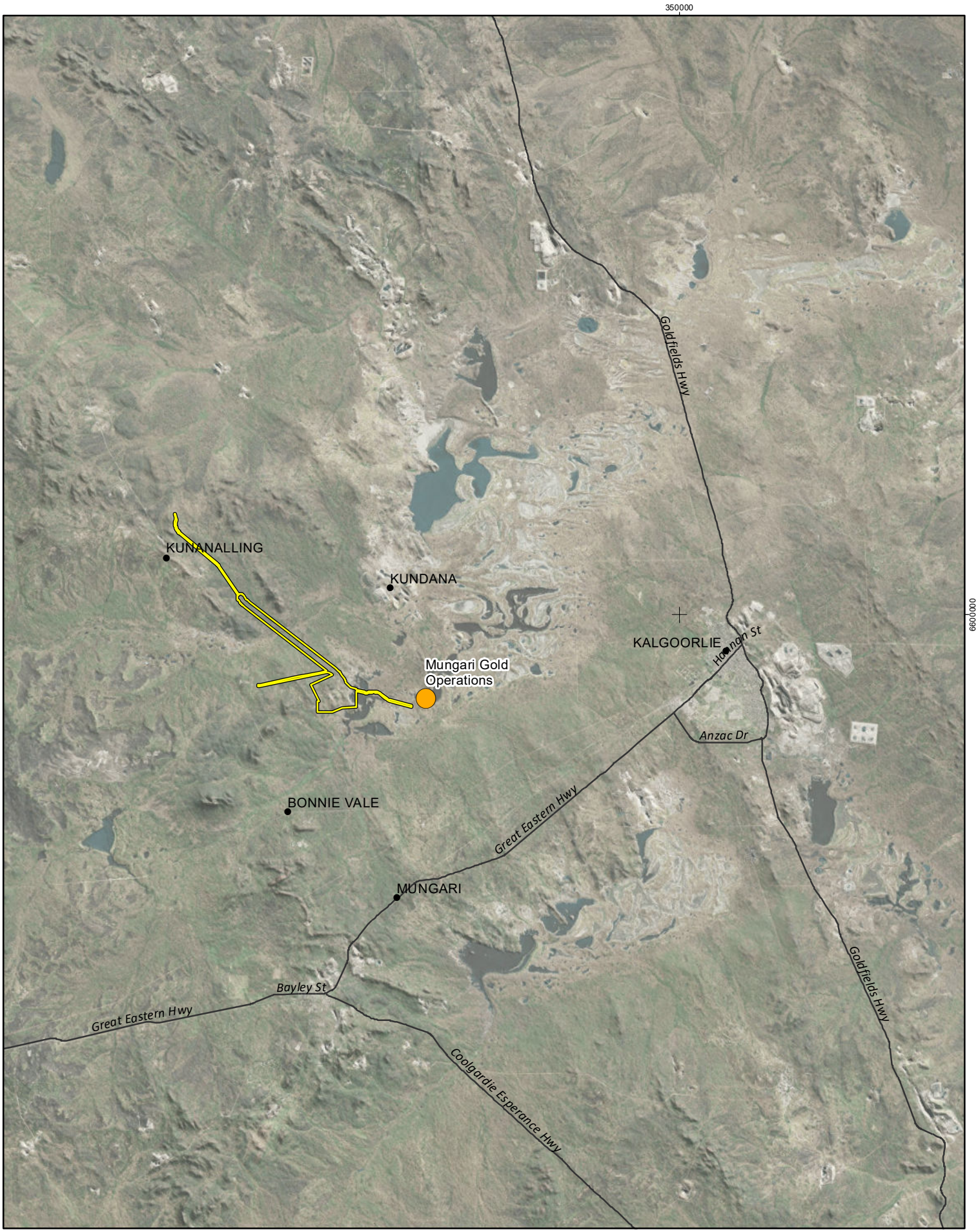
Evolution Mining Ltd (EVN) operates the Mungari Gold Operations (MGO) including the Frog's Leg and White Foil gold projects. MGO is located in the Goldfields region, approximately 20 km west of Kalgoorlie (Figure 1-1).

Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by EVN to undertake a flora and vegetation survey for the Cutters Ridge Project (the Project), which included the Cutters Ridge mining area and a road corridor between Cutters Ridge and Mungari Mill (near White Foil) covering a total of 1,176.5 ha (collectively the study area), both located within the current MGO area (Figure 1-1).

1.1 SCOPE OF WORK

The scope of works for the flora and vegetation survey of the study area was as follows:

- conduct a desktop assessment of all existing flora and vegetation information collected within 40 km of the study area in order to define the potential botanical values present
- complete a two season flora and vegetation field survey, using methods applicable to a detailed (including targeted) survey (EPA 2016c)
- prepare a comprehensive technical report outlining survey outcomes of the survey for both seasons (autumn and spring 2018)
- provide commentary against the 10 clearing principles for proposed clearing within an indicative disturbance footprint for the Cutters Ridge Mine and a haul road from Mungari to Cutters Ridge
- prepare and provide all spatial data collected during the survey.



Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

0 2.75 5.5 11
Kilometres

1:334,805 (at A4) GDA 1994 MGA Zone 51

Mungari Gold Operations

Study area

Figure 1-1

Location of the Mungari Gold Operations and study area

PHOENIX ENVIRONMENTAL SCIENCES

2 LEGISLATIVE CONTEXT

The protection of flora and vegetation in Western Australia (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 the Environment and Energy (DoEE). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a Matter of National Environmental Significance (NES), require approval from the Australian Government Minister for the Environment through a formal referral process. The EPBC Act provides for the listing of Threatened native flora and threatened ecological communities (TECs) as matters of NES.

Conservation categories applicable to Threatened Flora 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.

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English & Blyth 1997). There are three categories under which ecological communities can be listed as TECs under the EPBC Act: Critically Endangered, Endangered and Vulnerable.

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

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened flora species in the following categories:

- critically endangered – species facing an extremely high risk of extinction in the wild in the immediate future[2]
- endangered – species facing a very high risk of extinction in the wild in the near future[2]
- vulnerable – species facing a high risk of extinction in the wild in the medium-term future[2].

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

- species of special conservation interest – 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
- cetaceans
- species subject to international agreement
- the category of species otherwise in need of special protection.

The DBCA administers the BC Act and also maintains a non-statutory list of Priority flora and fauna. Priority species are still considered to be of conservation significance – that is they may be rare or 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 flora and fauna lists are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Threatened and Priority Ecological Communities

The BC Act provides for the listing of TECs in the following categories:

- critically endangered ecological community – facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future[2]
- endangered ecological community – facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future[2]
- vulnerable ecological community – facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium-term future[2].

An ecological community may be listed as a collapsed ecological community under the BC Act if there is no reasonable doubt that the last occurrence of the ecological community has collapsed or the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure.

The DBCA also maintains a non-statutory list of Priority Ecological Communities (PECs), which may become TECs in the future, however, do not currently meet survey criteria or that are not adequately

[2] As determined in accordance with criteria set out in the ministerial guidelines.

defined. PECs are assigned to one of five categories depending on their priority for survey or definition, with Priority 1 of highest concern and Priority 5 of lowest concern.

2.2.3 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.

2.2.4 Other significant flora, vegetation and fauna

Under the EPA's environmental factor guideline (EPA 2016a), flora and vegetation may be considered significant for a range of reasons other than listing as a Threatened or Priority species or ecological community. EPA (2016a) identifies the following:

- Flora may be significant for:
    - local endemism or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
    - new species or anomalous features that indicate a potential new species
    - representing the range of a species (particularly, at the extremes of range recently discovered range extensions, or isolated outliers of the main range)
    - being unusual species, including restricted subspecies, varieties or naturally occurring hybrids
    - having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
- Vegetation may be significant for:
    - having restricted distribution
    - subject to a degree of historical impact from threatening processes
    - having a role as a refuge
    - providing an important function required to maintain ecological integrity of a significant ecosystem.

2.2.5 Clearing of native vegetation

The clearing of native vegetation in WA is not generally permitted where the biodiversity values, land conservation and water protection roles of native vegetation would be significantly affected. Any clearing of native vegetation in WA requires a permit under Part V Division 2 of the EP Act, except where an exemption applies under the Act, or is prescribed by the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (the Regulations), and the vegetation is not in an Environmentally Sensitive Area (ESA). Permit applications to clear native vegetation require assessment against the '10 Clearing Principles', as outlined in the regulations.

2.2.6 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 ESAs. ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005 (DMP 2008). 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.

2.3 INTRODUCED FLORA

Introduced flora pose threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space and sunlight; reducing the natural structural and biological diversity by smothering native plants or preventing them from growing back after clearing, fire or other disturbance; replacing the native plants that animals use for shelter, food and nesting; and altering fire regimes, often making fires hotter and more destructive (AWC 2007).

Management of some weed species is required under Commonwealth or State frameworks. Key classifications for significant introduced flora that are relevant to this report are:

- Declared Pest – the *Biosecurity and Agriculture Management Act 2007* (BAM Act), Section 22 makes provision for a plant taxon to be listed as a declared pest organism in parts of, or the entire State. Under the *Biosecurity and Agriculture Management Regulations 2013* Declared Pests are assigned to one of three control categories that dictate level of management required (DPIRD 2018).
- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Australian Weeds Committee 2012). Management is required in accordance with Department of Primary Industries and Regional Development (DPIRD) guidelines for particular WoNS.

Throughout this report, introduced flora species are indicated with an asterisk (*).

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The study area is located in the Eastern Goldfields subregion (COO03) of the Coolgardie bioregion (DSEWPaC 2012) which is characterised by Cowan (2001) as:

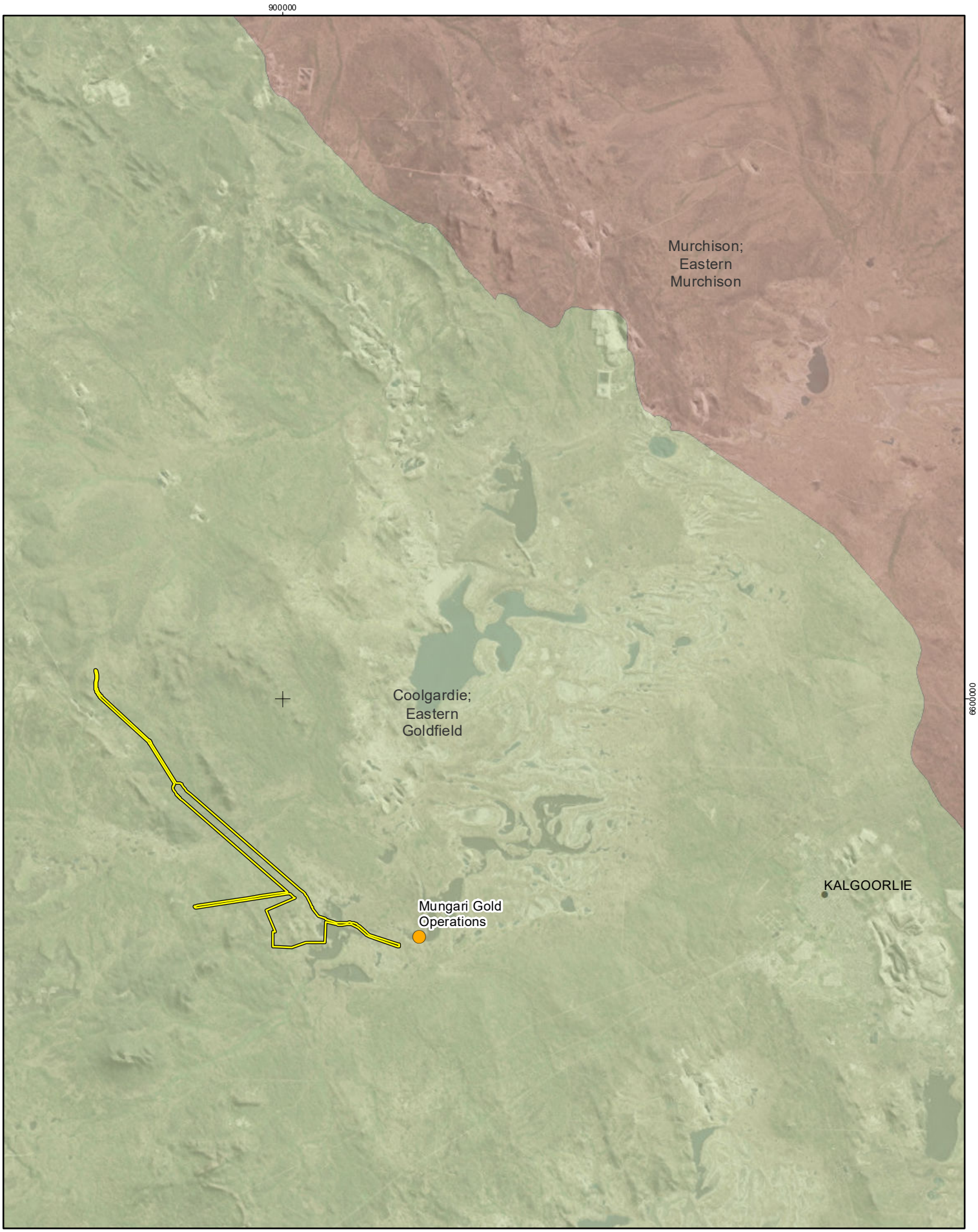
- gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite
- tertiary soils dominated by calcareous earths overlay eroded gneisses and granites
- a series of large playa lakes, including Lake Lefroy, indicate the remnants of an ancient major drainage line in the western half
- vegetation consisting of mallees, *Acacia* thickets and shrub-heaths on sandplains
- dwarf shrublands of samphires persist on salt lakes, surrounded by diverse *Eucalyptus* woodlands, which also occur on ranges and in valleys.

The Eastern Goldfields subregion is regarded for its high floristic species and ecosystem diversity, in particular *Eucalyptus* spp., *Acacia* spp. and ephemeral flora communities of the Fraser Range vegetation complex and Woodline Hills and several notable wetlands including freshwater lakes, large salt lakes, claypans, and freshwater swamps such as Rowles Lagoon, Clear and Muddy Lakes and Swan Lake (Cowan 2001).

3.2 LAND SYSTEMS

According to Department of Agriculture and Food Western Australia mapping, three land systems occur in the study area (Figure 3-2):

- **BB5** – Rocky ranges and hills of greenstones-basic igneous rocks, representing 218.71 ha (18.53%) of the study area
- **Mx43** – Gently undulating valley plains and pediments; some outcrop of basic rock, representing 707.11 ha (59.92%) of the study area
- **SV15** – Salt lakes and their associated areas, representing 254.34 ha (21.55%) of the study area.



Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

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Kilometres

1:250,000 (at A4) GDA 1994 MGA Zone 50

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Mungari Gold Operations
Study area

IBRA bioregion; subregion

Coolgardie; Eastern Goldfield (COO03)
Murchison; Eastern Murchison (MUR01)

Figure 3-1

IBRA region of the study area

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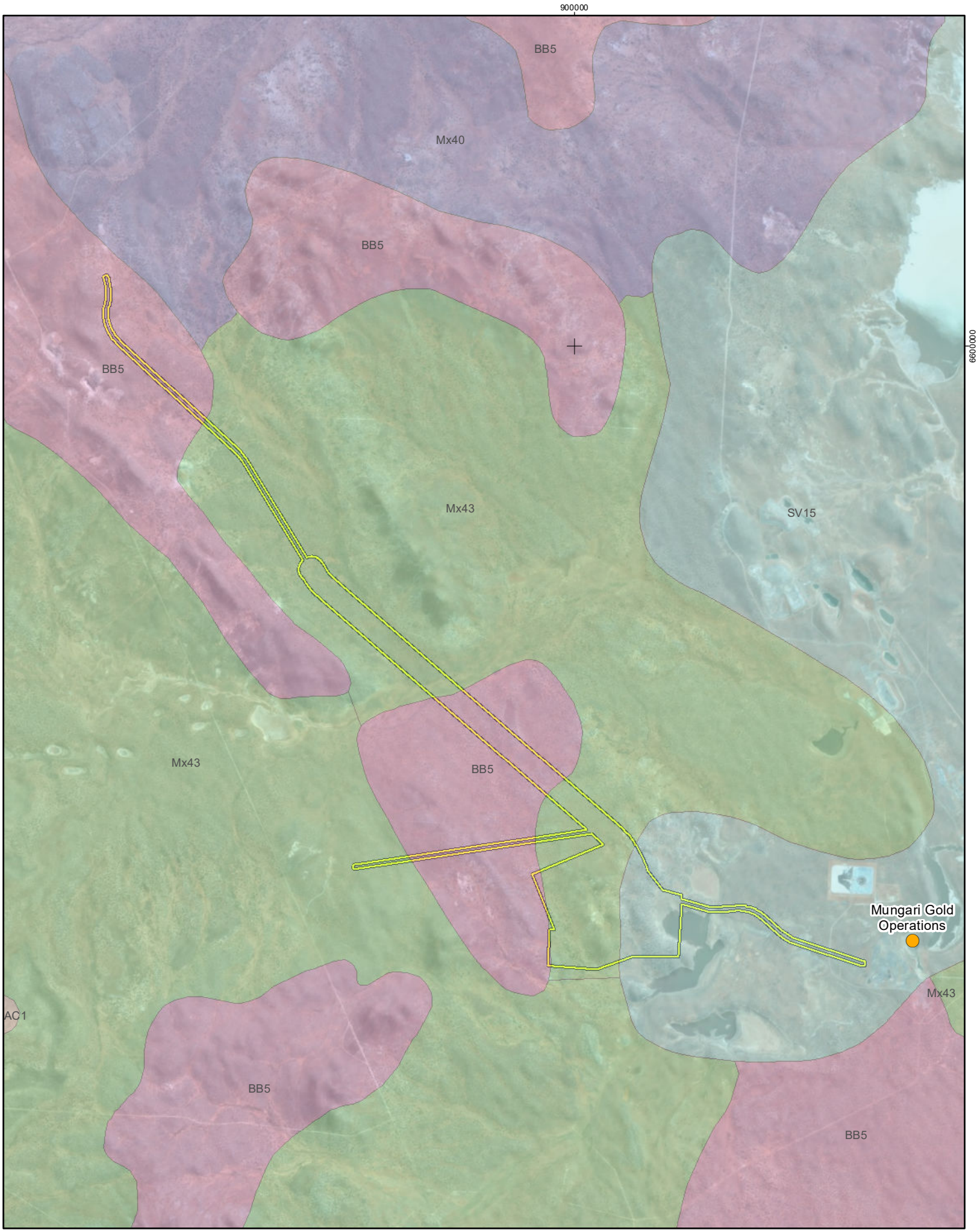

Evolution Mining Ltd
Mungari Operations - Cutters Ridge

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Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

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Mungari Gold Operations
Study area

Land system

- AC1
- BB5
- Mx40
- Mx43
- SV15

Figure 3-2

Land systems of the study area

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3.3 LAND USE AND CONSERVATION RESERVES

The dominant land use within the Eastern Goldfields subregion is Unallocated Crown Land (UCL) or Crown reserve and grazing-native pasture-leasehold and to a lesser extent conservation reserves and mining tenements (Cowan 2001).

The study area is not situated within any conservation reserves; however, eight reserves or former pastoral leases acquired by the DBCA for conservation occur within 40 km of the study area (Figure 1-1). Of these, the closest is Kurrawang Nature Reserve is, located approximately 12 km southeast of the study area. The former Credo pastoral lease tenement which also encompasses the Rowles Lagoon Conservation Park is located approximately 27 km northwest of the study area. The former pastoral lease was acquired by the DBCA in 2007 and is in the process of being gazetted into the reserves system to be managed for conservation. Several smaller Timber Reserves occur to the east and south of the study area (Figure 1-1).

3.4 CLIMATE AND WEATHER

The Eastern Goldfields subregion has an arid to semi-arid climate with 200–300 mm of annual rainfall which occurs mostly over winter months (Cowan 2001).

The nearest Bureau of Meteorology (BoM) weather station is located at Kalgoorlie-Boulder Airport (Latitude**:** 30.78°S Longitude**:** 121.45°E) approximately 20 km east-southeast of the study area. Kalgoorlie-Boulder Airport records the highest maximum mean monthly temperature (33.6°C) in January, the lowest maximum mean annual temperature (16.7°C) in July (BoM 2018) (Figure 3-3). The highest minimum mean monthly temp (18.3°C) is recorded in January with the lowest (5.0°C) recorded in July (BoM 2018) (Figure 3-3). Average annual rainfall is 266.3 mm with January, February and June recording the highest monthly averages (26.8, 30.4 and 27.7 mm respectively) (BoM 2018) (Figure 3-3).

Daily mean temperatures and rainfall for Kalgoorlie-Boulder Airport in the 12 months preceding the survey were comparable to annual long-term averages (Figure 3-3). Mean maximum temperatures were slightly above average for most months, with the exception of April and July – which were considerably higher – and January, February and October which were slightly below average (Figure 3-3).

Mean minimum temperatures were slightly above the average in the 12 months preceding the survey (Figure 3-3). Annual rainfall (November 2017 to October 2018) prior to the current survey was above average, with Kalgoorlie-Boulder Airport receiving 274.4 mm of rainfall compared to the long term annual average of 266.9 mm (BoM 2018) (Figure 3-3).

Rainfall for the three months before both the surveys was below average with the first season survey in June only receiving 20 mm in the three months previously (30% of the average rainfall for those months) and 39.6 mm (66% of the average rainfall) in the second season survey.

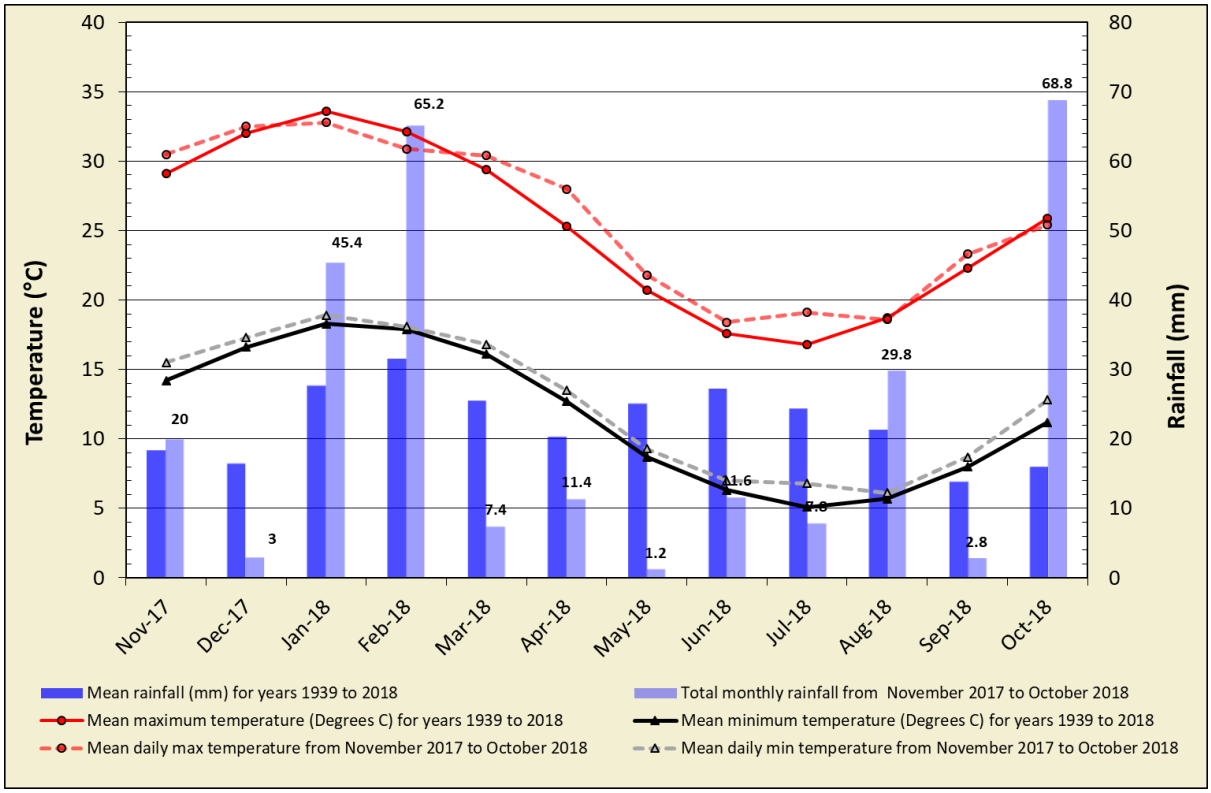


Figure 3-3 **Annual climate data and mean monthly data for the 12 months preceding the field survey for Kalgoorlie-Boulder Airport (BoM 2018)**

4 METHODS

The survey was undertaken in accordance with the following:

- *Environmental Factor Guideline. Flora and vegetation* (EPA 2016d)
- *Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment* (EPA 2016c).

4.1 DESKTOP ASSESSMENT

The focus of the desktop assessment was on identifying significant flora and vegetation that may be present in the study area, in particular:

- Threatened Flora listed under the EPBC Act
- Threatened Flora listed under the BC Act
- Priority Flora listed by DBCA
- TECs listed under the EPBC Act
- TECs listed under the BC Act
- PECs listed by DBCA.

Searches of relevant biological databases were undertaken for the study area with a 40 km buffer (Table 4-1). Available previous botanical reports for MGO were reviewed to build on the potential values identified from the database searches (Table 4-2).

Table 4-1 Database searches conducted for the desktop assessment

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (2018)	EPBC Act Threatened flora and ecological communities	Approximate centre point of study area (121.1729°, -30.7654°) with 40 km buffer
DPaW Threatened and Priority Flora Database (DBCA 2019)	Threatened and Priority flora	As above.
DPaW Threatened and Priority Ecological Communities Database (DBCA 2019)	Threatened and Priority ecological communities	As above.
DPaW NatureMap Database (DBCA 2018c)	Threatened and Priority flora	As above.

Table 4-2 Survey reports and datasets incorporated in the desktop assessment

Report author	Survey type	Project
Botanica Consulting (2010)	Level 2 Flora and Vegetation Survey	White Foil Area
Outback Ecology (2003)	Flora and Vegetation Survey	Proposed dewatering pipeline from Frog's Leg/White Foil Projects to Red Lake
Outback Ecology (2006)	Flora survey	Potential Cutback Areas of the Frog's Leg (M 15/688 Lease) and White Foil Open Pits (M 15/830 Lease)
Native Vegetation Solutions (2017)	Level 2 Flora and Vegetation Survey	Mungari TSF 2
Mattiske Consulting (2002)	Flora and vegetation survey	Frog's Leg project area

4.2 FIELD SURVEY

4.2.1 Quadrats, relevés and transects

Field work for flora and vegetation surveys was conducted over two trips, on 13-15 June and 2-9 October 2018 and involved a combination of sampling within bounded vegetation quadrats located in representative native vegetation, relevés (unbound areas), targeted searches for significant species and vegetation, as well as traversing the study area to record additional flora taxa present and condition of the vegetation (Figure 4-1). Survey site locations were selected to ensure that an accurate representation of the major vegetation types within the study area were sampled adequately. Preliminary survey locations were pre-selected using high-quality aerial photography with selection based on apparent changes in the vegetation visible in the aerial imagery. A total of 38 quadrats, three transects and six relevés were sampled throughout the study area (Figure 4-1; Appendix 1).

Sampling sites for the Eastern Goldfields subregion consist of quadrats of 20 m x 20 m (400 m^2) in dimension. The intensity of sampling aimed to provide a minimum of three quadrats per vegetation unit (per EPA 2016b) and was determined by the complexity of the flora and vegetation. All quadrats were orientated (where possible) in a north-south direction measured out with a tape measure, the NW corner permanently marked with a steel fence dropper. The following attributes were recorded at each quadrat:

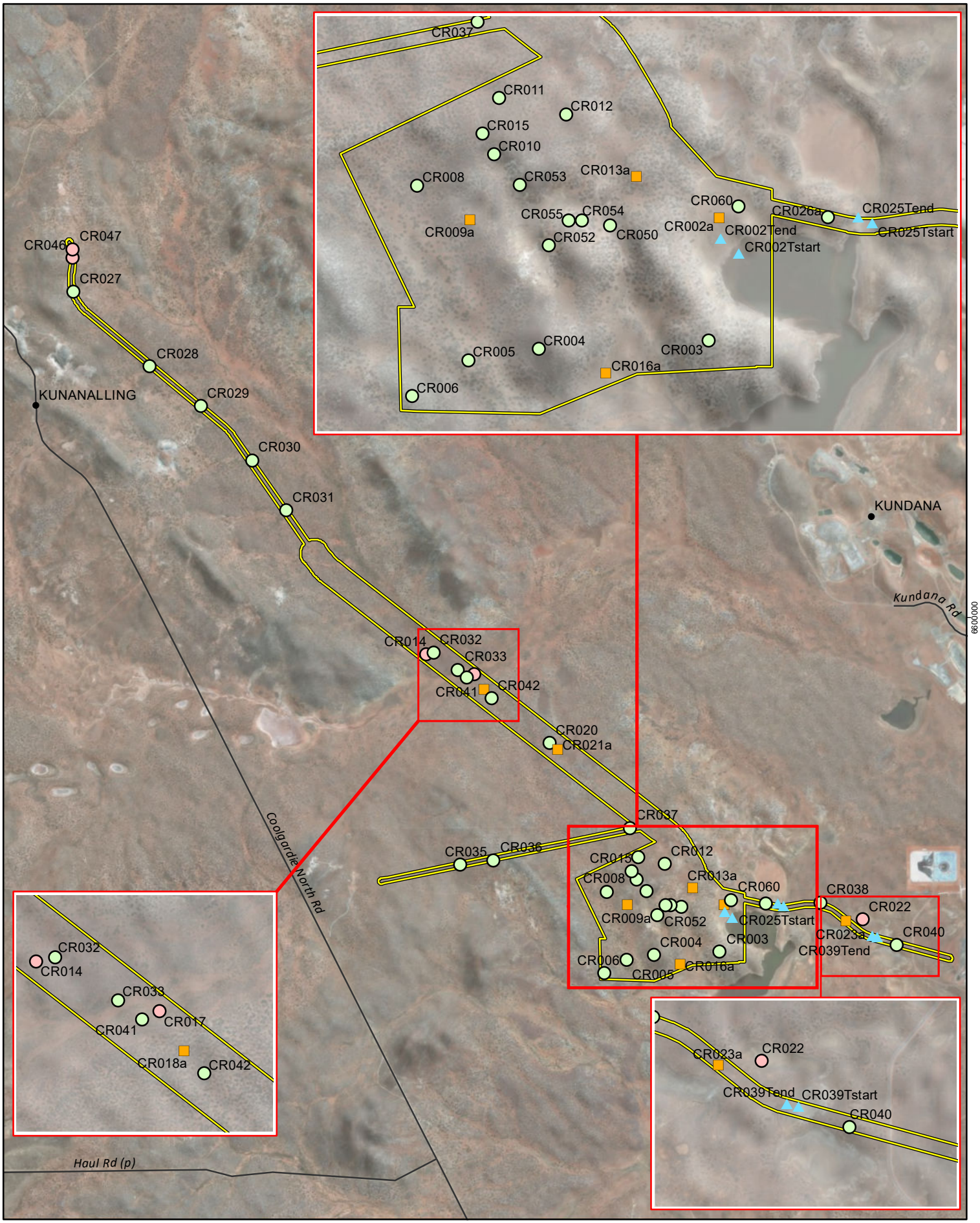
- location – the geographic coordinates of all four corners of each quadrat and single point for relevé in WGS84 datum using a handheld GPS
- description of vegetation – a broad description utilising the structural formation and height classes based on National Vegetation Information System (ESCAVI 2003a) and in accordance with EPA (2016c) (Table 4-3
- habitat – a brief description of landform and habitat
- geology – a broad description of surface soil type and rock type
- disturbance history – a description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity and fauna activity

- vegetation condition – the condition of the vegetation was recorded utilising the appropriate condition scale for the South West Interzone botanical province (EPA 2016b) (Table 4-3)
- height and percentage foliage cover (PFC) – a visual estimate of the canopy cover of each species present within the quadrat was recorded as a percentage, as was the total vegetation cover, cover of shrubs and trees >2 m tall, cover of shrubs <2 m, total grass cover and total herb cover
- photograph – a colour photograph of the vegetation within each quadrat in a south-easterly direction from the north-west corner of the quadrat
- flora species list – a list including the name of every flora species present within the quadrat; to ensure accurate taxonomic identification of flora species present within the study area, collections were made of each specimen at least once and each collection was pressed and documented for identification using the WA Herbarium resources.

The following information was recorded for each relevé:

- location – the geographic coordinates of a single point in WGS84 projection
- description of vegetation – a broad description utilising the structural formation and height classes based on National Vegetation Information System (ESCAVI 2003b) and in accordance with EPA (2016c) (Appendix 1)
- habitat – a brief description of landform and habitat
- geology – a broad description of surface soil type and rock type
- disturbance history – a description of any observed disturbance including an estimate of time since last fire, weed invasions, soil disturbance, human activity and fauna activity
- vegetation condition – the condition of the vegetation was recorded utilising the appropriate condition scale for the South West Interzone botanical province (EPA 2016b) (Table 4-3)
- photograph – a colour photograph of the vegetation.

Transect (defined straight line along which data are recorded) sampling was employed to describe riparian vegetation surrounding lake playas in the study area (per EPA 2016b). Transect surveys utilized 3 m x 3 m (9 m^2) quadrats spaced evenly along linear transects to sample the riparian vegetation across the lakes to obtain detailed data (as specified for the 20 m x 20 m quadrats above).



Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

0 0.75 1.5 3
Kilometres

1:90,000 (at A4) GDA 1994 MGA Zone 51

Study area
Survey site type
Quadrat
Quadrat and relevé
Relevé
Transect

Figure 4-1
Survey site locations

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4.2.2 Significant flora searches

Searches were undertaken for significant flora identified in the desktop review and – in the second phase survey – for significant flora recorded in the first phase. Greater survey effort was employed for significant species of higher conservation significance (i.e. Threatened, Priority 1) and, in the spring survey, in habitats suitable for spring-detectable species. Searches were intensified in low lying areas as these areas typically support a higher level of biodiversity.

The location of significant species previously recorded within the study area was targeted to confirm their presence, state (e.g. flowering) and abundance. Searches for further populations of targeted flora focused on similar habitat areas to the existing known populations. If a flora species was considered to potentially be a conservation significant species (i.e. similar floristic characteristics and occurring within suitable habitat) the following information was collected:

- GPS coordinates, including population boundary where applicable
- description of the habitat and floristic community in which the potential conservation significant species was located
- population size estimate (i.e. estimated number of individual plants) where applicable
- specimen collection for taxonomic identification and lodgement at the WA Herbarium
- photograph of live plant in situ and description of important details, such as flower colour, height of individual or average height of population.

4.2.3 Vegetation mapping

The vegetation descriptions from quadrats and transects from the survey were grouped according to similarity of community structure (i.e. canopy levels), species composition and combination of species and the prevalent community type (i.e. woodland, shrubland, etc.). To support delineation of vegetation types, cluster analyses were conducted based on species composition in each quadrat. As cover values for each species were recorded during the spring survey the analyses were conducted for species cover. In accordance to the current guidance (EPA 2016b) annual and short-lived (ephemeral) species were excluded from the dataset along with any taxon that could not be definitively identified to species level and singletons (species recorded at only one location with a cover value of 0.1%). Separate analyses were conducted for the 50 m x 50 m quadrats and the 3 m x 3 m quadrats scored for the transect surveys.

The fusion strategy for the site classification was flexible UPGMA with a beta value of -0.1 and Bray Curtis association measure in the software package PATN (Belbin 2003). A dendrogram was produced to illustrate the similarities between the vegetation units identified. Statistically distinct vegetation units (the floristic group) classified the vegetation at a local scale. Local scale vegetation units were described at NVIS Level V – Association (ESCAVI 2003b). The term ‘vegetation type’ was used for local scale vegetation units in accordance with (EPA 2016b).

The vegetation types thereby defined were then compared to relevé survey descriptions and the relevé assigned to the appropriate vegetation type.

The vegetation boundaries were mapped utilising high-quality colour aerial photography and from vegetation boundaries recorded on GPS during the field survey.

4.2.4 Condition mapping

The condition of vegetation was mapped across the study area based on the appropriate condition rating scale for the South West Interzone botanical province (EPA 2016b). The vegetation condition ratings relate to vegetation structure, the level of disturbance and weed cover at each structural layer and the ability of the vegetation unit to regenerate. Vegetation condition ranges from Pristine being the highest rating to Completely Degraded as the lowest (Table 4-3).

Table 4-3 Vegetation condition rating scale for South West Interzone botanical province (EPA 2016c)

Vegetation condition	Description
Pristine	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

4.2.5 Likelihood of occurrence assessment

The potential for occurrence in the study area of the significant flora and vegetation identified in the database searches was assessed. The assessment was based on reviewed information relating to habitat preference (soils, landforms, elevation and vegetation associations) and locality records from the database searches.

The flora assessments assigned each taxon to one of four ratings:

- definite – species recorded within the study area by previous or current survey
- likely – study area within known range of species; suitable habitat within the study area and/or records within 5 km of study area

- possible – study area within known range of species; optimal or potential habitat within the study area, no records within 5 km of study area
- unlikely – study area outside known range of species, no records within 5 km and/or no suitable habitat present in study area.

4.2.6 Taxonomy and nomenclature

Species that were well known to the survey botanists were identified in the field, while species that were unknown were collected and assigned a unique number to facilitate tracking. *Tecticornia* species are difficult to discern in the field as identification frequently relies on microscopic identification of reproductive structures, e.g. seeds. Specimens of all 'recognized' species of *Tecticornia* were therefore collected for identification.

Plant species collected during the survey were identified by the use of local and regional flora keys and by comparison with the named species held at the WA Herbarium. Plant taxonomists who are considered to be an authority on a particular plant group were consulted. All *Tecticornia* specimens. were sent to Dr Kelly Shepherd at the WA Herbarium for identification.

Nomenclature for flora and vegetation used in this report follows that used by FloraBase (DBCA 2018b) and the WA Herbarium.

4.3 SURVEY PERSONNEL

The personnel involved in the survey are presented in Table 4-4.

Table 4-4 Project team

Name	Qualifications	Role/s
Dr Grant Wells	PhD (Botany)	Project Manager, field surveys, flora taxonomy, data analyses and report review
Dr Grace Wells	PhD (Plant Conservation)	GIS, vegetation mapping and reporting
Alice Watt	BSc. Hons (Cons Bio. and Botany)	Field survey and reporting
Frank Obbens	BSc. Hons. (Env. Biol.)	Taxonomy
Karen Crews	BSc. (Env. Biol.) (Hons)	Report review
Ian Hay	B App Science (Surveying and mapping)	GIS

5 RESULTS

5.1 DESKTOP REVIEW

The database searches identified a high species diversity, with 844 flora taxa recorded within the area of the desktop assessment (Appendix 2).

5.1.1 Significant flora

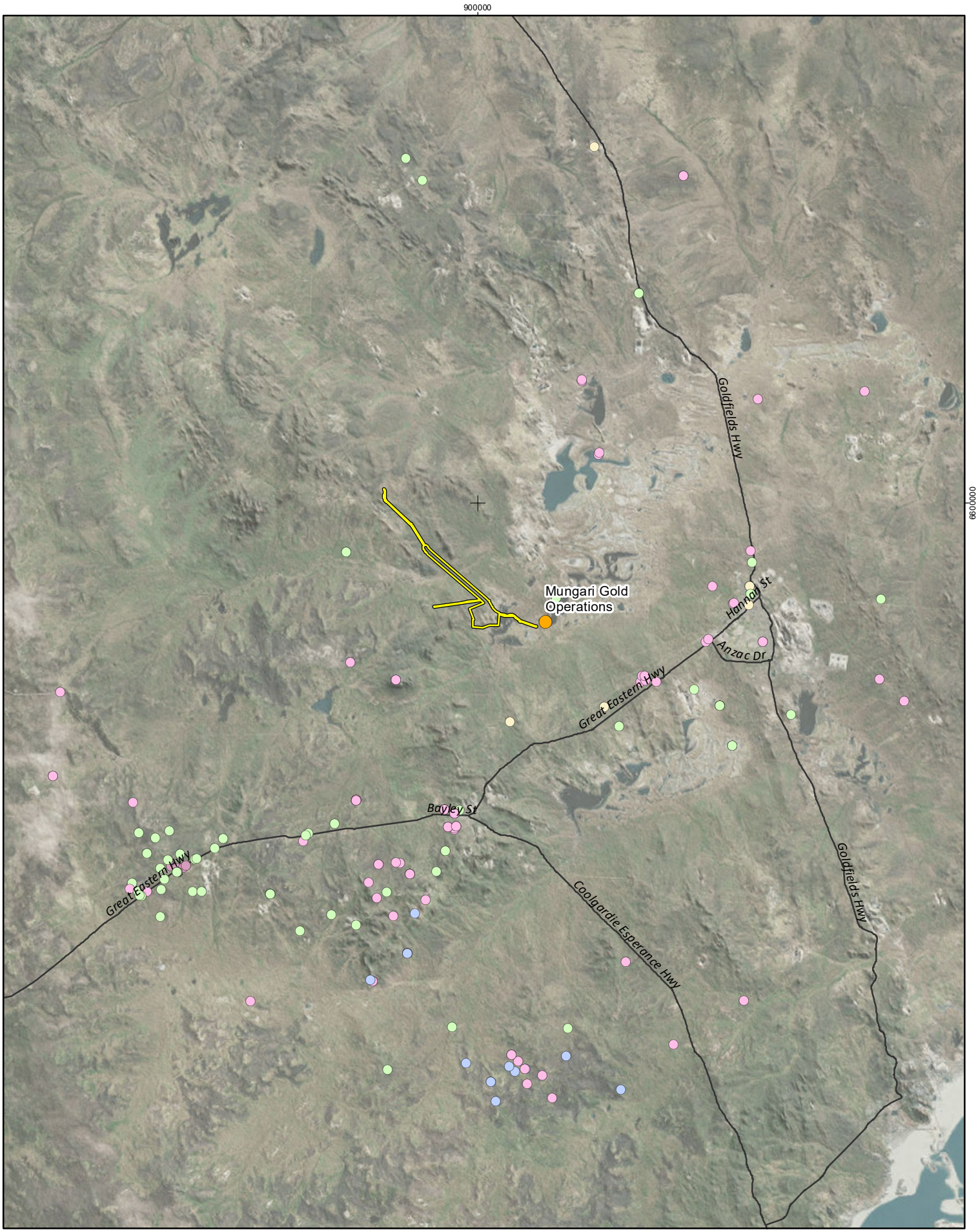
Records of 48 significant flora were identified within the 40 km radius of the study area (Table 5-1). These comprised of two Threatened species, *Gastrolobium graniticum* (EN EPBC Act, VU BC Act) and *Thelymitra stellata* (EN EPBC Act and BC Act), 17 Priority 1 taxa, six Priority 2 taxa, 19 Priority 3 taxa and four Priority 4 taxa. None of the records of significant flora were located within the study area (Figure 5-1). None of the previous flora surveys from the desktop review found any Threatened or Priority species.

Table 5-1 Significant flora records from the area of the database searches

Species	Cons. code	Habitat
Gastrolobium graniticum	EN (EPBC Act); VU (BC Act)	Flowers yellow, orange and red, in Aug to Sep. Occurs in sand, sandy loam and granite, on the margins of rock outcrops and along drainage lines (DBCA 2018b).
Thelymitra stellata	EN (EPBC Act, BC Act)	Flowers yellow and brown, in Oct to Nov. Occurs in sand, gravel and lateritic loam (DBCA 2018b).
Acacia coatesii	P1	Open woodland dominated by *Eucalyptus clelandii* and *E. lesouefii* over open shrubland that includes *Acacia erinacea, A. hemiteles, Atriplex nummularia, Eremophila scoparia, Dodonaea stenozyga* and *Olearia muelleri*. Grows in shallow, red, sandy clay on flat or gently sloping ground towards the base of a low greenstone ridge. Flowers from mid-Aug to early Oct (Maslin 2014).
Acacia epedunculata	P1	Flowers in Aug. Grows in moderately exposed, gently undulating sandplains in deep, yellow, well-drained sand in *Eucalyptus leptopoda* very open shrub mallee (DBCA 2018b).
Acacia sclerophylla var. *teretiuscula*	P1	Flowers in Sep to Oct. Grows in clay & loamy soils (DBCA 2018b).
Acacia websteri	P1	Grows in red sand, clay or loam. Low-lying areas, flats (DBCA 2018b). *Acacia*/*Eucalyptus*/*Allocasuarina* woodland/shrubland.
Austrostipa sp. Carlingup Road (S. Kern & R. Jasper LCH 18459)	P1	Grass to 40 cm. Occurs in loamy soils, sparse mallee woodland / tall open shrubland (DBCA 2018b).
Dampiera plumosa	P1	Flowers blue, in Oct. Grows in red sandy soils (DBCA 2018b).
Eremophila praecox	P1	Flowers purple, in Oct or Dec. Grows in red/brown sandy loam. Undulating plains (DBCA 2018b).
Eucalyptus websteriana subsp. *norsemanica*	P1	Flowers yellow, in Sep to Nov. Occurs on rocky rises (DBCA 2018b).
Lepidosperma sp. Parker Range (N. Gibson & M. Lyons 2094)	P1	Previously recorded on ridges and slopes, in brown clay loam/ clay-gravel over granite or laterite. Recorded from *Eucalyptus stricklandii* and *E. orbifolia* mallee shrubland, open *Acacia*

Species	Cons. code	Habitat
		shrubland, open *Eucalyptus* woodland, low sparse *Dodonaea lobulata* shrubland (DBCA 2018b).
Melichrus sp. Coolgardie	P1	Light pink pendent flowers in August. Previously recorded from Low *Eucalyptus concinna* woodland on slope; yellow sand on flats and undulating plains; sparse mallee over low heath; and scattered, open *Casuarina* shrubland on plain (DBCA 2018b).
Phebalium appressum	P1	Flowers white, in Jul. Occurs on yellow sandplain (DBCA 2018b).
Philotheca pachyphylla	P1	Flowers white, in May or Sep. Grows in sand, red loam and clay loam on sandplains and hill tops (DBCA 2018b).
Ptilotus chortophytus	P1	Recorded on breakaways, stony/rocky hills often with quartz. Brown loam often with shale (ALA 2018; DBCA 2018b).
Ptilotus procumbens	P1	Flowers pink-white, in Nov. Grows in red clay (DBCA 2018b).
Rhodanthe uniflora	P1	Flowers yellow, in Aug to Oct. Recorded from open *Eucalyptus* woodland and sparse *Maireana pyramidata* shrubland in red clay and brown soil (DBCA 2018b).
Thryptomene sp. Coolgardie (E. Kelso s.n. 1902)	P1	No habitat data for this species. Previously collected in Oct (DBCA 2018b).
Thryptomene sp. Londonderry (R.H. Kuchel 1763)	P1	Small pink/white flowers in Jun to Nov. *Acacia* and *Casuarina* shrubland, *Acacia* and *Allocasuarina* low woodland. Orange-brown sand, well-drained yellow sand (DBCA 2018b).
Austrostipa sp. Dowerin (G. Wiehl F 8004)	P2	Level crest of basalt and minor calcrete with red-brown skeletal light medium clay soils. Plain in reserve site. Dry red sand / loam (ALA 2018).
Elachanthus pusillus	P2	Low plains, drainage flats in red clay, red loam soils (DBCA 2018b).
Goodenia salina	P2	Well-drained, saline, grey or brown loamy clay. Low gypseous dunes near salt pans (DBCA 2018b).
Hakea rigida	P2	Flowers pink, in Sep to Oct. Sandy soils, yellow sand (DBCA 2018b).
Lepidium merrallii	P2	Clay loam (DBCA 2018b).
Phebalium clavatum	P2	Flowers white, in Aug to Sep. Sandy soils, sandplains (DBCA 2018b).
Acacia crenulata	P3	Clay, sandy clay, yellow sand. Rocky rises, granite outcrops, breakaways (DBCA 2018b).
Allocasuarina eriochlamys subsp. *grossa*	P3	Stony loam, laterite clay. Granite outcrops (DBCA 2018b).
Alyxia tetanifolia	P3	Flowers white-cream, in May to Jun or Nov. Sandy clay, loam, concretionary gravel. Drainage lines, near lakes (DBCA 2018b).
Angianthus prostratus	P3	Flowers white-yellow, in Jul to Sep. Red clay or loamy soils. Saline depressions (DBCA 2018b).
Austrostipa blackii	P3	Flowers in Sep to Nov. Shaded areas atop rocky banded ironstone formation ridge. Clay soils, between outcroppings. Crest. Red clay loam (ALA 2018).

Species	Cons. code	Habitat
Chrysocephalum apiculatum subsp. *norsemanense*	P3	Recorded growing in various soil types including yellow or red sand, yellow sandy clay, and calcareous soil. Flowers yellow, in Aug to Oct. Occurs in open *Acacia* and *Eucalyptus* woodland (ALA 2018; DBCA 2018b).
Cyathostemon verrucosus	P3	White flowers. Recorded flowering in Apr, Jul, Sep, Oct, Nov, Found on yellow sand plains, recorded in shrublands, sometimes dominated by mallees or *Banksia* (ALA 2018; DBCA 2018b).
Diocirea acutifolia	P3	Flowers white, in Nov to Dec. Occurs in clay loam, gravelly loam on undulating flats (DBCA 2018b).
Diocirea microphylla	P3	Flowers white, in Nov to Dec. Grows in red-brown clay loam (DBCA 2018b).
Eremophila veronica	P3	Flowers purple, in Apr to May. Grows in stony clay, clay loam on lateritic breakaways (DBCA 2018b).
Gompholobium cinereum	P3	Recorded growing in yellow sand, clayey sand, brown loam, sandy gravel and laterite. Occurs in well-drained open sites, slopes, plains, roadsides (DBCA 2018b).
Grevillea georgeana	P3	Flowers red/red & pink & cream, in Jan or Mar or Sep to Nov. Occurs in stony loam/clay on ironstone hilltops & slopes (DBCA 2018b).
Isolepis australiensis	P3	Flowers in Jun or Sep. Grows in silty sand and sandy clay on lake margins and pools (DBCA 2018b).
Lepidium fasciculatum	P3	Habitat records include brown cracking clay plain and dry lake bed with red loam soil (DBCA 2018b).
Melaleuca coccinea	P3	Flowers red, in Sep to Nov or Jan. Occurs in sandy loam over granite, granite outcrops, sandplains, river valleys (DBCA 2018b).
Notisia intonsa	P3	Occurs in eucalypt woodlands on floodplains, lake edges, seasonally wet areas, in clayey soils (DBCA 2018b).
Phlegmatospermum eremaeum	P3	Flowers white-cream, in Jun or Aug to Oct. Occurs in chenopod and eucalypt shrubland on flats and edges of salt lakes, in stony loam – clay/loam soils (DBCA 2018b).
Rinzia triplex	P3	Flowers pink, in Jun, Jul, Aug, Sep. Recorded on sandy plains in yellow to red, often gravelly or lateritic soils (ALA 2018; DBCA 2018b).
Styphelia sp. Bullfinch	P3	Flowers white, in Jul to Sep. Recorded from laterite breakaways/outcroppings, in clay loams (DBCA 2018b).
Eremophila caerulea subsp. *merrallii*	P4	Flowers purple, Oct to Dec. Occurs in eucalypt woodlands (often *E. salubris*), growing in sand, clay or loam on flats and undulating plains (DBCA 2018b).
Eucalyptus jutsonii subsp. *jutsonii*	P4	Grows in deep yellow to orange sand in broad and subdued rises (DBCA 2018b).
Eucalyptus x brachyphylla	P4	Flowers white, in Jun. occurs in sandy loam, on granite outcrops.
Frankenia glomerata	P4	Flowers pink-white, in Nov. White sand. Occurs in floodplains, salt lake edges, saline flats in white, grey sand-loam (DBCA 2018b).



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Project No	1204
Date	08-Feb-19
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Map author	GW, RE

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Mungari Gold Operations
Study area

Significant flora conservation status

- P1
- P2
- P3
- P4
- T

Figure 5-1

DBCA records of significant flora

PHOENIX ENVIRONMENTAL SCIENCES

5.1.2 Introduced flora

The desktop assessment identified records of 87 introduced species within the 40 km radius of the study area, of which 10 are a Declared Pest and seven are WoNS (Table 5-2; Appendix 2).

Table 5-2 Introduced flora records from the area of the database searches

Species name	Declared Pest	WoNS
**Alhagi maurorum* (Camelthorn)	s22(2) (C3)	
**Alyssum linifolium*	s22(2) (Exempt)	
**Cylindropuntia fulgida* var. *mamillata*	s22(2) (C3 Restricted)	Y
**Cylindropuntia imbricata*	s22(2) (C3 Restricted)	Y
**Cylindropuntia kleiniae*	s22(2) (C3 Restricted)	Y
**Cylindropuntia tunicata*	s22(2) (C3 Restricted)	Y
**Echium plantagineum* (Paterson's Curse)	s22(2) (Exempt)	
**Lycium ferocissimum*		Y
**Opuntia elata*	s22(2) (C3 Restricted)	Y
**Opuntia ficus-indica*	s22(2) (C3 Exempt)	Y
**Xanthium spinosum* (Bathurst Burr)	s22(2) (C2, C3)	

5.1.3 Vegetation associations

Regional scale vegetation mapping by Shepherd *et al.* (2002) mapped five vegetation associations in the study area (Figure 5-2):

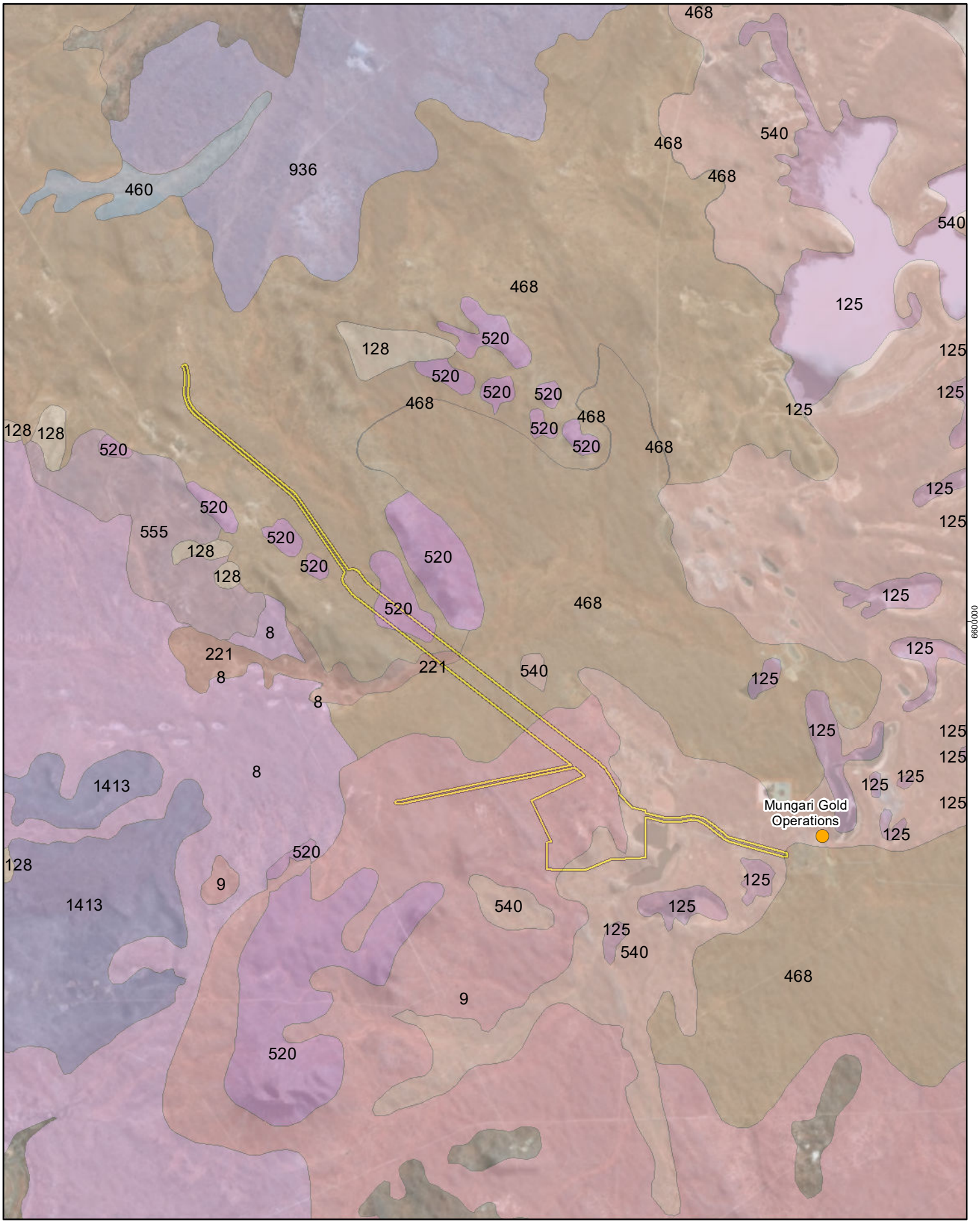
- Association 9: Medium woodland; coral gum (*Eucalyptus torquata*) & goldfields blackbutt (*E. lesouefii*), (also some e10,11)
- Association 221: Succulent steppe; saltbush
- Association 468: Medium woodland; salmon gum & goldfields blackbutt
- Association 520: Shrublands; *Acacia quadrimarginea* thicket
- Association 540: Succulent steppe with open low woodland; sheoak over saltbush.

The remaining extent of all vegetation associations at the Statewide scale exceeds 94% (DBCA 2018a) and they are therefore considered of Least Concern (Table 5-3). All five associations have over 95% remaining at the bioregional and subregional scales (DBCA 2018a).

Only one vegetation association has below 10% proportion of extent in DBCA managed lands (association 9) at the Statwide scale, the rest have above 17% extent and association 520 represented by almost half (45.5%) of extent in DBCA managed lands (Table 5-3).

Table 5-3 Statewide extent of Pre-European vegetation associations present in the study area (DBCA 2018a)

Vegetation association	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Current extent in DBCA managed lands (%)	% of study area
9	240,509.33	235,161.94	97.78	8.07	47.9
221	63,720.06	59,923.05	94.04	17.99	1.8
468	592,022.31	583,902.76	98.63	23.15	25.3
520	37,922.62	37,369.58	98.54	45.54	6.7
540	202,423.88	200,158.84	98.88	28.18	18.3
Total					**100.0**



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Mungari Gold Operations
Study area

Vegetation Assoc
8
9
125
128
221
460
468
520
540
555
936
1413

Figure 5-2

Shepherd *et al*. (2002) vegetation associations of the study area

PHOENIX ENVIRONMENTAL SCIENCES

5.1.4 Significant vegetation

No TECs listed under the EPBC Act or at the State level, nor any PECs listed by DBCA were returned in the database search results.

Mattiske Consulting (2002) defined 19 vegetation types comprised of *Eucalyptus* woodlands, chenopod shrublands and mixed shrublands dominated by *Eremophila* species all of which were described as "widespread and were not found to have any flora conservation issues associated with them". Outback Ecology (2003) defined 26 vegetation types and described them as well represented in the surrounding areas and therefore not considered ecologically significant. Similarly, none of the previous survey reports reviewed identified any of the vegetation defined as significant vegetation (Botanica Consulting 2010; Native Vegetation Solutions 2017; Outback Ecology 2006).

5.2 FIELD SURVEY

A total of 215 flora taxa representing 36 families and 81 genera were recorded in the study area during the field surveys (Appendix 3), of which eight could not be definitively identified to species level and did not resemble any of the recorded species. A further ten specimens could not be identified to species level but were considered to represent one of the species recorded elsewhere. Species richness ranged from 8–34 species between quadrats (Appendix 1). The assemblage included 208 native species and seven introduced species, including 189 perennial species and 26 annual or short-lived species. The most prominent families recorded were Chenopodiaceae (56 species), Fabaceae (20 species), Scrophulariaceae (19 species), Myrtaceae (18 species) and Asteraceae (17 species).

5.2.1 Significant flora

No Commonwealth or State listed Threatened flora were recorded in the study area during the survey. Four Priority flora, *Eremophila praecox* (P1), *Allocasuarina eriochlamys* subsp. *grossa* (P3), *Austrostipa blackii* (P3) and *Calandrinia* ?*quartzitica*/*Calandrinia* ?*lefroyensis* (P1) were recorded in the study area (Figure 5-3).

A specimen of the *Calandrinia* taxon collected from the study area could not be definitively identified due to the seeds being too immature. The specimen was shown to Frank Obbens, the taxonomic specialist for *Calandrinia*, who identified it as either *C.* ?*quartzitica* (P1) or *C.* ?*lefroyensis* (P1) (see section 5.2.1.1.4 and 5.2.1.1.5).

Both the *Austrostipa blackii* and the *Calandrinia* specimens collected in the study area were not recognised as a significant species in the field and therefore the size and distribution of the population in the study area is unknown. Both the specimens were collected during a quadrat survey with a recorded foliage cover of 0.1% indicating the species was rare in the quadrat.

Assessment of the likelihood of occurrence in the study area for the remaining 45 significant flora identified from the desktop assessment (Table 5-1) determined six as possible and 39 unlikely (Table 5-4). Of those considered to possibly occur, one was Priority 1, one was Priority 2, three were Priority 3 and one was Priority 4.

The study area represented a range extension for two taxa:

- *Calandrinia* sp. Gypsum, ~110 km northern range extension, therefore considered a significant flora as it is a new range extension for this species
- both of the possible identifications of the *Calandrinia* specimen, *C. quartzitica* (P1), ~70 km southern extension or *C. lefroyensis* (P1), ~60 km north-west range extension.

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- Mungari Gold Operations
- Study area

Significant flora conservation status

- P1
- P3
- Range extension

Figure 5-3

Records of significant flora from the field survey

PHOENIX ENVIRONMENTAL SCIENCES

Table 5-4 Likelihood of occurrence for conservation significant flora in the study area

Species	Cons. code	Likelihood of occurrence
Gastrolobium graniticum	EN (EPBC Act); VU (BC Act)	Unlikely, lack of suitable habitat in the study area.
Thelymitra stellata	EN (EPBC Act, BC Act)	Unlikely, the record came up in the Protected Matters database search but the nearest records occur hundreds of kilometres from the study area.
Acacia coatesii	P1	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Acacia epedunculata	P1	Unlikely, possible suitable habitat but closest record over 40 km from the study area.
Acacia sclerophylla var. *teretiuscula*	P1	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Acacia websteri	P1	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Austrostipa sp. Carlingup Road (S. Kern & R. Jasper LCH 18459)	P1	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Dampiera plumosa	P1	Unlikely, limited suitable habitat in study area and record approximately 30km from study area.
Eremophila praecox	P1	Definite, found in study area.
Eucalyptus websteriana subsp. *norsemanica*	P1	Unlikely, some suitable habitat in study area but record >30km from study area.
Lepidosperma sp. Parker Range (N. Gibson & M. Lyons 2094)	P1	Unlikely, limited suitable habitat in study area but record approximately 30 km from study area.
Melichrus sp. Coolgardie	P1	Unlikely, limited suitable soil type in study area but record approximately 40 km from study area.
Phebalium appressum	P1	Possible, some suitable habitat in study area and record within 10 km.
Philotheca pachyphylla	P1	Unlikely, some suitable habitat in study area but record >30km from study area.
Ptilotus chortophytus	P1	Unlikely, some suitable habitat in study area but record >20 km from study area.
Ptilotus procumbens	P1	Unlikely, some suitable soil type in study area but record >20km from study area.
Rhodanthe uniflora	P1	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Thryptomene sp. Coolgardie (E. Kelso s.n. 1902)	P1	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Thryptomene sp. Londonderry (R.H. Kuchel 1763)	P1	Unlikely, no suitable habitat in study area.
Austrostipa sp. Dowerin (G. Wiehl F 8004)	P2	Unlikely, no suitable habitat (basalt and minor calcrete) in study area.
Elachanthus pusillus	P2	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Goodenia salina	P2	Unlikely, no suitable habitat (low gypseous dunes) in study area.

Species	Cons. code	Likelihood of occurrence
Hakea rigida	P2	Possible, some suitable soil type (yellow sand) in study area and record within 10 km of study area.
Lepidium merrallii	P2	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Phebalium clavatum	P2	Unlikely, some suitable habitat in study area but record >30 km from study area.
Acacia crenulata	P3	Unlikely, some suitable habitat in study area but record >30 km from study area.
Allocasuarina eriochlamys subsp. *grossa*	P3	Definite, found in study area.
Alyxia tetanifolia	P3	Possible, some suitable habitat (drainage lines, near lakes) in study area and record within 20km of study area.
Angianthus prostratus	P3	Possible, some suitable habitat in study area but record >30 km from study area.
Austrostipa blackii	P3	Definite, found in study area.
Chrysocephalum apiculatum subsp. *norsemanense*	P3	Unlikely, no suitable habitat in study area.
Cyathostemon verrucosus	P3	Unlikely, some suitable soil type (yellow sand) in study area but record >20km from study area.
Diocirea acutifolia	P3	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Diocirea microphylla	P3	Unlikely, suitable habitat in study area but closest record approximately >20 km from study area.
Eremophila veronica	P3	Unlikely, no suitable habitat (lateritic breakaways) in study area.
Gompholobium cinereum	P3	Possible, suitable habitat in study area and record within 20 km of study area.
Grevillea georgeana	P3	Unlikely, some suitable habitat (ironstone hilltops & slopes) in study area but record >20km from study area.
Isolepis australiensis	P3	Unlikely, some suitable habitat (silty sand and sandy clay on lake margins and pools) in study area but record >20 km from study area.
Lepidium fasciculatum	P3	Unlikely, no suitable habitat (brown cracking clay plain and dry lake bed) in study area.
Melaleuca coccinea	P3	Unlikely, no suitable soil type (sandy loam over granite) in study area.
Notisia intonsa	P3	Unlikely no suitable habitat (eucalypt woodland on floodplain) in study area.
Phlegmatospermum eremaeum	P3	Unlikely, no suitable habitat (chenopod and eucalypt shrubland on flats and edges of salt lakes) in study area.
Rinzia triplex	P3	Unlikely, no suitable habitat (sandy plains) in study area.
Styphelia sp. Bullfinch	P3	Unlikely, no suitable habitat (laterite breakaways/outcroppings) in study area.

Species	Cons. code	Likelihood of occurrence
Eremophila caerulea subsp. *merrallii*	P4	Possible, suitable habitat in study area and record within 20 km of study area.
Eucalyptus jutsonii subsp. *jutsonii*	P4	Unlikely, no suitable soil type (deep yellow to orange sand) in study area.
Eucalyptus x *brachyphylla*	P4	Unlikely, some suitable habitat (granite outcrops) in study area but record >20km from study area.
Frankenia glomerata	P4	Unlikely, some suitable habitat (floodplains, salt lake edges, saline flats) in study area but record >20 km from study area.

5.2.1.1.1 ***Eremophila praecox***

Status: Priority 1

Description: Broom-like shrub, 1.5-3 m high. Purple flowers October or December (Figure 5-4).

Figure 5-4 ***Eremophila praecox***

Distribution and ecology: Occurs in the Eastern Goldfields subregion in the Coolgardie bioregion (DBCA 2019). This species is known from 15 records (ALA 2019), with habitat descriptions including eucalypt woodland over *Acacia*, *Melaleuca* and *Eremophila* shrubland on a loamy plain and *Eucalyptus oleosa* mallee over *Triodia* on red-brown loam sandy soil.

Population sizes provided in records for the species are limited to two plants recorded and a comment of 'infrequent' (DBCA 2019).

Survey records: Three individuals were found at two locations in the study area (Figure 5-3) in a mid *Eucalyptus transcontinentalis* and *E. clellandiorum* woodland over mid sparse *Atriplex nummularia*,

Maireana sedifolia and *Eremophila scoparia* shrubland over isolated low *Acacia erinacea*, *Eremophila parvifolia* subsp. *auricampa* and *Olearia muelleri* shrubs in a mid *Eucalyptus salubris*, *E. transcontinentalis* and *E. gracilis* woodland over mid open *Eremophila scoparia*, *Senna artemisioides* subsp. *filifolia* and *Atriplex nummularia* shrubland over isolated low *Olearia muelleri*, *Ptilotus obovatus* and *Eremophila parvifolia* subsp. *auricampa* shrubs.

5.2.1.1.2 ***Allocasuarina eriochlamys* subsp. *grossa***

Status: Priority 3

Description: Dioecious or monoecious shrub, 1-3 m high, bracteoles prominently exceeding cone (Figure 5-5).

Figure 5-5 *Allocasuarina eriochlamys* subsp. *grossa*

Distribution and ecology: Occurs in the Coolgardie and Nullarbor bioregions (DBCA 2019). This species is known from 64 records (ALA 2019), with habitat descriptions including:

- tall shrubland of *Acacia acuminata* with an understory of *Lepidospermum* sp. on lower footslope of basalt hill
- tall shrubland of *Eucalyptus lesouefii* on low breakaway
- in *Casuarina campestris* scrub on stony loam hill
- on laterite or granite hill.

Population sizes range from counts of 1,000's of plants to comments of 'infrequent' to 'common' or 'locally frequent' (DBCA 2019).

Survey records: In the study area, 165 individuals were located in a Low *Eucalyptus clellandiorum* and *E. griffithsii* woodland over tall *Acacia burkittii*, *Allocasuarina eriochlamys* subsp. *grossa* and *Melaleuca pauperiflora* subsp. *fastigiata* shrubland over low open *Cryptandra aridicola*, *Dodonaea lobulata* and *Exocarpos aphyllus* shrubland (Figure 5-3).

5.2.1.1.3 ***Austrostipa blackii***

Status: Priority 3

Description: Tufted perennial, grass-like or herb up to 1 m high. Flowers September to November.

Distribution and ecology: Occurs in the Avon Wheatbelt, Coolgardie and Yalgoo bioregions (DBCA 2019). This species is known from 46 records in Western Australia (ALA 2019), with habitat descriptions including:

- *Eucalyptus* aff. *oleosa* open woodland over *Acacia acuminata* and *A. resinimarginea* tall open shrubland, over *Phebalium canaliculatum*, *Euryomyrtus maidenii* and *Prostanthera grylloana* low shrubland, over *Triodia scariosa* very open hummock grassland on red silty sand with fine sandy gravel
- tall open scrub of *Acacia resinimarginea* and *Acacia* sp. narrow phyllode in a winter wet depression on orange clay loam soil
- *Eucalyptus longissima*, *Banksia arborea*, *Acacia* sp. Mt Jackson (B.Ryan 176), *Philotheca brucei* subsp. *brucei* on rocky banded ironstone formation
- open woodland of *Allocasuarina dielsiana* over open shrubland of *Allocasuarina tessellata* and *Acacia karina* over open forbland of *Podolepis gardneri*, *Ptilotus helipteroides*, *Schoenia cassiniana* and *Stenopetalum filifolium* on basalt outcrop with red brown shallow sandy clay soil.

Population sizes provided in records for the species ranged from one plant and comments of 'isolated' to comments of 'locally common'.

Survey records: In the study area, a cover value of 0.1% was given at a quadrat (CR004) in a tall *Acacia burkittii*, *Brachychiton gregorii* and *Grevillea berryana* shrubland over mid open *Eremophila gibbosa* and *Scaevola spinescens* and *Dodonaea lobulata* shrubland over low *Leiocarpa semiclava* subsp. *semiclava*, *Solanum lasiophyllum* and *P. obovatus* shrubland (Figure 5-3).

5.2.1.1.4 ***Calandrinia quartzitica***

Status: Priority 1

Description: Semi-erect to erect herb with very fleshy leaves, up to 0.5 m high. White or pink flowers in September to October (Figure 5-6).

Figure 5-6 ***Calandrinia quartzitica*** **(Obbens F.J. 2018), A – habitat, B – habit, photographs by Brian Moyle**

Distribution and ecology: Occurs in the Eastern Murchison subregion (DBCA 2019). This species is known from nine records from the edge of five salt lakes (Obbens F.J. 2018). It occurs in samphire dominated lake edges close to quartzitic ridges and breakaways or quartzitic hummocky ground in brown silty sand or red-brown silty loam.

No population sizes are provided (DBCA 2019) but comments on frequency range from 'scattered' to 'locally common'.

Survey records: Specimen recorded from a single quadrat (CR002a) is either *Calandrinia quartzitica* or *C. lefroyensis* (Figure 5-3). Vegetation description for the site is isolated tall *Grevillea sarissa* subsp. *sarissa* and *Melaleuca halmaturorum* shrubs over low *Tecticornia indica* subsp *bidens*, *T*. sp. Dennys Crossing and *T. pruinosa*. shrubland over isolated low *Disphyma crassifolium* and *Calandrinia* ?*quartzitica* forbs.

5.2.1.1.5 ***Calandrinia lefroyensis***

Status: Priority 1

Description: semi-erect to erect herb with very fleshy leaves up to 0.26 m high. Pink flowers in October to November (Figure 5-7)

Figure 4. *Calandrinia lefroyensis* from Lake Cowan. A – habitat; inset – flower. Photographs by Lillian Hancock.

Figure 5-7 *Calandrinia lefroyensis* (Obbens F.J. 2018), A – habitat, B – flower, photographs by Lillian Hancock

Distribution and ecology: Occurs in the Eastern Goldfields subregion (DBCA 2019). This species is known from five records from salt lake flats among samphire communities on brown silty loam or brown-grey sandy clays (Obbens F.J. 2018).

Population sizes range from counts of 4, 10 and 34 plants to comments of 'occasional and scattered' to 'locally common' (DBCA 2019).

Survey records: See *C. quartzitica* above.

5.2.2 Introduced flora

A total of seven introduced flora species were recorded in the study area; none of these were Declared Pests or WoNS (Table 5-5; Appendix 3).

Table 5-5 Introduced flora species recorded during the field survey

Family	Species
Convolvulaceae	**Cuscuta epithymum*
Geraniaceae	**Erodium cicutarium*
Primulaceae	**Lysimachia arvensis*
Fabaceae	**Medicago minima*
Asteraceae	**Monoculus monstrosus*
Oxalidaceae	**Oxalis corniculata*
Lamiaceae	**Salvia verbenaca*

5.2.3 Unidentified flora

A total of 18 taxa recorded in the study area could not be identified to species level, in most instances due to insufficient taxonomic characters as plants were sterile (lacking reproductive structures; Table 5-6).

Table 5-6 Unidentified flora taxa recorded during the field survey

Unidentified taxon	Comments
Atriplex ?nana	Sterile
Atriplex ?vesicaria	Sterile
Calandrinia ?quartzitica	Immature seeds
Cassytha ?nodiflora	Sterile
Euphorbia ?philochalix	Sterile
Frankenia ?interioris	Sterile
Grevillea ?oncogyne	Sterile
Maireana ?amoena	Sterile
Maireana ?georgei	Sterile
Maireana sp.	Sterile
Maireana tomentosa ?subsp. tomentosa	Sterile
Olearia ?ciliata	Sterile
Roycea ?divaricata	Sterile
Sclerolaena ?brevifolia	Sterile

Unidentified taxon	Comments
Senna ?*stowardii*	Sterile
Tecticornia sp. (sterile 1)	Sterile
Tecticornia sp. (sterile 2)	Sterile
Thysanotus ?*manglesianus*	Sterile

5.2.4 Vegetation types

Nineteen (19) vegetation types were defined for the study area based on statistical analyses (Figure 5-8; Figure 5-9). The vegetation comprised (Figure 5-10; Table 5-7):

- nine *Tecticornia* spp. shrublands
- one chenopod shrubland
- two shrublands
- seven woodlands.

One *Tecticornia* spp. shrubland (MhTiDc) that occurred on undulating sandy plain adjacent a salt lake was clearly distinguishable and was mapped as a distinct vegetation type. All remaining *Tecticornia* shrublands occurred on salt lake playa and it was not possible from aerial imagery or in the field to readily distinguish boundaries between the different vegetation types defined from the statistical analysis. These were therefore mapped as a single mosaic.

A small section of the study area (15.47 ha, 1.32%) comprised a salt lake playa that was inundated at the time of the surveys and was naturally devoid of vegetation. There were a number of areas recently cleared of vegetation from exploration activities.

The woodland vegetation types were the most dominant covering 1,026.13 ha and accounting for 88.71% of the vegetation in the study area (Table 5-8). A chenopod shrubland CsAvDc was the next most prevalent (4.08%) followed by shrublands (3.88%) and *Tecticornia* spp. shrublands (3.34%) (Table 5-8).

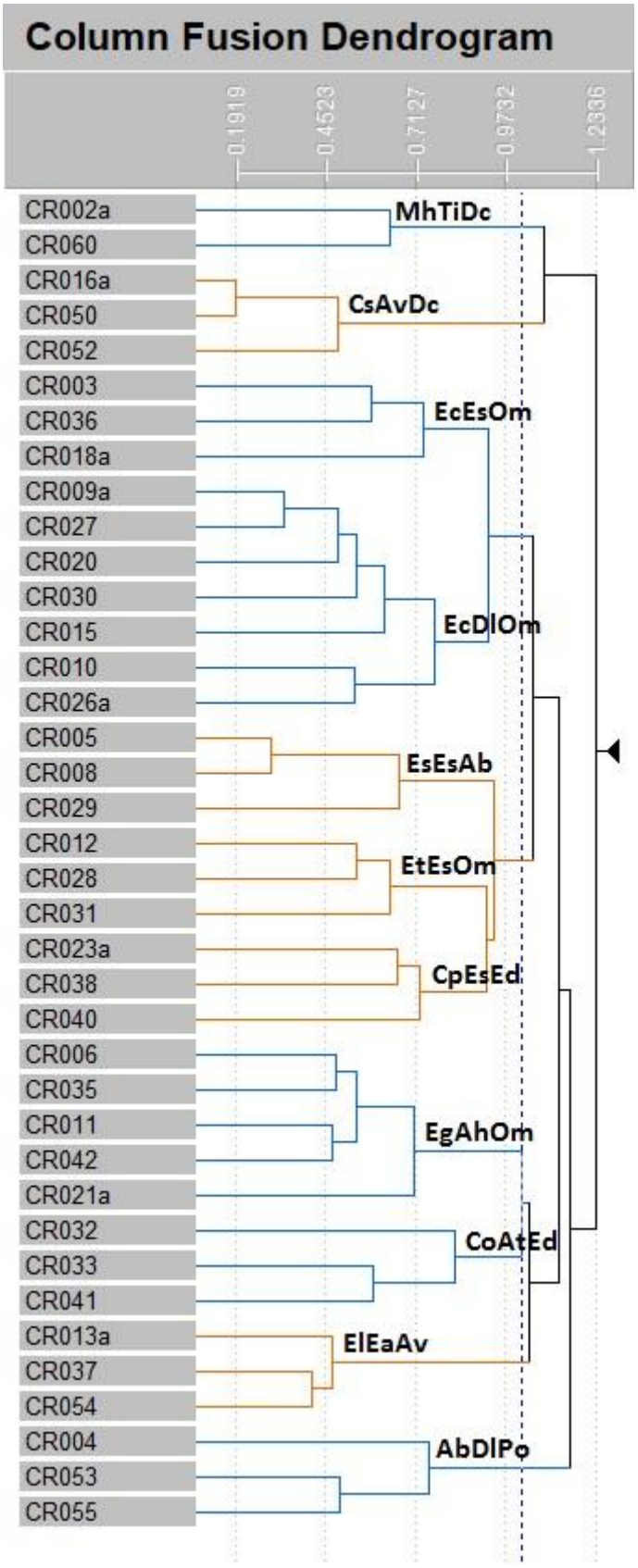

Figure 5-8 Vegetation types delineated from the dendrogram of 20 m x 20 m quadrats

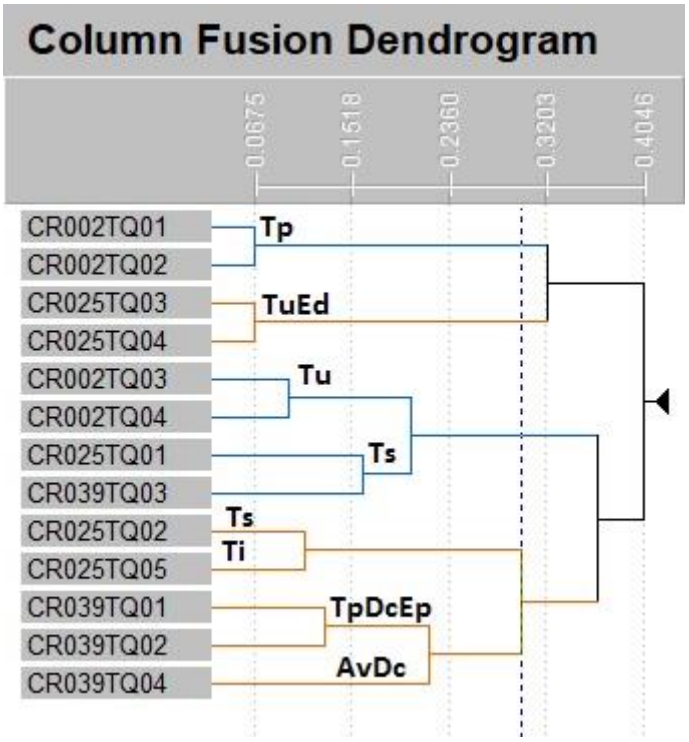

Figure 5-9 **Vegetation types delineated from the dendrogram of 3 m x 3 m quadrats from transect surveys**

PERTH

Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
Date	08-Feb-19
Drawn by	IH
Map author	GW, RE

0 0.75 1.5 3
Kilometres

1:100,000 (at A4) GDA 1994 MGA Zone 50

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Mungari Gold Operations

Vegetation type

- AbDlPo
- Cleared
- CoAtEd
- CpEsEd
- CsAvDc
- EcDlOm
- EcEsOm
- EgAhOm
- ElEaAv
- EsEsAb
- EtEsOm
- Lake
- MhTiDc
- *Tecticornia* spp. shrubland

Figure 5-10

Vegetation types mapped in the study area

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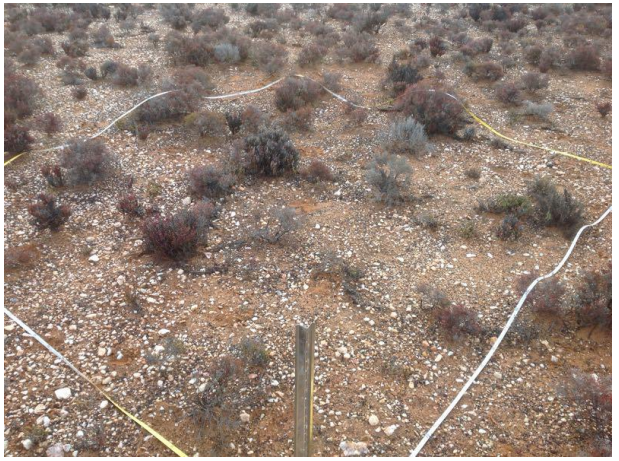
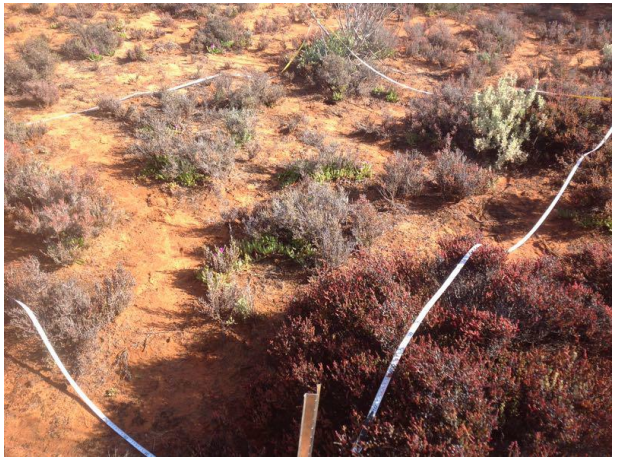
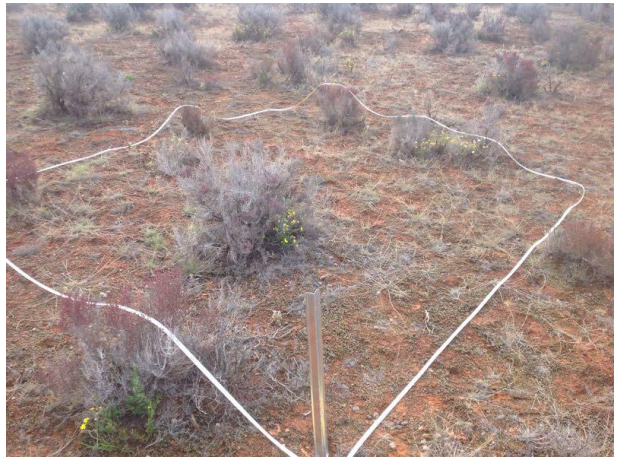
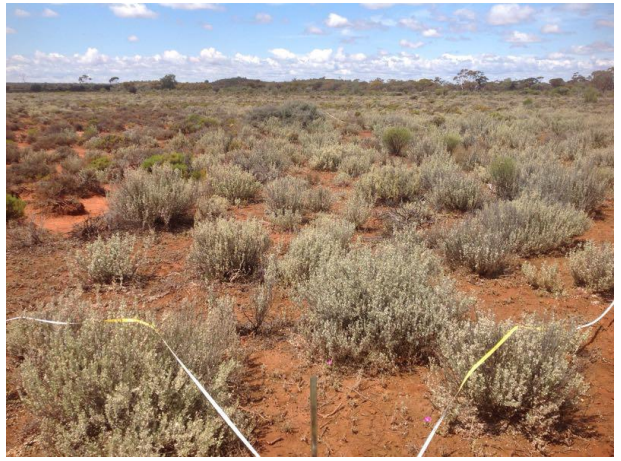
Table 5-7 Vegetation types recorded in the study area

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Tecticornia spp. shrubland	MhTiDc	CR002a, CR060	Isolated tall *Melaleuca halmatororum and Grevillea sarissa* subsp. *sarissa* shrubs over low *Tecticornia indica* subsp. *bidens*, *T. doliiformis* and *T. pruinosa* chenopod shrubland over isolated low *Disphyma crassifolium*, *Calandrinia* ?*quartzitica* and *Sclerolaena* spp. forbs.	
Tecticornia spp. shrubland	Tp	CR002TQ01, CR002TQ02	Isolated low shrubs to low *Tecticornia pergranulata* subsp. *pergranulata* and *T. doliiformis* chenopod shrubland.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Tecticornia spp. shrubland	TuEd	CR025TQ03, CR025TQ04	Low *Tecticornia undulata*, *Atriplex lindleyi* subsp. *inflata* and *Frankenia irregularis* shrubland over low isolated *Eragrostis dielsii* grasses.	
Tecticornia spp. shrubland	Tu	CR002TQ03, CR002TQ04	Low *Tecticornia undulata*, *T.* sp. Denny's Crossing and *T. doliiformis* chenopod shrubland.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Tecticornia spp. shrubland	Ts	CR039TQ03	Low *Tecticornia* sp. Denny's crossing shrubland over low sparse *Disphyma crassifolium* and *Surreya diandra* forbland over isolated low *Eragrostis dielsii* grasses.	
Tecticornia spp. shrubland	Ti	CR025TQ01	Low *Tecticornia indica* subsp. *bidens*, *T*. sp. Denny's crossing and *Atriplex* ?*vesicaria* shrubland over isolated *Disphyma crassifolium*, *Erodium cicutarium* and *Surreya diandra* forbs and low isolated clumps of *Eragrostis dielsii* grasses.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Tecticornia spp. shrubland	Td	CR025TQ02, CR025TQ05	Low *Tecticornia doliiformis* shrubland over isolated clumps of low *Disphyma crassifolium*, *Heliotropium curassavicum* and *Senecio pinnatifolius* var. *pinnatifolius* forbs and isolated clumps of low *Eragrostis dielsii* grasses.	
Tecticornia spp. shrubland	TpDcEp	CR039TQ01, CR039TQ02	Low *Tecticornia pruinosa* chenopod shrubland over *Disphyma crassifolium*, *Surreya diandra* and *Senecio pinnatifolius* var. *pinnatifolius* forbs over low open *Eragrostis dielsii* and *E. pergracilis* grassland.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Tecticornia spp. shrubland	AvDc	CR039TQ04	Low open *Atriplex vesicaria*, *Gunniopsis quadrifida* and *Tecticornia disarticulata* shrubland over isolated clumps of low *Disphyma crassifolium*, *Surreya diandra* and *Asteridea chaetopoda* forbs.	
Low chenopod shrubland	CsAvDc	CR016a, CR050, CR052	Isolated mid *Cratystylis subspinescens*, *Pimelea microcephala* and *Senna artemisioides* subsp. *filifolia* shrubs over low *Atriplex vesicaria*, *Tecticornia* sp. (sterile 1) and *Roycea divaricata* shrubland over isolated low *Disphyma crassifolium*, *Brachyscome ciliaris* and *Vittadinia dissecta* var. *hirta* forbs.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Shrubland	AbDlPo	CR004, CR053, CR055	Tall *Acacia burkittii* shrubland over sparse to open mid *Dodonaea lobulata*, *Acacia tetragonophylla* and *Eremophila oldfieldii* shrubland over isolated low *Ptilotus obovatus*, *Scaevola spinescens* and *Olearia pimelioides* shrubs.	
Shrubland	CpEsEd	CR023a, CR038, CR040	Isolated low *Casuarina pauper* trees over mid open *Eremophila scoparia*, *Dodonaea viscosa* and *Rhagodia drummondii* shrubland over isolated low shrubs to low open *Eremophila decipiens* subsp. *decipiens*, *Ptilotus obovatus* and *Enchylaena tomentosa* shrubland.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Woodland	EcEsOm	CR003, CR036, CR018a	Mid *Eucalyptus clelandiorum* and *E. oleosa* subsp. *oleosa* woodland over isolated mid *Eremophila scoparia*, *Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* shrubs to open shrubland over isolated low *Olearia muelleri*, *Ptilotus obovatus* and *Westringia rigida* shrubs to low pen shrubland.	
Woodland	EcDlOm	CR009a, CR027, CR020, CR030, CR015, CR010, CR026a	Mid *Eucalyptus clelandiorum* woodland with other *Eucalyptus* trees, frequently *E. celastroides* subsp. *celastroides* or *E. griffithsii,* over isolated shrubs to mid open *Dodonaea lobulata*, *Eremophila scoparia* and *Exocarpos aphyllus* shrubland over isolated low to sparse *Olearia muelleri, Ptilotus obovatus* and *Westringia rigida* shrubland.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Woodland	EsEsAb	CR005, CR008, CR029	Mid *Eucalyptus salmonophloia* and *E. salubris* woodland over mid *Eremophila scoparia*, *Senna artemisioides* subsp. *filifolia* and *Exocarpos aphyllus* shrubland over low open *Atriplex bunburyana*, *Maireana trichoptera* and *Ptilotus obovatus* shrubland.	
Woodland	EtEsOm	CR012, CR028, CR031	Mid *Eucalyptus transcontinentalis* woodland with other *Eucalyptus* trees frequently *E. clelandiorum* and *E. salubris* over mid open *Atriplex nummularia*, *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Olearia muelleri*, *Eremophila parvifolia* subsp. *auricampa* and *Ptilotus obovatus* shrubs.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Woodland	CoAtEd	CR032, CR033, CR041	Low to mid *Casuarina obesa* and *Eucalyptus griffithsii* woodland over mid to tall open *Acacia tetragonophylla*, *Exocarpos aphyllus* and *Cratystylis subspinescens* shrubland over isolated low *Eremophila decipiens* subsp. *decipiens*, *Grevillea acuaria* and *Rhagodia drummondii* shrubs.	
Woodland	ElEaAv	CR013a, CR037, CR054	Mid *Eucalyptus longicornis* woodland with *E. clelandiorum* and *E. griffithsii* trees over mid to tall open *Exocarpos aphyllus*, *Eremophila glabra* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Atriplex vesicaria*, *Ptilotus obovatus* and *Rhagodia drummondii* shrubs.	

Vegetation type	Vegetation code	Survey sites (quadrats)	Vegetation description	Photograph
Woodland	EgAhOm	CR006, CR035, CR011, CR042, CR021a	Mid *Eucalyptus griffithsii* woodland with other *Eucalyptus* trees including *E. oleosa* subsp. *oleosa* and *E. longicornis* over isolated shrubs to mid open *Acacia hemiteles, Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Olearia muelleri*, *Scaevola spinescens* and *Westringia rigida* shrubs.	

Table 5-8 Extent of each vegetation type/feature in the study area

Vegetation type	Extent in study area (ha)	% of study area	% of vegetation in study area
AbDlPo	13.07	1.11	1.13
Cleared	4.29	0.37	-
CoAtEd	76.59	6.51	6.62
CpEsEd	31.80	2.70	2.75
CsAvDc	47.20	4.01	4.08
EcDlOm	254.92	21.67	22.04
EcEsOm	88.06	7.49	7.61
EgAhOm	54.05	4.59	4.67
ElEaAv	212.43	18.06	18.36
EsEsAb	269.91	22.94	23.33
EtEsOm	70.18	5.97	6.07
Lake	15.47	1.32	-
MhTiDc	26.90	2.29	2.33
Tecticornia spp shrublands	11.63	0.99	1.01
Total	**1176.50**	**100**	**100**

5.2.5 Vegetation condition

The condition of vegetation in the study area ranged from Completely Degraded to Pristine (Table 5-9, Figure 5-11). Areas naturally devoid of vegetation in the study area (1.32%) were assigned Not Applicable (N/A) condition rating.

The majority of the vegetation in the study area (86.69%) was recorded to be in Excellent to Pristine condition. A small proportion of the study area (0.37%) was recorded to be Completely Degraded, i.e. these areas had been cleared and were virtually devoid of any native vegetation. The remaining 12.94% of the study area was in Good to Very Good condition with disturbance primarily in the form of weed infestations, grazing damage from livestock, vehicle tracks and historic clearing.

Table 5-9 Extent of vegetation condition in the study area

Condition rating	Extent in study area (ha)	% of study area
Not Applicable (Lake)	15.47	1.32
Completely Degraded (Cleared)	4.29	0.37
Good	4.15	0.35
Very Good	132.64	11.27
Excellent	205.31	17.45
Pristine	814.64	69.24
Total	**1,176.50**	**100**

Evolution Mining Ltd
Mungari Operations - Cutters Ridge

Project No	1204
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Map author	GW, RE

0 0.75 1.5 3
Kilometres

1:100,000 (at A4) GDA 1994 MGA Zone 50

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Mungari Gold Operations

Vegetation condition
- Pristine
- Excellent
- Very good
- Good
- Completely Degraded
- N/A

Figure 5-11

Vegetation condition mapped in the study area

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5.2.6 Significant vegetation

No listed TEC or PEC was returned from the database searches in the desktop assessment and none of the vegetation types defined for the study area were considered to resemble any listed TEC or PEC.

Vegetation types that contained significant flora were considered significant vegetation as they represent a refuge for the significant species:

- EcDlOm – *Allocasuarina eriochlamys* subsp. *grossa* (P3)
- AbDlPo – *Austrostipa blackii* (P3)
- CsAvDc – *Calandrinia* sp. Gypsum (F. Obbens & L. Hancock FO 10/14) (range extension)
- EtEsOm – *Eremophila praecox* (P1)
- MhTiDc – *Calandrinia* ?*quartzitica*/*Calandrinia* ?*lefroyensis* (P1).

Combined, the *Tecticornia* spp. shrublands mapped as a mosaic represented just over 1% of vegetation in the study area indicating that the individual vegetation types would comprise less than 1% of the study area and therefore may be considered significant due to restricted distribution. Similarly vegetation type AbDlOm represented just over 1% of the vegetation and may be considered significant vegetation due to restricted distribution.

5.3 SURVEY LIMITATIONS

The limitations of the survey have been considered (Table 5-10) in accordance with EPA technical guidance (EPA 2016c).

Table 5-10 Survey limitations

Limitations	Limitation for this survey?	Comments
Availability of adequate contextual information at a regional and local scale	Yes	There is a lack of information pertaining to the regional values of vegetation in the bioregion. However, several prior flora and vegetation surveys conducted within the immediate vicinity (some overlapping) the current study area provided adequate information on a local scale.
Competency/experience of survey personnel, including taxonomy	No	The lead botanist for the field surveys, Dr Grant Wells, has in excess of 20 years experience conducting surveys in the Goldfields. Taxonomic specialists, Dr Kelly Shepherd (*Tecticornia*) and Frank Obbens (*Calandrinia*) were engaged and all Priority flora specimens were lodged with the WA Herbarium.
Proportion of flora recorded and/or collected, any identification issues	Yes	A proportion of the specimens recorded in survey quadrats could not be definitively identified to species level and, as some areas were only surveyed in the spring season, autumn annual species may not have been present.
Was the appropriate area fully surveyed (effort and extent)	Yes	Changes to the study area between survey events resulted in some areas only being surveyed once during the spring season. It is therefore possible annual species that occur in autumn were not recorded during the survey. Searches for significant flora were not exhaustive and some areas of suitable habitat were not thoroughly foot searched for significant flora.
Access restrictions	Yes	Some sections of the road corridor were inaccessible and vegetation boundaries are extrapolated from aerial imagery.
Timing, rainfall, season	Possible	Rainfall in the months prior to both seasonal surveys was below average and it is possible that the number of annual species present may be lower than in seasons with higher rainfall events.
Disturbances which affected the results of the survey	No	There were not recent disturbances, such as fire, that may have affected the results of the survey.

6 DISCUSSION

6.1 FLORA AND VEGETATION

6.1.1 Flora assemblage

The number of species recorded in the current survey was higher than for the previous surveys reviewed in the desktop assessment (Table 6-1). The current survey also recorded a similar diversity based on average number of species per unit area (between 0.1 and 0.2 species per ha) to the previous surveys, aside from Outback Ecology (2003), which was considerably higher with nearly 1 species per ha The higher number of species per unit area from Outback Ecology (2003) may be because it was a linear corridor for a pipeline and intersected a higher number of vegetation types.

Table 6-1 Comparison of floristic data from the current survey with previous surveys

Survey	Area (ha)	Survey effort	No. vegetation types	No. of identified species	No. of families	No. of genera	No. of weeds
Native Vegetation Solutions (2017)	932	30 quadrats, 2 season	12	130	29	75	3
Botanica Consulting (2010)	820	16 quadrats, 2 season	4	82	22	42	0
Outback Ecology (2003)	85		26	76	20	30	1
Mattiske Consulting (2002)	1,050		19	120	30	53	2
Current survey	1,176.45		19	215	36	81	7

The current survey recorded all prominent families identified in previous surveys and these were similar throughout all flora and vegetation assessments (Table 6-2).

Table 6-2 Dominant plant families recorded in the current survey and previous surveys

Family	Current survey	Native Vegetation Solutions (2017)	Botanica Consulting (2010)	Outback Ecology (2003)	Mattiske Consulting (2002)
Chenopodiaceae	56	29	22	12	26
Asteraceae	17	19	4	5	9
Poaceae	12	11	3	1	6
Scrophulariaceae	19	10	11	-	-
Fabaceae	20	9	9	11	9
Myrtaceae	18	9	13	14	14

Total number of species	215	130	82	76	120
% dominant families	66.0	66.9	75.6	56.6	53.3

6.1.2 Significant flora

Three of the 48 significant flora identified from the desktop review, *Eremophila praecox* (P1), *Allocasuarina eriochlamys* subsp. *grossa* (P3) and *Austrostipa blackii* (P3), were recorded in the study area. The fourth Priority species, which is either *Calandrinia* ?*quartzitica* or *Calandrinia* ?*lefroyensis* (P1), was not identified through the desktop review; the record from the survey represents a range extension for either species. Following identification of habitats in the study area from the field surveys, assessment of the likelihood of occurrence of the significant flora determined a further six to be possibly present, with the remaining 39 species considered unlikely to be present.

The two records for *Eremophila praecox* (P1) represent 11.8% of the records for the species as recorded in ALA (2019). It is not possible to determine what proportion of the entire population of *E. praecox* the three plants recorded in the study area represent as there is no population size recorded for the majority of records.

The record for *Allocasuarina eriochlamys* subsp. *grossa* (P3) represents 1.5% of records for the species as recorded in ALA (2019). The 165 individuals recorded in the study area are likely to represent less than 10% of the total population recorded for the species as some records provide an estimate of population sizes in the thousands.

The record for *Austrostipa blackii* represents 2.12% of the records for the species as recorded in ALA (2019). It is not possible to determine what proportion this represents of the entire population as population size within the study area was not determined and there is no population size recorded for the majority of known records.

The record for *Calandrinia* ?*quartzitica*/*Calandrinia* ?*lefroyensis* (P1) would represent 10% of records for *C. quartzitica* and 16.7% of records for *C. lefroyensis* as recorded in ALA (2019). It is not possible to determine what proportion of the entire population these would represent as population size within the study area was not determined and there is no population size recorded for the majority of records for either Priority Flora.

With the exception to the *Calandrinia* specimen, none of the specimens that could not be identified to species level were considered likely to represent any listed significant flora:

- the *Atriplex* specimens were both perennial shrubs and did not resemble *A. lindleyi* subsp. *conduplicata* (P3) which is the only significant *Atriplex* species recorded for the Eastern Goldfields subregion that is herbaceous (DBCA 2019)
- the *Frankenia* specimen was recorded in low chenopod shrubland and did not resemble either *F. georgei* (P1) recorded on rocky hills, or the low prostrate *Frankenia glomerata* (P4) which are the only significant *Frankenia* species recorded for the Eastern Goldfields subregion (DBCA 2019)
- the plant habit and leaves of the *Grevillea* specimen were not commensurate with any of the three significant *Grevillea* spp. recorded for the Eastern Goldfields subregion, *G. georgeana* (P3), *G. phillipsiana* (P1) and *G. secunda* (P4)
- the *Thysanotus* specimen was a trailing climbing plant and not commensurate with the caespitose (grass-like) habit of *T. brachyantherus* (P2) which is the only significant *Thysanotus* species recorded for the Eastern Goldfields subregion (DBCA 2019)

- the *Tecticornia* specimens were erect shrubs recorded on undulating plain and hillslopes and the habit and habitat were not commensurate with the low spreading shrubs of *T. flabelliformis* (P1) and *T. mellarium* (P1) which are largely restricted to the margins and playa of salt lakes and are the only two significant *Tecticornia* species recorded for the Eastern Goldfields subregion (DBCA 2019); both Priority species are well known to the lead botanist on the current survey, Dr Grant Wells, who has made several recent collections of both species
- there are no listed significant *Cassytha*, *Euphorbia*, *Maireana*, *Olearia*, *Roycea*, *Sclerolaena* or *Senna* species in the Eastern Goldfields subregion (DBCA 2019).

6.1.3 Vegetation

Each of the vegetation types defined for the current survey align with one or more vegetation types recorded in previous surveys indicating a broader distribution outside the study area:

- the *Tecticornia* ssp. shrublands (including MhTiDc) align with Association 221, succulent steppe, saltbush of Shepherd *et al.* (2002), the chenopod shrublands (community 4a-4e) of Mattiske Consulting (2002) and the *Tecticornia* shrubland of Native Vegetation Solutions (2017)
- the chenopod shrubland (CsAvDc) aligns with Association 221, succulent steppe, saltbush of Shepherd *et al.* (2002), the mixed shrubland (2e) of Mattiske Consulting (2002) and the chenopod shrubland (4b) of Outback Ecology (2003)
- the AbDlPo shrubland aligns with the scrubland (2b) of Outback Ecology (2006)
- the CpEsEd shrubland aligns with the *Casuarina* shrubland (5a) of Mattiske Consulting (2002), the *Casuarina* woodland of Botanica Consulting (2010) and the *Casuarina pauper* over sclerophyll shrubland of Native Vegetation Solutions (2017)
- the *Eucalyptus* woodlands align broadly with Associations 468 and 540 of Shepherd *et al.* (2002), woodlands 1a, 1b, 1d, 1g, 1k and 1l of Mattiske Consulting (2002) and the mixed *Eucalyptus* woodlands over sclerophyll shrublands, *Eucalyptus griffithsii* woodland over sclerophyll shrubland and *Eucalyptus* woodland over hummock spinifex vegetation types of Native Vegetation Solutions (2017).

None of the vegetation types represented a listed TEC or PEC. Five vegetation types defined for the study area EcDlOm, AbDlPo, CsAvDc, -EtEsOm and MhTiDc, were considered significant vegetation as they represent a refuge for significant flora species.

The *Tecticornia* spp. shrublands mapped as a mosaic had a limited distribution in the study area; however, a large proportion of these vegetation types were recorded in the haul road corridor which intercepted only a small portion of the overall distribution of these vegetation types.

The shrubland AbDlPo had a limited distribution within the study area but did align with vegetation type ‘scrubland (2b)’ recorded by Outback Ecology (2006) indicating a broader distribution in the surrounding area. This vegetation type was restricted to the crests and slopes of low rocky hills and similar habitat outside of the study area may be targeted to identify the broader distribution of this vegetation type should it become apparent that a high proportion within the study area will be impacted.

All other vegetation types defined for the study area had distributions that extended out of the study area and aligned with vegetation types from other studies indicating a broader distribution in the surrounding area.

6.1.4 Commentary against the 10 clearing principles – Cutters Ridge Mine and haul road from Mungari to Cutters Ridge

A preliminary assessment has been conducted against the 10 clearing principles to support a native vegetation clearing permit application for the proposed Cutters Ridge Mine and a haul road between Mungari and Cutters Ridge (Table 6-3). The indicative disturbance footprint (IDF) is shown in Figure 6-1.

The preliminary assessment has considered whether the proposed clearing within the IDF has potential to be at variance with any of the clearing principles in accordance with *A guide to the assessment of applications to clear native vegetation, under Part V Division 2 of the Environmental Protection Act 1986* (DER 2014). It is noted that this assessment has been based on the information available in this report, the terrestrial fauna survey report (Phoenix 2019) and the physical extent of the IDF. A detailed impact assessment was beyond the scope of this report and limited information was available on which to assess potential for variance against principle G, I and J. Further consideration of these principles may therefore be required.

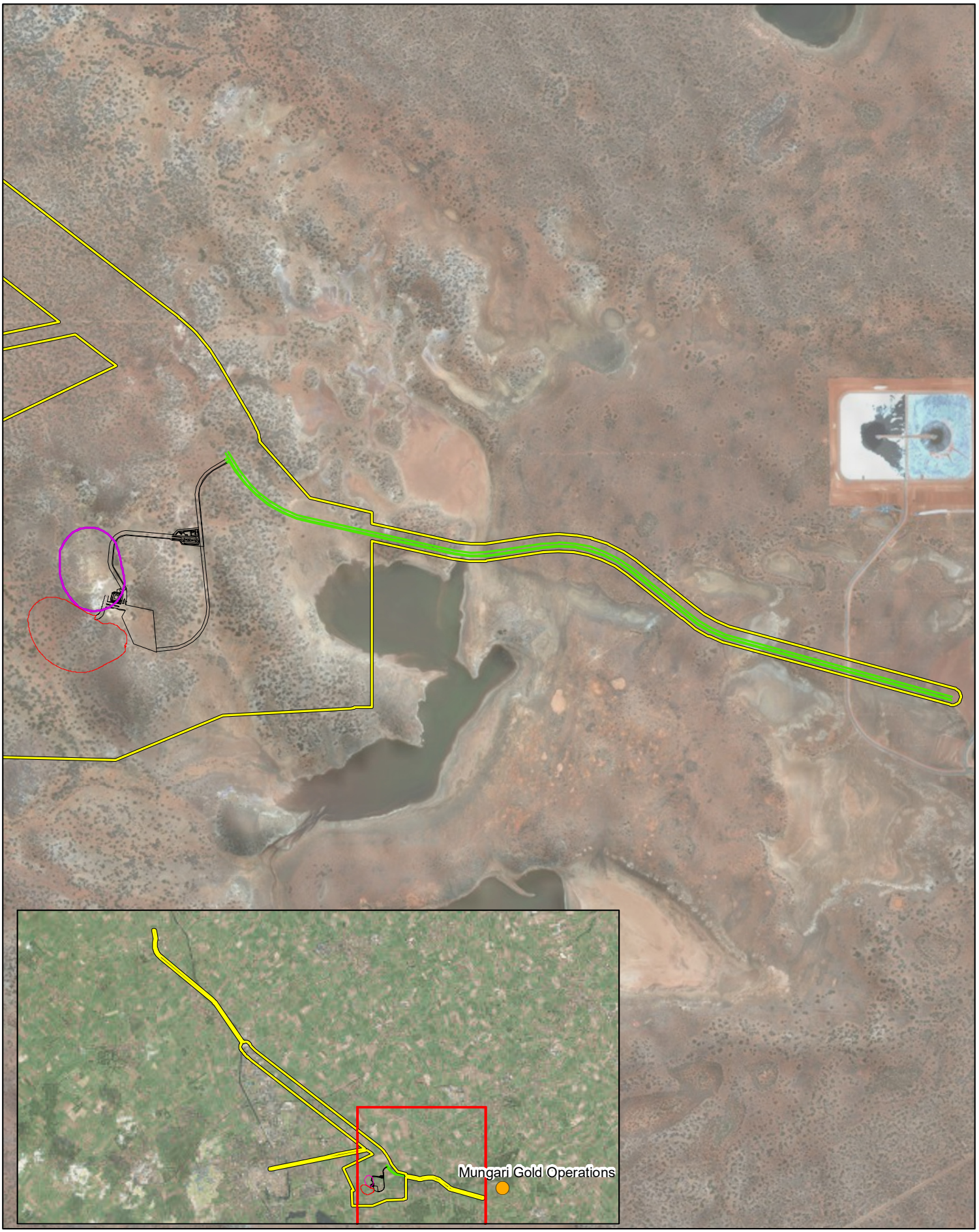
Table 6-3 Commentary against the clearing principles for proposed clearing for Cutters Ridge Mine and haul road from Mungari to Cutters Ridge

Principle	Statement against principle
A) Native vegetation should not be cleared if it comprises a high level of biological diversity	**Potential for variance with Principle A: unlikely** Vegetation in the IDF does not contain particularly high species diversity. The IDF is not located within a recognised biodiversity hotspot. Diversity recorded in the study area during the current survey was comparable to that of previous surveys within the locality. High biodiversity values are recognised in the Eastern Goldfields IBRA subregion, including *Eucalyptus* Woodlands (high diversity of *Eucalyptus* species), high diversity in *Acacia* species and ephemeral flora communities of tertiary sandplain shrublands and valley floor woodlands (Cowan 2001). The study area is not representative of any of these high biodiversity areas; diversity of *Acacia* species and *Eucalyptus* species recorded within the study area was relatively low (13 and 15 species respectively) in comparison to numbers of species identified in the desktop review (54 and 55 species respectively). Nine vegetation types were recorded within the IDF: • AbDlPo – Tall Acacia *burkittii shrubland* over sparse to open mid *Dodonaea lobultata* shrubland over isolated low *Ptilotus obovatus* shrubs • CpEsEd – Isolated low *Casuarina pauper* trees over mid open *Eremophila scoparia* shrubland over isolated low shrubs to low *open Eremophila decipiens* subsp. *decipiens* shrubland • CsAvDc – Isolated mid *Cratystylis subspinescens* shrubs over low *Atriplex vesicaria* shrubland over isolated low *Disphyma crassifolium* forbs • EcDlOm – Mid *Eucalyptus clelandiorum* woodland over isolated shrubs to mid open *Dodonaea lobulata* shrubland over isolated low to sparse *Olearia muelleri* shrubland • EcEsOm – Mid *Eucalyptus clelandiorum* woodland over isolated mid *Eremophila scoparia* shrubs to open shrubland over isolated low *Olearia muelleri* shrubland

Principle	Statement against principle
	• ElEaAv – Mid *Eucalyptus longicornis* woodland over mid to tall open *Exocarpos aphyllus* shrubland over isolated low *Atriplex vesicaria* shrubs • EsEsAb – Mid *Eucalyptus salmonophloia* woodland over *mid Eremophila scoparia* shrubland over low open *Atriplex bunburyana* shrubland • MhTiDc – Isolated tall *Melaleuca halmatororum* shrubs over low *Tecticornia indica* subsp. *bidens* chenopod shrubland over isolated low *Disphyma crassifolium* forbs • Tecticornias – Mosaic of *Tecticornia* spp. None of these are restricted to the IDF, all are well represented in the wider study area and all were determined to align with vegetation types mapped in previous surveys in the locality indicating a broader distribution outside the study area. The vegetation within the IDF does not comprise any PECs. Vegetation within the IDF may support Priority flora; however, no plants of any Priority flora have been recorded within the IDF: • Vegetation type MhTiDc within the study area supports a population of *C.* ?*quartzitica* (P1) or *C.* ?*lefroyensis* (P1). Specimens were recorded in close proximity (~30 m) to the IDF. *C.* ?*quartzitica* or *C.* ?*lefroyensis* from the study area may be considered a significant population of Priority flora as either record would represent a range extension for the species. Both species are known from multiple salt lakes. Additional plants likely to occur in MhTiDc; however, only a very small proportion of the total mapped extent of MhTiDc intersects the IDF. • Vegetation type AbDlPo within the study area supports a population of *Austrostipa* blackii (P3). The species was recorded ~190 m from the IDF. *A. blackii* is a widely distributed species known from three bioregions (Avon Wheatbelt, Coolgardie and Yalgoo bioregions) and 46 records in ALA (2019). Additional plants likely to occur in AbDlPo; however, only a very small proportion of the total mapped extent of MhTiDc intersects the IDF. • Vegetation type EcDlOm within the study area supports a population of *Allocasuarina eriochlamys* subsp. *grossa* (P3). The species was recorded ~620 m from the IDF. *A. e.* subsp. *grossa* is known from two bioregions and 64 records in ALA (2019). Only a small proportion of EcDlOm intersects the IDF.
B) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	**Potential for variance with Principle B: unlikely** The IDF contains three broad fauna habitats: open eucalypt woodland, shrubland and chenopod shrubland all of which are well represented outside the IDF in the wider study area and more broadly across parts of the Eastern Goldfields subregion. The IDF contains suitable habitat for 16 significant fauna species. Twelve of these are EPBC Act and BC Act listed Migratory shorebirds (Oriental Pratincole, Common Sandpiper, Sharp-tailed Sandpiper, Sanderling, Curlew Sandpiper, Pectoral Sandpiper, Red-necked Stint, Long-toed Stint, Grey-tailed Tattler, Grey-tailed Tattler, Common Greenshank and Glossy Ibis) that may utilize the chenopod shrubland and adjacent saltlake habitat (present in the study area but not the IDF) for feeding intermittently during inundation events. Similarly,

Principle	Statement against principle
	the Hooded Plover (P4) may also feed in the chenopod shrubland habitat on occasion during periods of inundation. The chenopod shrubland within the IDF is not considered significant habitat for any of the twelve Migratory shorebirds or the Hooded Plover. The proposed haul road intersects a very small proportion of the mapped extent of chenopod shrubland. The chenopod shrubland and saltlake habitats of the study area were considered unlikely to represent significant habitat for migratory shorebirds due to limited extent of potential roosting habitat. In addition, the saltlake present in the study area is part of a series of regional saltlakes that include the 33 km^2 White Flag Lake, 13 km to the north. Similar feeding habitat is likely to be extensive within this lake system during inundation events. The chenopod shrubland within the IDF is likely to represent marginal feeding habitat for shorebirds during inundation events in comparison to the saltlake proper and, more significantly, the expansive White Flag Lake. *Leipoa ocellata* Malleefowl (VU EBPC Act, BC Act) was recorded in open eucalypt woodland in the study area, outside the IDF. The habitat of the IDF is considered suitable for foraging by the species but less suitable for nesting due to patchiness of vegetation cover. The open eucalypt woodland and shrubland habitats of the IDF may be significant habitat for Malleefowl if the species is found to be nesting in the vicinity and utilising the study area as important foraging habitat. However, the open eucalypt woodland and shrubland habitats are well represented outside the IDF in the wider study area and more broadly across parts of the Eastern Goldfields subregion. Only a small proportion of the mapped extent of each occurs within the IDF. The two remaining significant species that may occur within the IDF, Peregrine Falcon (SP BC Act) and Fork-tailed Swift (Mig. EPBC Act, BC Act), inhabit a broad range of habitats and may occur only occasionally to forage in the study area. The habitats of the study area are not considered significant habitats for these species.
C) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	**Potential for variance with Principle C: unlikely** No Threatened flora species were recorded in the Study Area during the flora and vegetation survey. Two Threatened flora were identified in the desktop review, *Gastrolobium graniticum* (EN EPBC Act, VU BC Act) and *Thelymitra stellata* (EN EPBC Act, BC Act); both are considered likely to occur in the IDF or wider study area.
D) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC)	**Potential for variance with Principle D: unlikely** No TEC was recorded within the IDF or wider study area during the survey. No TECs listed under the EPBC Act or BC Act were returned in the DBCA Threatened and Priority Ecological Community database search results in the desktop review.
E) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has extensively cleared	**Potential for variance with Principle E: unlikely** The IDF does not occur in an area that has been extensively cleared. The broad vegetation associations mapped by Beard for the IDF (Shepherd *et al.* 2002) – association 9 (Medium woodland; coral gum (*Eucalyptus torquata*) & goldfields blackbutt (E. *le soufii*)), 540 (Succulent steppe with open low woodland; sheoak over saltbush) and 468 (Medium woodland; salmon gum &

Principle	Statement against principle
	goldfields blackbutt) – all have over have over 95% remaining at the bioregional and subregional scales based on DBCA (2018a).
F) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse of wetland	**Potential for variance with Principle F: possible** The IDF contains two vegetation types that are growing in association with a saltlake: • MhTiDc – Isolated tall *Melaleuca halmatororum* shrubs over low *Tecticornia indica* subsp. *bidens* chenopod shrubland over isolated low *Disphyma crassifolium* forbs • Tecticornias – Mosaic of *Tecticornia* spp. The saltlake is not listed as a significant wetland under any formal listings (for example RAMSAR, Directory of Important Wetlands, Conservation Category wetlands). Only minor clearing of these vegetation types is proposed and is unlikely to cause significant impact to the vegetation types or the wetland. Possible minor, localised erosion or water quality decline may occur from the proposed clearing. Measures should be implemented to minimise impacts to the salt lake system.
G) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	**Potential for variance with Principle G: unlikely** The potential for land degradation from arising from vegetation clearing includes wind and soil Proposed clearing within the IDF is unlikely to result in appreciable land degradation. Minor localised wind erosion may occur, particularly in and around the saltlake; this can be mitigated through implementation of appropriate management measures during construction and operation.
H) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	**Potential for variance with Principle H: unlikely** The IDF is not situated within or adjacent to any conservation reserves.
I) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	**Potential for variance with Principle I: unlikely** Other than the saltlake, no surface water systems are present within or in the vicinity of the IDF. Clearing is considered unlikely to cause any deterioration in surface water quality other than possibly very minor, localised impacts where the IDF intersects the saltlake and adjacent vegetation. The IDF is located within the Goldfields Groundwater Area, as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Clearing within the IDF is unlikely to cause major deterioration in groundwater quality, although very minor, localised impacts may occur temporarily during clearing.
J) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	**Potential for variance with Principle J: unlikely** The IDF intersects part of a saltlake and associated vegetation communities which are naturally prone to periodic inundation. Clearing within the IDF is unlikely to exacerbate the incidence of flooding, although there may be some minor shifts in inundation patterns.



Evolution Mining Ltd - Biological survey for Mungari Gold Operations Cutters Ridge Project

Project No	1254
Date	5/15/2019
Drawn by	IH
Map author	GW, RE

0 0.275 0.55 1.1

Kilometres

1:32,000 (at A4) GDA 1994 MGA Zone 51

\\PHOENIXSERVER\Office-Server\GIS\Projects\SIGM\1228-SI-SI-ECO\Mapping\MapDocuments\Figures\1254_6-1_Indicative disturbance footprint.mxd

Study area

cut_190314_wd_top385rl-toe_only

cutr_181212_v06_safety-bund_poly

cutr_layout_190327_site_layout

road_mungari_to_cutr_170310

Figure 6-1

Indicative disturbance footprint for Cutters Ridge mine and haul road

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Appendix 1 Flora survey site descriptions

Site details			
Site:	CR002a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	09 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.768105, 121.196957 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	25	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	5	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sand, sandy loam,
Grass cover (%):	0.1	**Rock type:**	quartz;
Herb cover (%):	0.2	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated tall *Grevillea sarissa* subsp. *sarissa* and *Melaleuca halmaturorum* shrubs over low *Tecticornia indica* subsp *bidens*, *T*. sp. Dennys Crossing and *T. pruinosa*. shrubland over isolated low *Disphyma crassifolium* and *Calandrinia* ?*quartzitica* forbs.		

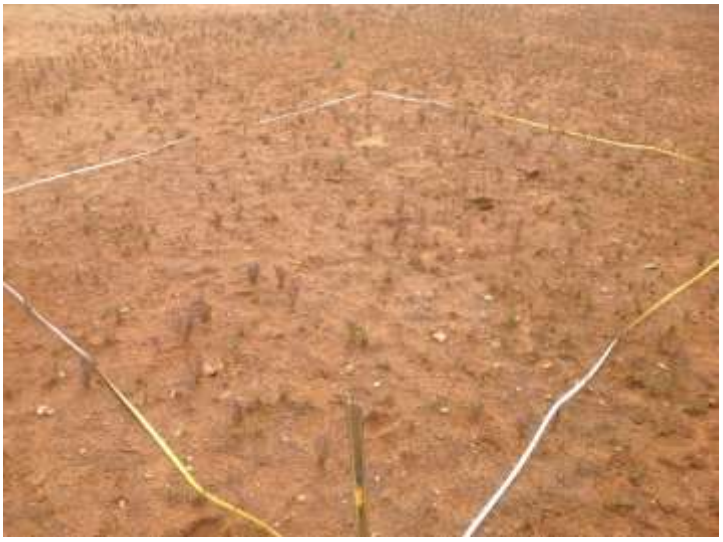
Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia pruinosa	15.0	00.50		
Tecticornia indica subsp. *bidens*	05.0	00.40		
Grevillea sarissa subsp. *sarissa*	03.0	02.50		
Dodonaea viscosa	02.0	01.50		
Melaleuca halmaturorum	01.0	02.10		
Frankenia setosa	01.0	00.30		
Maireana glomerifolia	01.0	00.30		
Disphyma crassifolium	01.0	00.10		
Enchylaena tomentosa	00.5	00.50		
Rhagodia drummondii	00.5	00.50		
Maireana ?*amoena*	00.5	00.20		
Eremophila scoparia	00.1	00.80		
Solanum nummularium	00.1	00.40		
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	00.1	00.40		

Atriplex vesicaria	00.1	00.30
Calandrinia ?quartzitica	00.1	00.30
Maireana carnosa	00.1	00.25
Aristida contorta	00.1	00.15
Surreya diandra	00.1	00.15
Sclerolaena diacantha	00.1	00.10

Site details			
Site:	CR002TQ01	**Type:**	Transect (3 m x 3 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.770379, 121.198438 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	3	**Topography:**	salt lake (playa)
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	3	**Soil:**	clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated low *Tecticornia pergranulata* subsp. *pergranulata* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia pergranulata subsp. *pergranulata*	03.0	00.20		

Site details			
Site:	CR002TQ02	**Type:**	Transect (3 m x 3 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.770051, 121.198014 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	4	**Topography:**	salt lake (playa)
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	4	**Soil:**	sandy clay,
Grass cover (%):	0	**Rock type:**	quartz;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia pergranulata* subsp. *pergranulata*, and *T. doliiformis* chenopod shrubland.		



Species	**Cover (%)**	**Height (m)**	**Weed**	**Conservation status**
Tecticornia pergranulata subsp. *pergranulata*	03.0	00.15		
Tecticornia doliiformis	01.0	00.15		

Site details			
Site:	CR002TQ03	**Type:**	Transect (3 m x 3 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.769704, 121.197531 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	15	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	yellow, whitish,
Shrub cover <2 m (%):	15	**Soil:**	sand,
Grass cover (%):	0	**Rock type:**	quartz;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low *Tecticornia undulata*, *T.* sp. Dennys Crossing and *T. doliiformis* chenopod shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	10.0	00.40		
Tecticornia undulata	04.0	00.30		
Tecticornia doliiformis	01.0	00.25		
Maireana amoena	00.1	00.15		
Maireana eriosphaera	00.1	00.15		

Site details			
Site:	CR002TQ04	**Type:**	Transect (3 m x 3 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.769414, 121.197065 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	10	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	yellow, whitish,
Shrub cover <2 m (%):	10	**Soil:**	sand,
Grass cover (%):	0	**Rock type:**	quartz;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low open *Tecticornia* sp. Dennys Crossing and *T. doliiformis* chenopod shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	10.0	00.20		
Tecticornia doliiformis	00.1	00.15		

Site details			
Site:	CR003	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.775984, 121.196064 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	25	**Soil colour:**	brown,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	granite rocks
Herb cover (%):	0.2	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus clelandiorum*, *E. oleosa* subsp. *oleosa* and *E. longicornis* woodland over isolated tall *Eremophila interstans* subsp. *interstans* shrubs over low open *Atriplex vesicaria*, *Maireana pentatropis* and *Enchylaena tomentosa* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Atriplex vesicaria	20.0	00.50		
Eucalyptus longicornis	15.0	20.00		
Eucalyptus oleosa subsp. *oleosa*	10.0	20.00		
Eucalyptus clelandiorum	10.0	12.00		
Eremophila interstans subsp. *interstans*	01.0	01.10		
Maireana pentatropis	01.0	00.50		
Eucalyptus loxophleba subsp. *lissophloia*	00.1	05.00		
Senna artemisioides subsp. *artemisioides*	00.1	01.20		
Pittosporum angustifolium	00.1	00.50		
Dodonaea viscosa	00.1	00.40		
Enchylaena tomentosa	00.1	00.40		
Eremophila glabra	00.1	00.40		
Ptilotus obovatus	00.1	00.40		
Olearia muelleri	00.1	00.25		
Maireana georgei	00.1	00.15		

Maireana trichoptera	00.1	00.15
Rhagodia drummondii	00.1	00.10
Roepera aurantiaca	00.1	00.10
Sclerolaena brevifolia	00.1	00.10
Sclerolaena diacantha	00.1	00.10

Site details			
Site:	CR004	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.776369, 121.18336 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	hill top
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	35	**Soil:**	clay loam,
Grass cover (%):	0.1	**Rock type:**	granite rocks
Herb cover (%):	0.1	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	exploration drill pads, erosion, clearing, vehicle tracks
Land system:			
Vegetation description and type:	Tall *Acacia burkittii*, *Brachychiton gregorii* and *Grevillea berryana* shrubland over mid open *Eremophila gibbosa* and *Scaevola spinescens* and *Dodonaea lobulata* shrubland over low *Leiocarpa semiclava* subsp. *semiclava* *Solanum lasiophyllum* and *Ptilotus obovatus* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Leiocarpa semicalva subsp. *semicalva*	30.0	00.20		
Grevillea berryana	10.0	05.00		
Brachychiton gregorii	10.0	03.00		
Acacia burkittii	10.0	02.50		
Acacia tetragonophylla	05.0	02.00		
Acacia gibbosa	05.0	01.50		
Eremophila gibbosa	03.0	01.50		
Scaevola spinescens	02.0	01.10		
Exocarpos aphyllus	01.0	01.50		
Dodonaea lobulata	01.0	01.00		
Amyema gibberula var. *gibberula*	00.1	02.00		
Prostanthera althoferi	00.1	01.20		
Cassytha ?*nodiflora*	00.1	01.00		
Rhyncharrhena linearis	00.1	01.00		

Olearia pimeleoides	00.1	00.50	
Ptilotus obovatus	00.1	00.50	
Solanum lasiophyllum	00.1	00.50	
Austrostipa blackii	00.1	00.10	P3 (DBCA list)
Austrostipa scabra	00.1	00.10	
Cheilanthes sieberi subsp. *sieberi*	00.1	00.10	
Goodenia havilandii	00.1	00.04	
Ptilotus helipteroides	00.1	00.02	
Euphorbia porcata	00.1	00.01	

Site details			
Site:	CR005	**Type:**	Quadrat (20 m x 20 m)
Date(s):	15 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.777041, 121.178069 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%)	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	clay loam, clay,
Grass cover (%):	0.1	**Rock type:**	none
Herb cover (%):	0.1	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus salmonophloia*, *E. salubris* and *E. griffithsii* woodland over mid open *Acacia jennerae*, *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* shrubland over low open *Atriplex* ?*vesicaria*, *Maireana tripterra* and *Tecticornia doliiformis* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus salmonophloia	20.0	25.00		
Senna artemisioides subsp. *filifolia*	15.0	01.20		
Eucalyptus salubris	10.0	15.00		
Tecticornia doliiformis	10.0	00.60		
Eremophila scoparia	07.0	01.50		
Atriplex ?*vesicaria*	03.0	00.50		
Eremophila dempsteri	01.0	04.00		
Acacia jennerae	01.0	02.00		
Exocarpos aphyllus	01.0	02.00		
Eucalyptus griffithsii	00.1	08.00		
Eremophila ionantha	00.1	01.20		
Pimelea microcephala	00.1	01.00		
Pittosporum angustifolium	00.1	01.00		
Rhagodia drummondii	00.1	01.00		
Lycium australe	00.1	00.60		

Enchylaena tomentosa	00.1	00.50
Maireana sedifolia	00.1	00.50
Ptilotus obovatus	00.1	00.50
Scaevola spinescens	00.1	00.50
Austrostipa elegantissima	00.1	00.40
Frankenia ?interioris	00.1	00.30
Maireana triptera	00.1	00.30
Austrostipa nitida	00.1	00.20
Maireana trichoptera	00.1	00.20
Vittadinia dissecta var. *hirta*	00.1	00.20
Sclerolaena diacantha	00.1	00.15
Ptilotus exaltatus	00.1	00.02

Site details			
Site:	CR006	**Type:**	Quadrat (20 m x 20 m)
Date(s):	15 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.779269, 121.173808 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	25	**Soil:**	clay loam,
Grass cover (%):	5	**Rock type:**	granite rocks
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	livestock tracks, vehicle tracks, weed infestation

Land system:

Vegetation description and type: Mid *Eucalyptus griffithsii* mallee woodland over isolated mid *Acacia dissona* var. *dissona*, *A. hemiteles* and *Senna artemisioides* subsp. *filifolia* shrubs over low open *Acacia merralii*, *Eremophila parvifolia* subsp. *auricampa* and *Westringia rigida* shrubland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus griffithsii	25.0	06.00		
Acacia merrallii	05.0	00.80		
Westringia rigida	05.0	00.30		
Acacia dissona var. *dissona*	01.0	02.00		
Acacia hemiteles	01.0	01.50		
Triodia scariosa	01.0	00.35		
Senna artemisioides subsp. *filifolia*	00.5	01.10		
Acacia densiflora	00.1	01.80		
Exocarpos aphyllus	00.1	01.50		
Eremophila oppositifolia	00.1	01.40		
Eremophila glabra	00.1	01.20		
Eremophila scoparia	00.1	01.00		
Acacia erinacea	00.1	00.80		
Cryptandra aridicola	00.1	00.70		

Eremophila parvifolia subsp. *auricampa*	00.1	00.50	
Scaevola spinescens	00.1	00.50	
Grevillea acuaria	00.1	00.40	
Ptilotus obovatus	00.1	00.40	
Atriplex nummularia	00.1	00.30	
Dodonaea lobulata	00.1	00.20	
Olearia muelleri	00.1	00.20	
Solanum hoplopetalum	00.1	00.20	
Enneapogon caerulescens	00.1	00.15	
Haloragis trigonocarpa	00.1	00.15	
Lysimachia arvensis	00.1	00.10	*
Salvia verbenaca	00.1	00.05	*
Ptilotus exaltatus	00.1	00.02	
Euphorbia ?philochalix	00.1	00.01	

Site details			
Site:	CR008	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.765669, 121.174482 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	35	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0.5	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid open *Eucalyptus salmonophloia* woodland over low *E. salubris* and *E. clelandiorum* woodland over mid *Acacia hemiteles*, *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus salmonophloia	20.0	15.00		
Eremophila scoparia	15.0	01.90		
Senna artemisioides subsp. *filifolia*	15.0	01.50		
Eucalyptus clelandiorum	05.0	08.00		
Eucalyptus salubris	05.0	08.00		
Acacia hemiteles	05.0	01.20		
Atriplex bunburyana	03.0	00.80		
Exocarpos aphyllus	01.0	04.00		
Scaevola spinescens	01.0	00.60		
Ptilotus obovatus	01.0	00.50		
Santalum spicatum	00.1	02.50		
Rhagodia drummondii	00.1	01.50		
Eremophila ionantha	00.1	01.40		
Eremophila oldfieldii	00.1	01.20		
Enchylaena tomentosa	00.1	01.00		
Lycium australe	00.1	01.00		

Senna stowardii	00.1	00.50
Austrostipa elegantissima	00.1	00.40
Maireana convexa	00.1	00.40
Maireana triptera	00.1	00.40
Olearia muelleri	00.1	00.30
Maireana trichoptera	00.1	00.20
Maireana georgei	00.1	00.15
Sclerolaena diacantha	00.1	00.15
Paspalidium gracile	00.1	00.10

Site details			
Site:	CR009a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	05 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.767917, 121.178289 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	sandy clay, clay loam,
Grass cover (%):	1	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	grazing – low, livestock tracks,
Land system:			
Vegetation description and type:	Mid *Eucalyptus clelandiorum* and *E. longicornis* woodland over mid open *Eremophila scoparia*, *Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Atriplex* ?*vesicaria*, *Olearia muelleri* and *Cratystylis* spp. shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus clelandiorum	25.0	18.00		
Senna artemisioides subsp. *filifolia*	10.0	01.50		
Eremophila scoparia	07.0	01.20		
Exocarpos aphyllus	02.0	01.80		
Eremophila interstans subsp. *interstans*	01.0	01.90		
Eremophila glabra	01.0	01.40		
Acacia hemiteles	01.0	01.00		
Austrostipa elegantissima	01.0	01.00		
Senna cardiosperma	01.0	01.00		
Olearia muelleri	01.0	00.30		
Cratystylis microphylla	00.5	00.50		
Atriplex ?*vesicaria*	00.5	00.40		
Eucalyptus longicornis	00.1	20.00		
Eremophila alternifolia	00.1	01.20		
Dodonaea viscosa	00.1	01.00		

Atriplex nummularia	00.1	00.60
Chenopodium curvispicatum	00.1	00.50
Cratystylis conocephala	00.1	00.50
Eremophila parvifolia	00.1	00.50
Scaevola spinescens	00.1	00.50
Lycium australe	00.1	00.45
Eremophila miniata	00.1	00.40
Solanum nummularium	00.1	00.30

Site details			
Site:	CR010	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.763716, 121.180255 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	55	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	30	**Soil colour:**	brown,
Shrub cover <2 m (%):	40	**Soil:**	sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals,
Land system:			
Vegetation description and type:	Low *Eucalyptus celastroides* subsp. *celastroides* and *E. clelandiorum* woodland over mid open *Eremophila scoparia*, *E. glabra* and *E. oppositifolia* shrubland over low *Cratystlis microphylla*, *Olearia muelleri* and *Atriplex stipitata* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus celastroides subsp. *celastroides*	20.0	09.00		
Eucalyptus clelandiorum	10.0	09.00		
Eremophila scoparia	10.0	01.50		
Cratystylis microphylla	10.0	01.00		
Eremophila oppositifolia	02.0	01.90		
Eremophila glabra	02.0	01.10		
Atriplex stipitata	02.0	00.40		
Olearia muelleri	02.0	00.40		
Exocarpos aphyllus	01.0	02.50		
Senna artemisioides subsp. *filifolia*	01.0	01.20		
Westringia rigida	01.0	00.30		
Santalum acuminatum	00.5	01.50		
Enchylaena tomentosa	00.1	01.20		
Acacia erinacea	00.1	01.00		
Acacia hemiteles	00.1	01.00		
Cratystylis conocephala	00.1	01.00		

Dodonaea lobulata	00.1	01.00
Eremophila parvifolia	00.1	01.00
Pomaderris forrestiana	00.1	01.00
Atriplex nummularia	00.1	00.50
Casuarina obesa	00.1	00.50
Lycium australe	00.1	00.50
Rhagodia drummondii	00.1	00.50
Ptilotus obovatus	00.1	00.40
Solanum nummularium	00.1	00.40
Tecticornia sp. (sterile 1)	00.1	00.40
Austrostipa elegantissima	00.1	00.30
Maireana convexa	00.1	00.20
Maireana trichoptera	00.1	00.15

Site details			
Site:	CR011	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.760096, 121.180682 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%)	20	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	35	**Soil:**	sandy loam,
Grass cover (%):	5	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus griffithsii* and *E. oleosa* subsp. *oleosa* woodland over mid open *Senna artemisioides* subsp *filifolia*, *Eremophila glabra* and *Halgania andromedifolia* shrubland over low sparse *Triodia scariosa* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus griffithsii	20.0	15.00		
Eucalyptus oleosa subsp. *oleosa*	10.0	15.00		
Halgania andromedifolia	06.0	01.10		
Triodia scariosa	06.0	00.40		
Senna artemisioides subsp. *filifolia*	05.0	01.40		
Eremophila glabra	02.0	01.60		
Scaevola spinescens	02.0	01.00		
Westringia rigida	02.0	00.50		
Eremophila oppositifolia subsp. *angustifolia*	01.0	02.00		
Acacia erinacea	01.0	01.20		
Dodonaea lobulata	00.1	01.50		
Exocarpos aphyllus	00.1	01.40		
Eremophila interstans subsp. *interstans*	00.1	01.20		
Eremophila parvifolia subsp. *auricampa*	00.1	01.20		
Eremophila pustulata	00.1	01.20		
Atriplex nummularia	00.1	00.50		

Atriplex acutibractea subsp. *acutibractea*	00.1	00.40
Olearia muelleri	00.1	00.30
Sclerolaena diacantha	00.1	00.15

Site details			
Site:	CR012	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.761223, 121.185682 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	plain
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus transcontinentalis*, *E. oleosa* subsp. *oleosa* and *E. clelandiorum* woodland over mid open *Eremophila scoparia*, *E. ionantha* and *Senna artemisioides* subsp. *filifolia* shrubland over low sparse *Atriplex eardleyae*, *A.* ? *vesicaria* and *Olearia muelleri* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus transcontinentalis	15.0	15.00		
Eucalyptus oleosa subsp. *oleosa*	05.0	15.00		
Eremophila ionantha	05.0	01.80		
Senna artemisioides subsp. *filifolia*	05.0	01.80		
Eremophila scoparia	05.0	01.50		
Atriplex ?*vesicaria*	02.0	00.50		
Atriplex eardleyae	02.0	00.50		
Casuarina pauper	01.0	06.00		
Olearia muelleri	01.0	00.30		
Scaevola spinescens	00.5	00.50		
Eucalyptus griffithsii	00.1	12.00		
Eucalyptus clelandiorum	00.1	08.00		
Santalum spicatum	00.1	02.20		
Dodonaea lobulata	00.1	01.70		
Eremophila glabra	00.1	01.50		

Exocarpos aphyllus	00.1	01.50
Acacia hemiteles	00.1	01.20
Cratystylis microphylla	00.1	01.20
Acacia erinacea	00.1	01.00
Atriplex nummularia	00.1	01.00
Casuarina obesa	00.1	01.00
Alyxia buxifolia	00.1	00.60
Dianella revoluta	00.1	00.60
Psydrax suaveolens	00.1	00.60
Ptilotus obovatus	00.1	00.50
Maireana triptera	00.1	00.40
Austrostipa elegantissima	00.1	00.30
Sclerolaena obliquicuspis	00.1	00.30
Sclerolaena ?brevifolia	00.1	00.20
Sclerolaena diacantha	00.1	00.10
Sclerolaena drummondii	00.1	00.10

Site details			
Site:	CR013a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	06 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.765333, 121.19086 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	35	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	granite outcropping; granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	evidence of feral animals, grazing – low, vehicle tracks,

Land system:

Vegetation description and type: Mid *Eucalyptus clelandiorum*, *E. longicornis* and *E. griffithsii* woodland over mid open *Eremophila glabra*, *Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Atriplex* ?*vesicaria*, *Acacia xerophila* var. *brevior* and *Ptilotus obovatus* shrubland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus longicornis	20.0	15.00		
Senna artemisioides subsp. *filifolia*	07.0	01.20		
Eremophila glabra	06.0	01.20		
Eucalyptus griffithsii	05.0	10.00		
Atriplex ?*vesicaria*	02.0	00.40		
Exocarpos aphyllus	01.0	01.50		
Ptilotus obovatus	01.0	00.50		
Acacia xerophila var. *brevior*	01.0	00.40		
Olearia muelleri	00.5	00.25		
Rhagodia drummondii	00.2	00.50		
Eucalyptus clelandiorum	00.1	12.00		
Atriplex nummularia	00.1	05.00		
Eremophila oppositifolia	00.1	02.00		
Santalum spicatum	00.1	02.00		

Eremophila scoparia	00.1	01.40
Eremophila longifolia	00.1	01.20
Dodonaea lobulata	00.1	01.00
Casuarina pauper	00.1	00.80
Eremophila alternifolia	00.1	00.50
Solanum nummularium	00.1	00.50
Marsdenia australis	00.1	00.40
Austrostipa elegantissima	00.1	00.30
Maireana sedifolia	00.1	00.20
Maireana trichoptera	00.1	00.15
Sclerolaena diacantha	00.1	00.10
Ptilotus holosericeus	00.1	00.01

Site details			
Site:	CR015	**Type:**	Quadrat (20 m x 20 m)
Date(s):	14 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.762397, 121.179421 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	hill top
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	15	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	ferrous – ironstone
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	vehicle tracks,
Land system:			
Vegetation description and type:	Low *Eucalyptus clelandiorum* and *E. griffithsii* woodland over tall *Acacia burkittii*, *Allocasuarina eriochlamys* subsp. *grossa* and *Melaleuca pauperiflora* subsp. *fastigiata* shrubland over low open *Cryptandra aridicola*, *Dodonaea lobulata* and *Exocarpos aphyllus* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus clelandiorum	25.0	09.00		
Allocasuarina eriochlamys subsp. *grossa*	20.0	03.00		P3 (DBCA list)
Acacia burkittii	10.0	02.50		
Dodonaea lobulata	10.0	01.00		
Cryptandra aridicola	05.0	01.00		
Eucalyptus griffithsii	03.0	08.00		
Scaevola spinescens	01.0	01.50		
Melaleuca pauperiflora subsp. *fastigiata*	00.1	02.00		
Acacia erinacea	00.1	01.00		
Acacia tetragonophylla	00.1	01.00		
Eremophila gibbosa	00.1	01.00		
Eremophila glabra	00.1	01.00		
Eremophila oppositifolia	00.1	01.00		
Exocarpos aphyllus	00.1	01.00		
Thysanotus manglesianus	00.1	00.60		

Prostanthera althoferi	00.1	00.50
Senna artemisioides subsp. *filifolia*	00.1	00.50
Halgania andromedifolia	00.1	00.45
Olearia muelleri	00.1	00.40
Santalum spicatum	00.1	00.40
Triodia scariosa	00.1	00.30
Westringia rigida	00.1	00.30
Halgania cyanea	00.1	00.25

Site details			
Site:	CR016a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	06 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.777945, 121.188308 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	floodplain
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	50	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – low, livestock tracks, vehicle tracks, weed infestation,

Land system:

Vegetation description and type: Isolated mid *Cratystylis subspinescens* and *Pimelea microcephala* shrubs over low *Atriplex vesicaria*, *Roycea divaricata* and *Tecticornia* sp. (sterile 1) chenopod shrubland over isolated low *Calandrinia* sp. Gypsum, *Disphyma crassifolium* and *Sclerolaena obliquicuspis* forbs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Atriplex vesicaria	35.0	00.50		
Tecticornia sp. (sterile 1)	10.0	00.60		
Roycea divaricata	10.0	00.40		
Sclerolaena obliquicuspis	02.0	00.10		
Cratystylis subspinescens	01.0	01.20		
Enteropogon ramosus	01.0	00.30		
Disphyma crassifolium	01.0	00.08		
Frankenia ?interioris	00.5	00.30		
Maireana amoena	00.5	00.20		
Maireana appressa	00.5	00.20		
Salvia verbenaca	00.5	00.10	*	
Monoculus monstrosus	00.5	00.03	*	
Eragrostis dielsii	00.5	00.02		
Calandrinia sp. Gypsum (F. Obbens & L. Hancock FO 10/14)	00.2	00.40		

Sclerolaena cuneata	00.2	00.25	
Pimelea microcephala	00.1	01.20	
Enchylaena tomentosa	00.1	00.60	
Eremophila scoparia	00.1	00.60	
Lycium australe	00.1	00.60	
Solanum nummularium	00.1	00.50	
Eremophila parvifolia subsp. *auricampa*	00.1	00.40	
Sclerolaena eurotioides	00.1	00.30	
Austrostipa nitida	00.1	00.20	
Cuscuta epithymum	00.1	00.20	*
Enneapogon caerulescens	00.1	00.15	
Heliotropium curassavicum	00.1	00.15	
Maireana turbinata	00.1	00.15	
Minuria cunninghamii	00.1	00.15	
Osteocarpum salsuginosum	00.1	00.15	
Sida spodochroma	00.1	00.10	
Vittadinia dissecta var. *hirta*	00.1	00.10	
Brachyscome ciliaris	00.1	00.08	
Medicago minima	00.1	00.01	*

Site details			
Site:	CR018a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	09 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.731759, 121.151423 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus clelandiorum* and *E. oleosa* subsp. *oleosa* woodland over mid open *Acacia hemiteles*, *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Olearia muelleri*, *Scaevola spinescens* and *Westringia rigida* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus oleosa subsp. *oleosa*	25.0	12.00		
Senna artemisioides subsp. *filifolia*	15.0	01.20		
Acacia hemiteles	07.0	01.10		
Westringia rigida	02.0	00.40		
Eremophila scoparia	01.0	01.10		
Olearia muelleri	01.0	00.25		
Scaevola spinescens	00.5	00.40		
Eucalyptus clelandiorum	00.1	12.00		
Casuarina obesa	00.1	04.00		
Alectryon oleifolius subsp. *canescens*	00.1	02.50		
Eremophila ionantha	00.1	01.30		
Marsdenia australis	00.1	01.20		
Acacia nyssophylla	00.1	01.00		
Dodonaea lobulata	00.1	01.00		
Exocarpos aphyllus	00.1	01.00		

Eremophila parvifolia	00.1	00.50
Austrostipa elegantissima	00.1	00.40
Eremophila glabra	00.1	00.40
Maireana convexa	00.1	00.20
Maireana trichoptera	00.1	00.20
Ptilotus obovatus	00.1	00.20
Aristida contorta	00.1	00.15

Site details			
Site:	CR020	**Type:**	Quadrat (20 m x 20 m)
Date(s):	15 June 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.740835, 121.163976 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	20	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus clelandiorum*, *E. celastroides* subsp. *celastroides*, *E. transcontinentalis* woodland over mid open *Dodonaea lobulata*, *Eremophila oppositifolia* and *Senna artemisioides* subsp. *filifolia* shrubland over low open *Scaevola spinescens*, *Ptilotus obovatus* and *Westringia rigida* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus clelandiorum	20.0	18.00		
Senna artemisioides subsp. *filifolia*	10.0	01.50		
Scaevola spinescens	10.0	00.80		
Dodonaea lobulata	06.0	01.20		
Westringia rigida	03.0	00.30		
Eremophila oppositifolia	02.0	01.80		
Exocarpos aphyllus	01.0	02.00		
Cryptandra aridicola	01.0	01.00		
Triodia scariosa	00.5	00.25		
Eucalyptus transcontinentalis	00.1	15.00		
Eucalyptus celastroides subsp. *celastroides*	00.1	05.00		
Eremophila caperata	00.1	03.00		
Alyxia buxifolia	00.1	01.20		
Eremophila glabra	00.1	01.20		
Eremophila oldfieldii	00.1	01.20		

Acacia colletioides	00.1	00.50
Atriplex vesicaria	00.1	00.40
Ptilotus obovatus	00.1	00.40
Maireana convexa	00.1	00.20
Maireana radiata	00.1	00.20
Maireana triptera	00.1	00.20
Maireana trichoptera	00.1	00.15

Site details			
Site:	CR021a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	09 October 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-30.74199, 121.165461 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	hill top
Tree/shrub cover >2 m (%)	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	1	**Rock type:**	ferrous – ironstone;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus griffithsii* woodland over tall sparse *Allocasuarina helmsii*, *Grevillea sarissa* subsp. *bicolor* and *Eremophila oppositifolia* shrubland over mid open *Dodonaea lobulata*, *Cryptandra aridicola* and *Scaevola spinescens* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus griffithsii	12.0	30.00		
Cryptandra aridicola	06.0	01.20		
Triodia scariosa	05.0	00.25		
Dodonaea lobulata	04.0	01.30		
Allocasuarina helmsii	03.0	02.10		
Eremophila oppositifolia	02.0	02.20		
Scaevola spinescens	02.0	00.60		
Grevillea sarissa subsp. *bicolor*	01.0	04.00		
Amyema gibberula var. *gibberula*	00.1	01.80		
Acacia burkittii	00.1	01.70		
Acacia hemiteles	00.1	01.00		
Exocarpos aphyllus	00.1	01.00		
Senna artemisioides subsp. *filifolia*	00.1	01.00		
Eremophila glabra	00.1	00.40		
Westringia rigida	00.1	00.30		

Olearia muelleri	00.1	00.25
Ptilotus exaltatus	00.1	00.25

Site details			
Site:	CR023a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	08 October 2018	**Permanent:**	No
Observer(s):	Grant Wells	**Position:**	-30.771199, 121.220283 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	7	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	35	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated low *Casuarina pauper* trees over mid sparse *Eremophila scoparia* shrubland over low open *Cratystylis microphylla*, *Eremophila decipiens* subsp. *decipiens* and *Maireana glomerifolia* shrubland.		

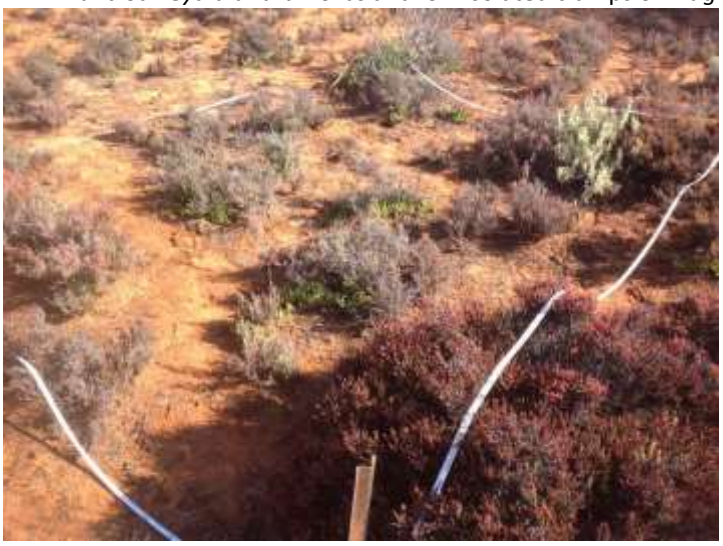
Species	Cover (%)	Height (m)	Weed	Conservation status
Eremophila scoparia	06.0	01.30		
Eremophila decipiens subsp. *decipiens*	06.0	00.40		
Casuarina pauper	05.0	05.00		
Cratystylis microphylla	03.0	01.00		
Maireana glomerifolia	03.0	00.30		
Acacia kalgoorliensis	02.0	02.00		
Surreya diandra	02.0	00.30		
Maireana triptera	01.0	00.30		
Scaevola spinescens	00.5	01.00		
Atriplex ?vesicaria	00.5	00.35		
Frankenia ?interioris	00.5	00.25		
Amyema preissii	00.1	01.50		
Dodonaea viscosa	00.1	01.00		
Lycium australe	00.1	01.00		
Senna cardiosperma	00.1	01.00		
Tecticornia doliiformis	00.1	00.60		

Maireana convexa	00.1	00.50
Maireana sedifolia	00.1	00.50
Marsdenia australis	00.1	00.50
Ptilotus obovatus	00.1	00.50
Gunniopsis quadrifida	00.1	00.40
Olearia pimeleoides	00.1	00.40
Maireana carnosa	00.1	00.30
Rhagodia drummondii	00.1	00.30
Minuria cunninghamii	00.1	00.25
Olearia muelleri	00.1	00.25
Enchylaena tomentosa	00.1	00.20
Maireana trichoptera	00.1	00.20
Sclerolaena diacantha	00.1	00.15
Disphyma crassifolium	00.1	00.10

Site details			
Site:	CR025TQ01	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.76856, 121.208434 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	35	**Soil:**	sand, sandy loam,
Grass cover (%):	5	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	evidence of feral animals, livestock tracks, vehicle tracks,

Land system:

Vegetation description and type: Low *Tecticornia indica* subsp. *bidens*, *T*. sp. Dennys Crossing and *Atriplex* ? *vesicaria* shrubland over isolated *Disphyma crassifolium*, *Erodium cicutarium* and *Surreya diandra* forbs and low isolated clumps of *Eragrostis dielsii* grasses.



Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia indica subsp. *bidens*	30.0	00.50		
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	05.0	00.40		
Disphyma crassifolium	05.0	00.10		
Atriplex ?*vesicaria*	02.0	00.50		
Enchylaena tomentosa	00.2	00.30		
Maireana eriosphaera	00.2	00.25		
Maireana trichoptera	00.2	00.25		
Erodium cicutarium	00.1	00.06	*	
Surreya diandra	00.1	00.05		
Eragrostis dielsii	00.1	00.01		

Site details			
Site:	CR025TQ02	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.768447, 121.208221 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	25	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	25	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	evidence of feral animals, grazing – low, livestock tracks, vehicle tracks,
Land system:			
Vegetation description and type:	Low *Tecticornia undulata* and *T. doliiformis* chenopod shrubland over isolated clumps of low *Eragrostis dielsii* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia doliiformis	24.0	00.40		
Tecticornia undulata	01.0	00.30		
Eragrostis dielsii	00.1	00.01		

Site details			
Site:	CR025TQ03	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.76838, 121.207938 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	20	**Topography:**	salt lake (playa)
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none
Land system:			
Vegetation description and type:	Low *Tecticornia undulata*, *Atriplex lindleyi* subsp. *inflata* and *Frankenia irregularis* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia undulata	18.0	00.20		
Atriplex lindleyi subsp. *inflata*	01.0	00.20		
Frankenia irregularis	01.0	00.15		

Site details			
Site:	CR025TQ04	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.768259, 121.207624 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	20	**Topography:**	salt lake (playa)
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	18	**Soil:**	sandy clay, clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	livestock tracks, vehicle tracks,
Land system:			
Vegetation description and type:	Low *Tecticornia undulata*, *T. pergranulata* subsp. *pergranulata* and *T. doliiformis* chenopod shrubland over low isolated *Eragrostis dielsii* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia undulata	16.0	00.15		
Tecticornia doliiformis	02.0	00.25		
Tecticornia pergranulata subsp. *pergranulata*	01.0	00.25		
Atriplex lindleyi subsp. *inflata*	01.0	00.20		
Eragrostis dielsii	01.0	00.01		
Frankenia irregularis	00.1	00.15		

Site details			
Site:	CR025TQ05	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.768153, 121.20736 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	20	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sand, sandy loam,
Grass cover (%):	0	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals, livestock tracks,

Land system:

Vegetation description and type: Low *Tecticornia indica* subsp. *bidens*, *T*. sp. Dennys Crossing and *T. doliiformis* chenopod shrubland over isolated clumps of low *Disphyma crassifolium*, *Heliotropium curassavicum* and *Senecio pinnatifolius* var. *pinnatifolius* forbs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia doliiformis	10.0	00.25		
Tecticornia indica subsp. *bidens*	05.0	00.20		
Maireana amoena	01.0	00.20		
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	01.0	00.15		
Frankenia cinerea	01.0	00.05		
Senecio pinnatifolius var. *pinnatifolius*	00.1	00.20		
Disphyma crassifolium	00.1	00.10		
Heliotropium curassavicum	00.1	00.01		

Site details			
Site:	CR026a	**Type:**	Quadrat (20 m x 20 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.76812, 121.20513 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sand, sandy loam,
Grass cover (%):	0	**Rock type:**	granite outcropping;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals,
Land system:			
Vegetation description and type:	Low *Eucalyptus clelandiorum* and *E. griffithsii* woodland over mid open *Eremophila scoparia*, *E. oppositifolia* and *E. glabra* shrubland over low sparse *Olearia muelleri*, *Ptilotus obovatus* and *Atriplex vesicaria* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus clelandiorum	15.0	10.00		
Eucalyptus griffithsii	15.0	10.00		
Eremophila scoparia	10.0	01.20		
Eremophila oppositifolia	05.0	01.10		
Ptilotus obovatus	03.0	00.50		
Olearia muelleri	03.0	00.30		
Eremophila glabra	02.0	01.50		
Casuarina pauper	01.0	02.50		
Cratystylis microphylla	01.0	01.20		
Dodonaea viscosa	01.0	00.60		
Rhagodia drummondii	01.0	00.50		
Exocarpos aphyllus	00.5	01.70		
Dodonaea lobulata	00.5	01.00		
Atriplex vesicaria	00.5	00.40		
Eremophila decipiens subsp. *decipiens*	00.1	00.60		
Eremophila granitica	00.1	00.50		

Lycium australe	00.1	00.50
Rhagodia spinescens	00.1	00.50
Maireana pentatropis	00.1	00.40
Solanum nummularium	00.1	00.40
Triodia scariosa	00.1	00.30
Westringia rigida	00.1	00.30
Maireana convexa	00.1	00.25
Maireana tomentosa subsp. *tomentosa*	00.1	00.20
Maireana trichoptera	00.1	00.20
Sclerolaena diacantha	00.1	00.10

Site details			
Site:	CR027	**Type:**	Quadrat (20 m x 20 m)
Date(s):	02 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.664589, 121.073926 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	ferrous – ironstone;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	excavation, exploration (drill pads and access tracks), historic clearing, historic operations, vehicle tracks,

Land system:

Vegetation description and type: Low *Eucalyptus clelandiorum* woodland over isolated tall *Eremophila interstans* subsp. *interstans* shrubs over mid sparse *Eremophila scoparia*, *Atriplex nummularia* and *A.* ?*vesicaria* shrubland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus clelandiorum	25.0	08.00		
Eremophila interstans subsp. *interstans*	03.0	02.50		
Atriplex nummularia	03.0	01.20		
Atriplex ?*vesicaria*	03.0	00.60		
Eremophila scoparia	02.0	01.10		
Dodonaea lobulata	00.1	01.00		
Exocarpos aphyllus	00.1	01.00		
Eremophila oldfieldii	00.1	00.80		
Eremophila alternifolia	00.1	00.50		
Scaevola spinescens	00.1	00.50		
Ptilotus obovatus	00.1	00.40		
Maireana ?*georgei*	00.1	00.30		
Olearia muelleri	00.1	00.25		
Maireana triptera	00.1	00.20		

Maireana trichoptera	00.1	00.15
Sclerolaena fusiformis	00.1	00.15
Sclerolaena diacantha	00.1	00.10

Site details			
Site:	CR028	**Type:**	Quadrat (20 m x 20 m)
Date(s):	02 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.677138, 121.088422 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	35	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	30	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	5	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	vehicle tracks,
Land system:			
Vegetation description and type:	Mid *Eucalyptus transcontinentalis* and *E. clelandiorum* woodland over mid sparse *Atriplex nummularia*, *Maireana sedifolia* and *Eremophila scoparia* shrubland over isolated low *Acacia erinacea*, *Eremophila parvifolia* subsp. *auricampa* and *Olearia muelleri* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus transcontinentalis	30.0	12.00		
Eremophila scoparia	02.0	01.80		
Maireana sedifolia	02.0	01.40		
Atriplex nummularia	01.0	01.10		
Eucalyptus clelandiorum	00.1	11.00		
Eremophila praecox	00.1	01.20		P1 (DBCA list)
Dodonaea lobulata	00.1	01.00		
Acacia erinacea	00.1	00.80		
Scaevola spinescens	00.1	00.80		
Austrostipa elegantissima	00.1	00.40		
Maireana radiata	00.1	00.40		
Eremophila parvifolia subsp. *auricampa*	00.1	00.25		
Olearia muelleri	00.1	00.25		
Senna artemisioides subsp. *filifolia*	00.1	00.25		

Site details			
Site:	CR029	**Type:**	Quadrat (20 m x 20 m)
Date(s):	02 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.683935, 121.098124 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%)	30	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	40	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	historic clearing, vehicle tracks,
Land system:			
Vegetation description and type:	Mid *Eucalyptus salmonophloia* and *E. gracilis* woodland over mid *Atriplex nummularia*, *Maireana sedifolia* and *Eremophila scoparia* shrubland over isolated low *Ptilotus obovatus*, *Atriplex bunburyana* and *Maireana trichoptera* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus salmonophloia	25.0	15.00		
Maireana sedifolia	20.0	01.50		
Atriplex nummularia	15.0	01.40		
Eucalyptus gracilis	05.0	06.00		
Eremophila scoparia	05.0	01.80		
Atriplex bunburyana	01.0	00.50		
Maireana trichoptera	01.0	00.25		
Sclerolaena diacantha	00.5	00.15		
Senna artemisioides subsp. *filifolia*	00.1	01.50		
Maireana radiata	00.1	00.50		
Ptilotus obovatus	00.1	00.50		
Scaevola spinescens	00.1	00.50		
Atriplex ?nana	00.1	00.40		
Eremophila dempsteri	00.1	00.40		
Chenopodium curvispicatum	00.1	00.35		

Maireana pyramidata	00.1	00.30
Maireana ?georgei	00.1	00.20
Ptilotus exaltatus	00.1	00.05

Site details			
Site:	CR030	**Type:**	Quadrat (20 m x 20 m)
Date(s):	02 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.693087, 121.107778 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	50	**Topography:**	plain
Tree/shrub cover >2 m (%)	40	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	40	**Soil:**	clay loam,
Grass cover (%):	1	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	evidence of feral animals, livestock tracks,

Land system:

Vegetation description and type: Mid *Eucalyptus clelandiorum*, *E. salmonophloia* and *E. salubris* woodland over mid *Eremophila ionantha*, *E. scoparia* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Acacia hemiteles*, *Olearia muelleri* and *Ptilotus obovatus* shrubs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus clelandiorum	40.0	11.00		
Senna artemisioides subsp. *filifolia*	30.0	01.60		
Eucalyptus salmonophloia	05.0	15.00		
Eucalyptus salubris	05.0	12.00		
Eremophila scoparia	05.0	01.80		
Eremophila ionantha	05.0	01.50		
Olearia muelleri	01.0	00.40		
Eragrostis dielsii	01.0	00.05		
Acacia tetragonophylla	00.5	02.00		
Ptilotus obovatus	00.5	00.50		
Pimelea microcephala	00.1	01.20		
Scaevola spinescens	00.1	01.00		
Exocarpos aphyllus	00.1	00.70		
Senna artemisioides subsp. x *artemisioides*	00.1	00.60		

Pittosporum angustifolium	00.1	00.50
Acacia hemiteles	00.1	00.40
Austrostipa elegantissima	00.1	00.40
Solanum nummularium	00.1	00.30
Maireana tomentosa ?subsp. *tomentosa*	00.1	00.15

Site details			
Site:	CR031	**Type:**	Quadrat (20 m x 20 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.701465, 121.114131 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%)	30	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	ferrous – ironstone;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	exploration (drill pads and access tracks), historic clearing, historic operations,
Land system:			
Vegetation description and type:	Mid *Eucalyptus salubris*, *E. transcontinentalis* and *E. gracilis* woodland over mid open *Eremophila scoparia*, *Senna artemisioides* subsp. *filifolia* and *Atriplex nummularia* shrubland over isolated low *Olearia muelleri*, *Ptilotus obovatus* and *Eremophila parvifolia* subsp. *auricampa* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus salubris	20.0	15.00		
Eucalyptus transcontinentalis	10.0	15.00		
Eremophila scoparia	10.0	01.80		
Atriplex nummularia	01.0	01.60		
Senna artemisioides subsp. *filifolia*	01.0	01.50		
Olearia muelleri	01.0	00.50		
Eucalyptus gracilis	00.1	08.00		
Exocarpos aphyllus	00.1	01.00		
Atriplex ?vesicaria	00.1	00.70		
Ptilotus obovatus	00.1	00.50		
Rhagodia drummondii	00.1	00.50		
Eremophila parvifolia subsp. *auricampa*	00.1	00.40		
Eremophila praecox	00.1	00.40		P1 (DBCA list)

Maireana erioclada	00.1	00.40
Maireana ?*georgei*	00.1	00.30
Maireana sp.	00.1	00.30
Maireana triptera	00.1	00.30
Maireana trichoptera	00.1	00.15
Sclerolaena cuneata	00.1	00.10
Sclerolaena diacantha	00.1	00.10

Site details			
Site:	CR032	**Type:**	Quadrat (20 m x 20 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.725565, 121.141931 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	plain
Tree/shrub cover >2 m (%)	15	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	40	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	ferrous – ironstone;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals,
Land system:			
Vegetation description and type:	Low *Casuarina obesa* woodland over mid *Atriplex nummularia*, *Eremophila ionantha* and *E. scoparia* shrubland over isolated low *Rhagodia drummondii*, *Maireana sedifolia* and *Olearia muelleri* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Atriplex nummularia	20.0	01.30		
Casuarina obesa	15.0	08.00		
Eremophila ionantha	15.0	01.20		
Exocarpos aphyllus	01.0	01.40		
Acacia tetragonophylla	01.0	01.20		
Eremophila scoparia	01.0	01.20		
Lycium australe	01.0	01.20		
Olearia muelleri	01.0	00.30		
Rhagodia drummondii	00.5	01.20		
Amyema gibberula var. *gibberula*	00.1	01.50		
Pimelea microcephala	00.1	01.20		
Senna stowardii	00.1	01.20		
Cratystylis subspinescens	00.1	01.00		
Dodonaea viscosa	00.1	01.00		
Acacia hemiteles	00.1	00.80		
Eremophila decipiens subsp. *decipiens*	00.1	00.50		

Grevillea acuaria	00.1	00.50
Scaevola spinescens	00.1	00.50
Maireana sedifolia	00.1	00.25
Maireana georgei	00.1	00.20

Site details			
Site:	CR033	**Type:**	Quadrat (20 m x 20 m)
Date(s):	03 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.728414, 121.146614 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	drainage line
Tree/shrub cover >2 m (%)	50	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals,
Land system:			
Vegetation description and type:	Mid *Eucalyptus griffithsii* and *Casuarina obesa* woodland over tall open *Acacia tetragonophylla*, *Eremophila alternifolia* and *Exocarpos aphylla* shrubland over low sparse *Grevillea acuaria*, *Lycium australe* and *Rhagodia drummondii* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus griffithsii	10.0	15.00		
Eremophila alternifolia	10.0	03.00		
Acacia tetragonophylla	10.0	02.80		
Grevillea acuaria	06.0	00.60		
Casuarina obesa	05.0	10.00		
Exocarpos aphyllus	02.0	03.00		
Rhagodia drummondii	02.0	00.90		
Lycium australe	01.0	01.00		
Alyxia buxifolia	00.5	02.00		
Santalum spicatum	00.1	02.00		
Marsdenia australis	00.1	01.50		
Amyema preissii	00.1	01.20		
Cratystylis subspinescens	00.1	01.00		
Pimelea microcephala	00.1	01.00		
Pittosporum angustifolium	00.1	01.00		

Dianella revoluta	00.1	00.70
Eremophila decipiens subsp. *decipiens*	00.1	00.30

Site details			
Site:	CR035	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.760798, 121.146465 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	55	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	35	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	6	**Soil:**	sand, sandy loam,
Grass cover (%):	25	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low open *Eucalyptus griffithsii* and *E. gracilis* forest over isolated mid *Acacia hemiteles*, *A. nyssophylla* and *Eremophila caperata* shrubs over low open *Triodia scariosa* hummock grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus griffithsii	35.0	07.00		
Triodia scariosa	25.0	00.30		
Acacia hemiteles	02.0	01.40		
Acacia nyssophylla	01.0	01.50		
Eremophila caperata	01.0	01.50		
Santalum acuminatum	00.5	01.70		
Olearia muelleri	00.2	00.30		
Eucalyptus gracilis	00.1	05.00		
Eremophila oldfieldii	00.1	02.00		
Amyema preissii	00.1	01.50		
Eremophila scoparia	00.1	01.20		
Thysanotus manglesianus	00.1	00.30		

Site details			
Site:	CR036	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.760173, 121.152879 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	35	**Soil colour:**	red-orange, whitish,
Shrub cover <2 m (%):	10	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	0	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	historic clearing, historic operations, vehicle tracks,

Land system:

Vegetation description and type: Low *Eucalyptus clelandiorum*, *E. oleosa* subsp. *oleosa* and *E. celastroides* subsp. *celastroides* woodland over isolated tall *Eremophila dempsteri* and *E. scoparia* shrubs over low sparse *Eremophila pustulata*, *Scaevola spinescens* and *Acacia erinacea* shrubland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus oleosa subsp. *oleosa*	15.0	10.00		
Eucalyptus clelandiorum	10.0	07.00		
Eucalyptus celastroides subsp. *celastroides*	05.0	05.00		
Eremophila pustulata	03.0	01.00		
Eremophila dempsteri	02.0	02.20		
Scaevola spinescens	02.0	00.50		
Eremophila scoparia	01.0	02.00		
Acacia erinacea	01.0	00.80		
Eucalyptus hypolaena	00.1	15.00		
Eucalyptus torquata	00.1	04.00		
Eremophila oppositifolia	00.1	01.50		
Santalum acuminatum	00.1	01.50		
Cratystylis conocephala	00.1	01.00		
Senna artemisioides subsp. *filifolia*	00.1	01.00		

Eremophila parvifolia subsp. *auricampa*	00.1	00.60
Exocarpos aphyllus	00.1	00.50
Senna stowardii	00.1	00.50
Atriplex nummularia	00.1	00.40
Ptilotus obovatus	00.1	00.40
Atriplex ?vesicaria	00.1	00.30
Olearia muelleri	00.1	00.30
Westringia rigida	00.1	00.30
Maireana tomentosa subsp. *tomentosa*	00.1	00.20
Ptilotus holosericeus	00.1	00.01

Site details			
Site:	CR037	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.755173, 121.179198 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	60	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	40	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	25	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals, vehicle tracks,
Land system:			
Vegetation description and type:	Mid *Eucalyptus longicornis* woodland over tall open *Dodonaea viscosa*, *Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* shrubland over low sparse *Atriplex* ?*vesicaria*, *Ptilotus obovatus* and *Scaevola spinescens* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus longicornis	30.0	15.00		
Senna artemisioides subsp. *filifolia*	10.0	02.00		
Exocarpos aphyllus	07.0	02.50		
Dodonaea viscosa	03.0	02.50		
Ptilotus obovatus	03.0	00.40		
Triodia scariosa	03.0	00.30		
Acacia hemiteles	02.0	02.00		
Scaevola spinescens	02.0	00.50		
Eremophila scoparia	01.0	01.50		
Atriplex ?*vesicaria*	01.0	00.50		
Eremophila glabra	00.5	01.50		
Eremophila ionantha	00.1	01.80		
Santalum spicatum	00.1	01.80		
Pittosporum angustifolium	00.1	01.00		
Rhagodia drummondii	00.1	00.60		

Austrostipa elegantissima	00.1	00.50
Solanum nummularium	00.1	00.50
Marsdenia australis	00.1	00.40
Maireana triptera	00.1	00.30
Olearia muelleri	00.1	00.30
Roepera similis	00.1	00.30
Maireana trichoptera	00.1	00.20
Austrostipa nitida	00.1	00.15

Site details			
Site:	CR038	**Type:**	Quadrat (20 m x 20 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.76804, 121.215512 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	7	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	35	**Soil:**	sand, sandy loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	livestock tracks,
Land system:			
Vegetation description and type:	Isolated low *Casuarina pauper* and *Alectryon oleifolius* subsp. *canescens* trees over mid open *Eremophila scoparia*, *Exocarpos aphyllus* and *Senna artemisioides* subsp. *filifolia* shrubland over low sparse *Atriplex nana*, *Maireana triptera* and *Lycium australe* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Senna artemisioides subsp. *filifolia*	08.0	01.60		
Eremophila scoparia	06.0	01.70		
Atriplex nana	04.0	00.25		
Lycium australe	03.0	00.80		
Casuarina pauper	02.0	06.00		
Alectryon oleifolius subsp. *canescens*	02.0	05.00		
Exocarpos aphyllus	02.0	01.50		
Maireana triptera	02.0	00.30		
Cratystylis subspinescens	01.0	00.60		
Acacia tetragonophylla	00.5	01.00		
Dodonaea viscosa	00.5	01.00		
Ptilotus obovatus	00.5	00.50		
Eremophila decipiens subsp. *decipiens*	00.5	00.40		
Acacia kalgoorliensis	00.1	01.00		
Cratystylis microphylla	00.1	00.50		

Rhagodia drummondii	00.1	00.50
Thysanotus manglesianus	00.1	00.50
Maireana pyramidata	00.1	00.40
Maireana thesioides	00.1	00.40
Maireana convexa	00.1	00.30
Maireana georgei	00.1	00.30
Minuria cunninghamii	00.1	00.30
Solanum nummularium	00.1	00.30
Maireana carnosa	00.1	00.25
Sclerolaena cuneata	00.1	00.25
Enchylaena tomentosa	00.1	00.20
Enteropogon ramosus	00.1	00.20
Frankenia ?interioris	00.1	00.20
Maireana trichoptera	00.1	00.20
Marsdenia australis	00.1	00.20
Paspalidium gracile	00.1	00.20
Disphyma crassifolium	00.1	00.10
Sclerolaena diacantha	00.1	00.10
Erymophyllum ramosum subsp. *ramosum*	00.1	00.05

Site details			
Site:	CR039TQ01	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.77394, 121.226247 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	25	**Topography:**	seasonally wet area
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	15	**Rock type:**	none
Herb cover (%):	3	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	livestock tracks,
Land system:			
Vegetation description and type:	Low *Tecticornia pruinosa*, *Atriplex holocarpa* and *Maireana erioclada* chenopod shrubland over isolated low *Senecio pinnatifolius* var. *pinnatifolius* and *Disphyma crassifolium* forbs over low open *Eragrostis pergracilis* grassland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eragrostis pergracilis	15.0	00.02		
Tecticornia pruinosa	10.0	00.50		
Senecio pinnatifolius var. *pinnatifolius*	03.0	00.20		
Maireana erioclada	00.1	00.40		
Disphyma crassifolium	00.1	00.10		
Atriplex holocarpa	00.1	00.08		

Site details			
Site:	CR039TQ02	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.773885, 121.225921 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	20	**Topography:**	seasonally wet area
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	10	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	15	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	evidence of feral animals, livestock tracks,

Land system:

Vegetation description and type: Low *Tecticornia pruinosa* shrubland over isolated low *Disphyma crassifolium*, *Surreya diandra* and *Senecio pinnatifolius* var. *pinnatifolius* forbs over low open *Eragrostis dielsii* and *E. pergracilis* grassland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia pruinosa	10.0	00.50		
Eragrostis dielsii	10.0	00.01		
Disphyma crassifolium	03.0	00.10		
Senecio pinnatifolius var. *pinnatifolius*	00.2	00.25		
Roepera reticulata	00.1	00.40		
Surreya diandra	00.1	00.15		
Eragrostis pergracilis	00.1	00.02		

Site details			
Site:	CR039TQ03	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.77383, 121.22564 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	25	**Soil:**	sand, sandy loam,
Grass cover (%):	1	**Rock type:**	none
Herb cover (%):	6	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	livestock tracks,
Land system:			
Vegetation description and type:	Low *Tecticornia* sp. Dennys Crossing shrubland over low sparse *Disphyma crassifolium* and *Surreya diandra* forbland over isolated low *Eragrostis dielsii* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	25.0	00.60		
Disphyma crassifolium	05.0	00.10		
Surreya diandra	01.0	00.10		
Eragrostis dielsii	01.0	00.01		

Site details			
Site:	CR039TQ04	**Type:**	Transect (3 m x 3 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.773787, 121.225371 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	20	**Topography:**	sand dune
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sand,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	livestock tracks,
Land system:			
Vegetation description and type:	Low open *Atriplex vesicaria*, *Gunniopsis quadrifida* and *Tecticornia disarticulata* shubland over isolated clumps of low *Disphyma crassifolium*, *Surreya diandra* and *Asteridea chaetopoda* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Gunniopsis quadrifida	10.0	00.40		
Tecticornia disarticulata	05.0	00.60		
Atriplex vesicaria	04.0	00.35		
Maireana triptera	01.0	00.25		
Frankenia ?interioris	00.1	00.30		
Asteridea chaetopoda	00.1	00.15		
Surreya diandra	00.1	00.10		

Site details			
Site:	CR040	**Type:**	Quadrat (20 m x 20 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.775366, 121.230027 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%)	5	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	40	**Soil:**	sand,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	evidence of feral animals, historic clearing, livestock tracks,

Land system:

Vegetation description and type: Isolated low *Eucalyptus celastroides* subsp. *celastroides* and *Casuarina pauper* trees over mid open *Dodonaea viscosa*, *Eremophila caperata* and *E. scoparia* shrubland over low *Eremophila decipiens* subsp. *decipiens*, *Ptilotus obovatus* and *Rhagodia drummondii* shrubland.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eremophila caperata	05.0	01.90		
Ptilotus obovatus	05.0	00.50		
Dodonaea viscosa	04.0	01.80		
Eremophila scoparia	04.0	01.80		
Eucalyptus celastroides subsp. *celastroides*	03.0	05.00		
Eremophila decipiens subsp. *decipiens*	02.0	00.40		
Casuarina pauper	01.0	03.00		
Senna artemisioides subsp. *filifolia*	01.0	01.90		
Exocarpos aphyllus	01.0	01.40		
Rhagodia drummondii	01.0	00.40		
Acacia hemiteles	00.1	01.50		
Olearia pimeleoides	00.1	00.60		
Enchylaena tomentosa	00.1	00.50		
Solanum nummularium	00.1	00.40		

Atriplex vesicaria	00.1	00.30
Austrostipa elegantissima	00.1	00.30
Rhyncharrhena linearis	00.1	00.30
Olearia muelleri	00.1	00.25
Maireana georgei	00.1	00.20
Maireana tomentosa subsp. *tomentosa*	00.1	00.20
Maireana trichoptera	00.1	00.20
Paspalidium gracile	00.1	00.20
Thysanotus ? *manglesianus*	00.1	00.15
Sclerolaena diacantha	00.1	00.10
Aristida contorta	00.1	00.05

Site details			
Site:	CR041	**Type:**	Quadrat (20 m x 20 m)
Date(s):	08 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.729711, 121.148352 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	plain
Tree/shrub cover >2 m (%)	5	**Soil colour:**	red-brown,
Shrub cover <2 m (%):	40	**Soil:**	clay loam, clay,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Low open*Casuarina obesa* woodland over mid open *Acacia hemiteles*, *Grevillea acuaria* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Rhagodia drummondii*, *Eremophila decipiens* subsp. *decipiens* and *Cratystylis subspinescens* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Grevillea acuaria	06.0	01.10		
Casuarina obesa	05.0	05.00		
Senna artemisioides subsp. *filifolia*	05.0	01.70		
Acacia hemiteles	05.0	01.60		
Rhagodia drummondii	03.0	00.60		
Acacia tetragonophylla	02.0	02.50		
Eremophila decipiens subsp. *decipiens*	02.0	00.40		
Atriplex nummularia	01.0	01.70		
Eremophila ionantha	01.0	01.60		
Cratystylis subspinescens	01.0	01.00		
Lycium australe	00.5	01.00		
Eucalyptus griffithsii	00.1	04.00		
Marsdenia australis	00.1	01.80		
Pimelea microcephala	00.1	01.80		
Eremophila alternifolia	00.1	01.60		

Dodonaea viscosa	00.1	01.50
Grevillea sarissa subsp. *sarissa*	00.1	01.30
Exocarpos aphyllus	00.1	01.20
Scaevola spinescens	00.1	01.20
Dianella revoluta	00.1	00.80
Enchylaena tomentosa	00.1	00.30
Pittosporum angustifolium	00.1	00.25
Vittadinia dissecta var. *hirta*	00.1	00.25
Paspalidium gracile	00.1	00.20

Site details			
Site:	CR042	**Type:**	Quadrat (20 m x 20 m)
Date(s):	09 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.733257, 121.152965 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	35	**Topography:**	plain
Tree/shrub cover >2 m (%)	20	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	20	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	none
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Mid *Eucalyptus griffithsii* and *E. longicornis* woodland over isolated tall *Exocarpos aphyllus* shrubs over mid open *Acacia hemiteles*, *Eremophila scoparia* and *Senna artemisioides* subsp. *filifolia* shrubland.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus griffithsii	20.0	11.00		
Senna artemisioides subsp. *filifolia*	12.0	01.50		
Eucalyptus longicornis	05.0	12.00		
Exocarpos aphyllus	02.0	02.20		
Eremophila scoparia	02.0	01.20		
Santalum spicatum	01.0	01.80		
Acacia hemiteles	01.0	01.10		
Scaevola spinescens	01.0	01.10		
Acacia nyssophylla	01.0	00.40		
Olearia muelleri	01.0	00.30		
Triodia scariosa	01.0	00.30		
Amyema miquelii	00.1	01.50		
Amyema preissii	00.1	01.00		
Olearia pimeleoides	00.1	00.70		
Eremophila parvifolia subsp. *auricampa*	00.1	00.50		
Austrostipa elegantissima	00.1	00.40		

Westringia rigida	00.1	00.30

Site details			
Site:	CR050	**Type:**	Quadrat (20 m x 20 m)
Date(s):	06 October 2018	**Permanent:**	Yes
Observer(s):	Alice Watt	**Position:**	-30.768472, 121.188853 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	43	**Soil:**	sandy clay, sandy loam,
Grass cover (%):	1	**Rock type:**	none
Herb cover (%):	2	**Fire age:**	not evident
Vegetation condition:	Very Good, EPA (2016)	**Disturbance**	grazing – low, livestock tracks, vehicle tracks, weed infestation,

Land system:

Vegetation description and type: Isolated mid *Senna artemisioides* subsp. *filifolia* and *Dodonaea viscosa* shrubs over low *Atriplex vesicaria*, *Tecticornia* sp. (sterile 1) and *Frankenia* ?*interioris* shrubland over isolated low *Disphyma crassifolium*, **Salvia verbeneca* and *Surreya diandra* forbs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Atriplex vesicaria	35.0	00.40		
Tecticornia sp. (sterile 1)	05.0	00.45		
Frankenia ?*interioris*	03.0	00.25		
Disphyma crassifolium	02.0	00.05		
Solanum nummularium	01.0	00.50		
Enteropogon ramosus	01.0	00.20		
Salvia verbenaca	00.5	00.15	*	
Dodonaea viscosa	00.3	01.10		
Senna artemisioides subsp. *filifolia*	00.3	01.10		
Surreya diandra	00.3	00.10		
Calandrinia eremaea	00.1	00.30		
Maireana tomentosa subsp. *tomentosa*	00.1	00.30		
Minuria cunninghamii	00.1	00.30		
Eremophila decipiens subsp. *decipiens*	00.1	00.25		

Sclerolaena eurotioides	00.1	00.25	
Austrostipa nitida	00.1	00.20	
Vittadinia dissecta var. *hirta*	00.1	00.20	
Brachyscome ciliaris	00.1	00.15	
Maireana turbinata	00.1	00.15	
Podolepis capillaris	00.1	00.15	
Sclerolaena recurvicuspis	00.1	00.10	
Goodenia havilandii	00.1	00.08	
Rytidosperma caespitosum	00.1	00.05	
Brachyscome perpusilla	00.1	00.02	
Enneapogon caerulescens	00.1	00.02	
Eragrostis dielsii	00.1	00.02	
Oxalis corniculata	00.1	00.02	*

Site details			
Site:	CR052	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.769691, 121.18423 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	0	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	38	**Soil:**	sandy clay, clay loam,
Grass cover (%):	2	**Rock type:**	none
Herb cover (%):	1	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	evidence of feral animals, grazing – low, historic clearing, historic operations, vehicle tracks,

Land system:

Vegetation description and type: Low *Atriplex vesicaria*, *Tecticornia* sp. (sterile 1) and *Surreya diandra* shrubland over isolated low *Disphyma crassifolium*, *Calandrinia eremaea* and *Sclerolaena cuneata* forbs over isolated low *Enteropogon ramosus* and *Eragrostis dielsii* grasses.

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia sp. (sterile 1)	25.0	00.50		
Atriplex vesicaria	15.0	00.50		
Disphyma crassifolium	02.0	00.05		
Enteropogon ramosus	01.0	00.20		
Surreya diandra	01.0	00.10		
Sclerolaena cuneata	00.5	00.30		
Frankenia setosa	00.5	00.25		
Eremophila scoparia	00.1	00.45		
Roycea divaricata	00.1	00.40		
Solanum nummularium	00.1	00.40		
Calandrinia eremaea	00.1	00.30		
Minuria cunninghamii	00.1	00.30		
Maireana eriosphaera	00.1	00.25		

Maireana triptera	00.1	00.25
Maireana georgei	00.1	00.20
Maireana tomentosa subsp. *tomentosa*	00.1	00.20
Paspalidium gracile	00.1	00.20
Thysanotus patersonii	00.1	00.15
Brachyscome ciliaris	00.1	00.10
Eragrostis dielsii	00.1	00.01

Site details			
Site:	CR053	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.765715, 121.182157 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	mesa
Tree/shrub cover >2 m (%)	25	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	5	**Soil:**	clay loam, clay,
Grass cover (%):	0	**Rock type:**	ferrous – ironstone;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Tall open *Acacia burkitii*, *A. tetragonophylla* and *Eremophila oldfieldii* shrubland over sparse mid *Dodonaea lobulata*, *Eremophila alternifolia* and *Scaevola spinescens* shrubs over isolated low *Ptilotus obovatus* and *Prostanthera grylloana* shrubs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia burkittii	15.0	03.00		
Acacia tetragonophylla	05.0	04.00		
Dodonaea lobulata	03.0	01.80		
Eremophila alternifolia	01.0	01.50		
Scaevola spinescens	01.0	01.50		
Ptilotus obovatus	00.2	00.50		
Eremophila oldfieldii	00.1	02.00		
Pittosporum angustifolium	00.1	01.20		
Stenanthemum stipulosum	00.1	01.20		
Olearia pimeleoides	00.1	01.00		
Prostanthera grylloana	00.1	00.50		
Cheilanthes lasiophylla	00.1	00.15		

Site details			
Site:	CR054	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.768099, 121.186731 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	40	**Topography:**	hill slope
Tree/shrub cover >2 m (%)	30	**Soil colour:**	brown,
Shrub cover <2 m (%):	15	**Soil:**	sandy loam,
Grass cover (%):	0	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Good, EPA (2016)	**Disturbance**	evidence of feral animals, historic clearing, vehicle tracks,

Land system:

Vegetation description and type: Mid *Eucalyptus longicornis* woodland over mid open *Cratystylis conocephala*, *Santalum acuminatum* and *Senna artemisioides* subsp. *filifolia* shrubland over isolated low *Atriplex vesicaria*, *Rhagodia drummondii* and *Olearia muelleri* shrubs.

Species	Cover (%)	Height (m)	Weed	Conservation status
Eucalyptus longicornis	30.0	15.00		
Cratystylis conocephala	12.0	01.30		
Senna artemisioides subsp. *filifolia*	02.0	01.20		
Atriplex vesicaria	02.0	00.50		
Rhagodia drummondii	01.0	00.60		
Santalum acuminatum	00.1	01.00		
Eremophila parvifolia subsp. *auricampa*	00.1	00.40		
Exocarpos aphyllus	00.1	00.40		
Ptilotus obovatus	00.1	00.40		
Senna sp. Austin (A. Strid 20210)	00.1	00.40		
Scaevola spinescens	00.1	00.30		
Westringia rigida	00.1	00.30		
Acacia xerophila var. *brevior*	00.1	00.25		
Maireana convexa	00.1	00.25		

Olearia muelleri	00.1	00.25
Austrostipa nitida	00.1	00.20
Sclerolaena diacantha	00.1	00.15

Site details			
Site:	CR055	**Type:**	Quadrat (20 m x 20 m)
Date(s):	07 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.768083, 121.185741 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	45	**Topography:**	hill top
Tree/shrub cover >2 m (%)	20	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	30	**Soil:**	sandy clay, clay loam,
Grass cover (%):	0	**Rock type:**	granite rocks;
Herb cover (%):	0	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Tall open *Acacia burkitii* shrubland over mid *Dodonaea lobulata*, *Eremophila granitica* and *Scaevola spinescens* shrubland over isolated clumps of low *Austrostipa elegantissima* grasses.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Acacia burkittii	20.0	02.20		
Eremophila granitica	15.0	01.40		
Dodonaea lobulata	12.0	01.60		
Scaevola spinescens	02.0	01.10		
Eremophila oldfieldii	01.0	01.50		
Rhyncharrhena linearis	00.1	01.00		
Austrostipa elegantissima	00.1	00.30		
Ptilotus obovatus	00.1	00.30		

Site details			
Site:	CR060	**Type:**	Quadrat (20 m x 20 m)
Date(s):	09 October 2018	**Permanent:**	Yes
Observer(s):	Grant Wells	**Position:**	-30.767379, 121.198461 (North-west)
Vegetation		**Physical features**	
Total vegetation cover (%):	30	**Topography:**	undulating plain
Tree/shrub cover >2 m (%)	1	**Soil colour:**	red-orange,
Shrub cover <2 m (%):	28	**Soil:**	sand,
Grass cover (%):	0	**Rock type:**	quartz;
Herb cover (%):	2	**Fire age:**	not evident
Vegetation condition:	Excellent, EPA (2016)	**Disturbance**	none,
Land system:			
Vegetation description and type:	Isolated tall *Melaleuca halmaturorum* shrubs over low open *Tecticornia doliiformis*, *T. indica* subsp. *bidens* and *T. undultata* chenopod shrubland over isolated low *Disphyma crassifolium*, *Calandrinia* ?*quartzica* and *Sclerolaena cuneata* forbs.		

Species	Cover (%)	Height (m)	Weed	Conservation status
Tecticornia doliiformis	10.0	00.30		
Tecticornia undulata	05.0	00.30		
Tecticornia indica subsp. *bidens*	05.0	00.25		
Tecticornia pruinosa	03.0	00.30		
Disphyma crassifolium	02.0	00.10		
Melaleuca halmaturorum	01.0	02.00		
Dodonaea viscosa	00.1	01.00		
Atriplex vesicaria	00.1	00.30		
Calandrinia ?*quartzitica*	00.1	00.30		
Enchylaena tomentosa	00.1	00.30		
Sclerolaena cuneata	00.1	00.25		
Tecticornia sp. (sterile 2)	00.1	00.20		

Appendix 2 Flora species records from desktop review

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Aizoaceae	*Aizoon pubescens*		*		
Aizoaceae	*Disphyma crassifolium* subsp. *clavellatum*				
Aizoaceae	*Gunniopsis quadrifida*				
Aizoaceae	*Mesembryanthemum crystallinum*		*		
Aizoaceae	*Mesembryanthemum nodiflorum*		*		
Aizoaceae	*Tetragonia eremaea*				
Amaranthaceae	*Alternanthera denticulata*				
Amaranthaceae	*Alternanthera nodiflora*				
Amaranthaceae	*Amaranthus viridis*		*		
Amaranthaceae	*Ptilotus aervoides*				
Amaranthaceae	*Ptilotus carlsonii*				
Amaranthaceae	*Ptilotus chortophytus*	P1 (DBCA list)			
Amaranthaceae	*Ptilotus eremita*				
Amaranthaceae	*Ptilotus exaltatus*				
Amaranthaceae	*Ptilotus gaudichaudii*				
Amaranthaceae	*Ptilotus grandiflorus*				
Amaranthaceae	*Ptilotus helichrysoides*				
Amaranthaceae	*Ptilotus holosericeus*				
Amaranthaceae	*Ptilotus nobilis*				
Amaranthaceae	*Ptilotus obovatus*				
Amaranthaceae	*Ptilotus procumbens*	P1 (DBCA list)			
Amaranthaceae	*Surreya diandra*				
Anacardiaceae	*Schinus molle* var. *areira*		*		
Apiaceae	*Daucus glochidiatus*				
Apocynaceae	*Alyxia buxifolia*				
Apocynaceae	*Alyxia tetanifolia*	P3 (DBCA list)			
Apocynaceae	*Asclepias curassavica*		*		
Apocynaceae	*Marsdenia australis*				
Apocynaceae	*Orbea variegata*		*		
Apocynaceae	*Rhyncharrhena linearis*				
Araliaceae	*Trachymene ornata*				
Asparagaceae	*Agave americana*		*		
Asparagaceae	*Chamaexeros fimbriata*				
Asparagaceae	*Chamaexeros macranthera*				
Asparagaceae	*Thysanotus manglesianus*				
Asparagaceae	*Thysanotus patersonii*				
Asphodelaceae	*Asphodelus fistulosus*		*		
Asphodelaceae	*Bulbine semibarbata*				
Asteraceae	*Actinobole uliginosum*				
Asteraceae	*Angianthus cornutus*				
Asteraceae	*Angianthus prostratus*	P3 (DBCA list)			

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Asteraceae	*Angianthus tomentosus*				
Asteraceae	*Arctotheca calendula*		*		
Asteraceae	*Asteridea athrixioides*				
Asteraceae	*Asteridea chaetopoda*				
Asteraceae	*Brachyscome ciliaris*				
Asteraceae	*Brachyscome iberidifolia*				
Asteraceae	*Brachyscome lineariloba*				
Asteraceae	*Brachyscome perpusilla*				
Asteraceae	*Calotis hispidula*				
Asteraceae	*Calotis multicaulis*				
Asteraceae	*Carthamus lanatus*		*		
Asteraceae	*Centaurea melitensis*		*		
Asteraceae	*Cephalipterum drummondii*				
Asteraceae	*Ceratogyne obionoides*				
Asteraceae	*Chrysocephalum apiculatum* subsp. *norsemanense*	P3 (DBCA list)			
Asteraceae	*Chrysocephalum puteale*				
Asteraceae	*Cichorium intybus*		*		
Asteraceae	*Conyza bonariensis*		*		
Asteraceae	*Conyza sumatrensis*		*		
Asteraceae	*Cotula australis*				
Asteraceae	*Craspedia haplorrhiza*				
Asteraceae	*Cratystylis conocephala*				
Asteraceae	*Cratystylis microphylla*				
Asteraceae	*Cratystylis subspinescens*				
Asteraceae	*Elachanthus pusillus*	P2 (DBCA list)			
Asteraceae	*Erymophyllum ramosum*				
Asteraceae	*Erymophyllum ramosum* subsp. *ramosum*				
Asteraceae	*Gazania linearis*		*		
Asteraceae	*Gilberta tenuifolia*				
Asteraceae	*Gnephosis brevifolia*				
Asteraceae	*Gnephosis tenuissima*				
Asteraceae	*Helianthus annuus*		*		
Asteraceae	*Helipterum craspedioides*				
Asteraceae	*Hyalosperma glutinosum*				
Asteraceae	*Hyalosperma glutinosum* subsp. *glutinosum*				
Asteraceae	*Hyalosperma zacchaeus*				
Asteraceae	*Isoetopsis graminifolia*				
Asteraceae	*Kippistia suaedifolia*				
Asteraceae	*Lactuca serriola* forma *serriola*		*		
Asteraceae	*Lawrencella rosea*				
Asteraceae	*Leiocarpa websteri*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Asteraceae	*Lemooria burkittii*				
Asteraceae	*Millotia myosotidifolia*				
Asteraceae	*Millotia perpusilla*				
Asteraceae	*Minuria cunninghamii*				
Asteraceae	*Minuria gardneri*				
Asteraceae	*Minuria leptophylla*				
Asteraceae	*Monoculus monstrosus*		*		
Asteraceae	*Myriocephalus pygmaeus*				
Asteraceae	*Notisia intonsa*	P3 (DBCA list)			
Asteraceae	*Olearia exiguifolia*				
Asteraceae	*Olearia homolepis*				
Asteraceae	*Olearia incana*				
Asteraceae	*Olearia muelleri*				
Asteraceae	*Olearia pimeleoides*				
Asteraceae	*Olearia rudis*				
Asteraceae	*Olearia* sp. Eremicola (Diels & Pritzel s.n. PERTH 00449628)				
Asteraceae	*Olearia subspicata*				
Asteraceae	*Oligocarpus calendulaceus*		*		
Asteraceae	*Oncosiphon suffruticosum*		*		
Asteraceae	*Opuntia elata*		*	Y	s22(2) (C3 Restricted)
Asteraceae	*Ozothamnus cassiope*				
Asteraceae	*Podolepis aristata* subsp. *affinis*				
Asteraceae	*Podolepis capillaris*				
Asteraceae	*Podolepis lessonii*				
Asteraceae	*Podolepis rugata*				
Asteraceae	*Podotheca wilsonii*				
Asteraceae	*Pogonolepis muelleriana*				
Asteraceae	*Pogonolepis stricta*				
Asteraceae	*Rhodanthe battii*				
Asteraceae	*Rhodanthe charsleyae*				
Asteraceae	*Rhodanthe chlorocephala* subsp. *rosea*				
Asteraceae	*Rhodanthe chlorocephala* subsp. *splendida*				
Asteraceae	*Rhodanthe floribunda*				
Asteraceae	*Rhodanthe haigii*				
Asteraceae	*Rhodanthe laevis*				
Asteraceae	*Rhodanthe manglesii*				
Asteraceae	*Rhodanthe oppositifolia* subsp. *oppositifolia*				
Asteraceae	*Rhodanthe pygmaea*				
Asteraceae	*Rhodanthe rubella*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Asteraceae	*Rhodanthe stricta*				
Asteraceae	*Rhodanthe uniflora*	P1 (DBCA list)			
Asteraceae	*Schoenia cassiniana*				
Asteraceae	*Schoenia filifolia* subsp. *filifolia*				
Asteraceae	*Senecio dolichocephalus*				
Asteraceae	*Senecio glossanthus*				
Asteraceae	*Senecio lacustrinus*				
Asteraceae	*Senecio magnificus*				
Asteraceae	*Senecio pinnatifolius*				
Asteraceae	*Sonchus oleraceus*		*		
Asteraceae	*Streptoglossa liatroides*				
Asteraceae	*Symphyotrichum squamatum*		*		
Asteraceae	*Trichanthodium skirrophorum*				
Asteraceae	*Triptilodiscus pygmaeus*				
Asteraceae	*Vittadinia cervicularis* var. *cervicularis*				
Asteraceae	*Vittadinia dissecta* var. *hirta*				
Asteraceae	*Vittadinia humerata*				
Asteraceae	*Vittadinia sulcata*				
Asteraceae	*Waitzia acuminata* var. *acuminata*				
Asteraceae	*Waitzia fitzgibbonii*				
Asteraceae	*Waitzia nitida*				
Boraginaceae	*Buglossoides arvensis*		*		
Boraginaceae	*Echium plantagineum*		*		
Boraginaceae	*Halgania andromedifolia*				
Boraginaceae	*Halgania cyanea* var. Allambi Stn (B.W. Strong 676)				
Boraginaceae	*Halgania cyanea* var. Charleville (R.W. Purdie +111)				
Boraginaceae	*Halgania integerrima*				
Boraginaceae	*Heliotropium europaeum*		*		
Boraginaceae	*Omphalolappula concava*				
Boraginaceae	*Trichodesma zeylanicum*				
Brassicaceae	*Alyssum linifolium*		*		s22(2) (Exempt)
Brassicaceae	*Arabidella chrysodema*				
Brassicaceae	*Arabidella trisecta*				
Brassicaceae	*Brassica tournefortii*		*		
Brassicaceae	*Capsella bursa-pastoris*		*		
Brassicaceae	*Carrichtera annua*		*		

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Brassicaceae	*Lepidium fasciculatum*	P3 (DBCA list)			
Brassicaceae	*Lepidium merrallii*	P2 (DBCA list)			
Brassicaceae	*Lepidium oxytrichum*				
Brassicaceae	*Lepidium papillosum*				
Brassicaceae	*Phlegmatospermum eremaeum*	P3 (DBCA list)			
Brassicaceae	*Sisymbrium irio*		*		
Brassicaceae	*Sisymbrium orientale*		*		
Brassicaceae	*Stenopetalum filifolium*				
Brassicaceae	*Stenopetalum lineare*				
Brassicaceae	*Stenopetalum lineare* var. *lineare*				
Brassicaceae	*Stenopetalum pedicellare*				
Bryaceae	*Bryum lanatum*				
Bryaceae	*Rosulabryum billarderii*				
Bryaceae	*Rosulabryum capillare*				
Cactaceae	*Cylindropuntia fulgida* var. *mamillata*		*	Y	
Cactaceae	*Cylindropuntia imbricata*		*	Y	s22(2) (C3 Restricted)
Cactaceae	*Cylindropuntia kleiniae*		*	Y	s22(2) (C3 Restricted)
Cactaceae	*Cylindropuntia tunicata*		*	Y	s22(2) (C3 Restricted)
Cactaceae	*Lycium ferocissimum*		*	Y	
Cactaceae	*Opuntia ficus-indica*		*	Y	s22(2) (C3 Restricted)
Campanulaceae	*Isotoma petraea*				
Campanulaceae	*Wahlenbergia gracilenta*				
Caryophyllaceae	*Spergularia diandra*		*		
Caryophyllaceae	*Spergularia marina*				
Casuarinaceae	*Allocasuarina acutivalvis* subsp. *acutivalvis*				
Casuarinaceae	*Allocasuarina campestris*				
Casuarinaceae	*Allocasuarina corniculata*				
Casuarinaceae	*Allocasuarina eriochlamys* subsp. *eriochlamys*				
Casuarinaceae	*Allocasuarina eriochlamys* subsp. *grossa*	P3 (DBCA list)			
Casuarinaceae	*Allocasuarina helmsii*				
Casuarinaceae	*Casuarina obesa*				
Casuarinaceae	*Casuarina pauper*				
Celastraceae	*Stackhousia muricata*				
Celastraceae	*Tripterococcus brunonis*				
Chenopodiaceae	*Atriplex acutibractea* subsp. *acutibractea*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Chenopodiaceae	*Atriplex acutibractea* subsp. *karoniensis*				
Chenopodiaceae	*Atriplex amnicola*				
Chenopodiaceae	*Atriplex codonocarpa*				
Chenopodiaceae	*Atriplex eardleyae*				
Chenopodiaceae	*Atriplex holocarpa*				
Chenopodiaceae	*Atriplex lindleyi* subsp. *inflata*				
Chenopodiaceae	*Atriplex nummularia*				
Chenopodiaceae	*Atriplex nummularia* subsp. *spathulata*				
Chenopodiaceae	*Atriplex pumilio*				
Chenopodiaceae	*Atriplex quadrivalvata* var. *quadrivalvata*				
Chenopodiaceae	*Atriplex semibaccata*				
Chenopodiaceae	*Atriplex spongiosa*				
Chenopodiaceae	*Atriplex stipitata*				
Chenopodiaceae	*Atriplex suberecta*				
Chenopodiaceae	*Atriplex vesicaria*				
Chenopodiaceae	*Chenopodium album*		*		
Chenopodiaceae	*Chenopodium curvispicatum*				
Chenopodiaceae	*Chenopodium murale*		*		
Chenopodiaceae	*Didymanthus roei*				
Chenopodiaceae	*Dissocarpus paradoxus*				
Chenopodiaceae	*Dysphania cristata*				
Chenopodiaceae	*Dysphania kalpari*				
Chenopodiaceae	*Dysphania pumilio*				
Chenopodiaceae	*Einadia nutans* subsp. *eremaea*				
Chenopodiaceae	*Enchylaena lanata*				
Chenopodiaceae	*Enchylaena tomentosa*				
Chenopodiaceae	*Enchylaena tomentosa* var. *tomentosa*				
Chenopodiaceae	*Eriochiton sclerolaenoides*				
Chenopodiaceae	*Maireana amoena*				
Chenopodiaceae	*Maireana appressa*				
Chenopodiaceae	*Maireana atkinsiana*				
Chenopodiaceae	*Maireana brevifolia*				
Chenopodiaceae	*Maireana carnosa*				
Chenopodiaceae	*Maireana erioclada*				
Chenopodiaceae	*Maireana eriosphaera*				
Chenopodiaceae	*Maireana georgei*				
Chenopodiaceae	*Maireana glomerifolia*				
Chenopodiaceae	*Maireana pentagona*				
Chenopodiaceae	*Maireana pentatropis*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Chenopodiaceae	*Maireana pyramidata*				
Chenopodiaceae	*Maireana radiata*				
Chenopodiaceae	*Maireana sedifolia*				
Chenopodiaceae	*Maireana suaedifolia*				
Chenopodiaceae	*Maireana tomentosa*				
Chenopodiaceae	*Maireana tomentosa* subsp. *tomentosa*				
Chenopodiaceae	*Maireana trichoptera*				
Chenopodiaceae	*Maireana triptera*				
Chenopodiaceae	*Maireana turbinata*				
Chenopodiaceae	*Rhagodia drummondii*				
Chenopodiaceae	*Rhagodia eremaea*				
Chenopodiaceae	*Roycea divaricata*				
Chenopodiaceae	*Salsola australis*				
Chenopodiaceae	*Sclerolaena cuneata*				
Chenopodiaceae	*Sclerolaena diacantha*				
Chenopodiaceae	*Sclerolaena drummondii*				
Chenopodiaceae	*Sclerolaena eurotioides*				
Chenopodiaceae	*Sclerolaena fusiformis*				
Chenopodiaceae	*Sclerolaena gardneri*				
Chenopodiaceae	*Sclerolaena obliquicuspis*				
Chenopodiaceae	*Sclerolaena parviflora*				
Chenopodiaceae	*Tecticornia chartacea*				
Chenopodiaceae	*Tecticornia disarticulata*				
Chenopodiaceae	*Tecticornia doliiformis*				
Chenopodiaceae	*Tecticornia halocnemoides*				
Chenopodiaceae	*Tecticornia indica* subsp. *bidens*				
Chenopodiaceae	*Tecticornia pergranulata* subsp. *elongata*				
Chenopodiaceae	*Tecticornia pergranulata* subsp. *pergranulata*				
Chenopodiaceae	*Tecticornia pruinosa*				
Chenopodiaceae	*Tecticornia pterygosperma* subsp. *pterygosperma*				
Chenopodiaceae	*Tecticornia* sp. Burnerbinmah (D. Edinger et al. 101)				
Chenopodiaceae	*Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)				
Chenopodiaceae	*Tecticornia triandra*				
Chenopodiaceae	*Tecticornia undulata*				
Colchicaceae	*Wurmbea tenella*				
Convolvulaceae	*Convolvulus clementii*				
Convolvulaceae	*Convolvulus remotus*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Convolvulaceae	*Ipomoea calobra*				
Crassulaceae	*Crassula colorata* var. *acuminata*				
Crassulaceae	*Crassula colorata* var. *colorata*				
Crassulaceae	*Crassula tetramera*				
Cucurbitaceae	*Cucumis myriocarpus*		*		
Cupressaceae	*Callitris columellaris*				
Cupressaceae	*Callitris preissii*				
Cyperaceae	*Chrysitrix distigmatosa*				
Cyperaceae	*Gahnia deusta*				
Cyperaceae	*Isolepis australiensis*	P3 (DBCA list)			
Cyperaceae	*Isolepis congrua*				
Cyperaceae	*Lepidosperma diurnum*				
Cyperaceae	*Lepidosperma* sp. Parker Range (N. Gibson & M. Lyons 2094)	P1 (DBCA list)			
Cyperaceae	*Mesomelaena preissii*				
Cyperaceae	*Schoenus subaphyllus*				
Didiereaceae	*Portulacaria afra*		*		
Droseraceae	*Drosera macrantha*				
Elaeocarpaceae	*Tetratheca efoliata*				
Ericaceae	*Leucopogon hamulosus*				
Ericaceae	*Leucopogon* sp. Clyde Hill (M.A. Burgman 1207)				
Ericaceae	*Melichrus* sp. Coolgardie	P1 (DBCA list)			
Ericaceae	*Styphelia* sp. Bullfinch	P3 (DBCA list)			
Euphorbiaceae	*Beyeria lechenaultii*				
Euphorbiaceae	*Beyeria sulcata* var. *brevipes*				
Euphorbiaceae	*Beyeria sulcata* var. *sulcata*				
Euphorbiaceae	*Euphorbia philochalix*				
Euphorbiaceae	*Euphorbia porcata*				
Euphorbiaceae	*Monotaxis grandiflora* var. *obtusifolia*				
Euphorbiaceae	*Monotaxis luteiflora*				
Euphorbiaceae	*Ricinocarpos stylosus*				
Euphorbiaceae	*Ricinocarpos velutinus*				
Fabaceae	*Acacia acuminata*				
Fabaceae	*Acacia ancistrophylla* var. *ancistrophylla*				
Fabaceae	*Acacia andrewsii*				
Fabaceae	*Acacia beauverdiana*				
Fabaceae	*Acacia burkittii*				
Fabaceae	*Acacia calcarata*				
Fabaceae	*Acacia camptoclada*				
Fabaceae	*Acacia chrysella*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Fabaceae	*Acacia coatesii*	P1 (DBCA list)			
Fabaceae	*Acacia collegialis*				
Fabaceae	*Acacia colletioides*				
Fabaceae	*Acacia coolgardiensis*				
Fabaceae	*Acacia crenulata*	P3 (DBCA list)			
Fabaceae	*Acacia deficiens*				
Fabaceae	*Acacia desertorum* var. *desertorum*				
Fabaceae	*Acacia duriuscula*				
Fabaceae	*Acacia effusifolia*				
Fabaceae	*Acacia enervia*				
Fabaceae	*Acacia enervia* subsp. *explicata*				
Fabaceae	*Acacia epedunculata*	P1 (DBCA list)			
Fabaceae	*Acacia eremophila* var. *eremophila*				
Fabaceae	*Acacia erinacea*				
Fabaceae	*Acacia gibbosa*				
Fabaceae	*Acacia hemiteles*				
Fabaceae	*Acacia inaequiloba*				
Fabaceae	*Acacia inceana* subsp. *inceana*				
Fabaceae	*Acacia jennerae*				
Fabaceae	*Acacia jensenii*				
Fabaceae	*Acacia jibberdingensis*				
Fabaceae	*Acacia kalgoorliensis*				
Fabaceae	*Acacia lasiocalyx*				
Fabaceae	*Acacia leptopetala*				
Fabaceae	*Acacia ligulata*				
Fabaceae	*Acacia longispinea*				
Fabaceae	*Acacia masliniana*				
Fabaceae	*Acacia merrallii*				
Fabaceae	*Acacia multispicata*				
Fabaceae	*Acacia murrayana*				
Fabaceae	*Acacia nyssophylla*				
Fabaceae	*Acacia pachypoda*				
Fabaceae	*Acacia prainii*				
Fabaceae	*Acacia pycnantha*		*		
Fabaceae	*Acacia ramulosa* var. *ramulosa*				
Fabaceae	*Acacia rendlei*				
Fabaceae	*Acacia resinimarginea*				
Fabaceae	*Acacia resinistipulea*				
Fabaceae	*Acacia sclerophylla* var. *teretiuscula*	P1 (DBCA list)			

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Fabaceae	*Acacia sclerosperma* subsp. *sclerosperma*				
Fabaceae	*Acacia sericocarpa*				
Fabaceae	*Acacia synchronicia*				
Fabaceae	*Acacia tetragonophylla*				
Fabaceae	*Acacia websteri*	P1 (DBCA list)			
Fabaceae	*Acacia xerophila* var. *brevior*				
Fabaceae	*Acacia yorkrakinensis* subsp. *acrita*				
Fabaceae	*Alhagi maurorum*		*		s22(2) (C3)
Fabaceae	*Bossiaea cucullata*				
Fabaceae	*Cullen discolor*				
Fabaceae	*Cullen leucanthum*				
Fabaceae	*Daviesia aphylla*				
Fabaceae	*Daviesia grahamii*				
Fabaceae	*Daviesia nematophylla*				
Fabaceae	*Daviesia pachyloma*				
Fabaceae	*Dillwynia* sp. Coolgardie (V.E. Sands 637.3.1)				
Fabaceae	*Erythrostemon gilliesii*		*		
Fabaceae	*Gastrolobium graniticum*	EN (EPBC Act); VU (BC Act)			
Fabaceae	*Glycyrrhiza acanthocarpa*				
Fabaceae	*Gompholobium cinereum*	P3 (DBCA list)			
Fabaceae	*Gompholobium gompholobioides*				
Fabaceae	*Hovea acanthoclada*				
Fabaceae	*Jacksonia arida*				
Fabaceae	*Kennedia prorepens*				
Fabaceae	*Leptosema daviesioides*				
Fabaceae	*Lotus cruentus*				
Fabaceae	*Medicago laciniata*		*		
Fabaceae	*Medicago minima*		*		
Fabaceae	*Medicago polymorpha*		*		
Fabaceae	*Mirbelia depressa*				
Fabaceae	*Mirbelia microphylla*				
Fabaceae	*Mirbelia ramulosa*				
Fabaceae	*Mirbelia seorsifolia*				
Fabaceae	*Petalostylis cassioides*				
Fabaceae	*Senna artemisioides*				
Fabaceae	*Senna artemisioides* subsp. *filifolia*				
Fabaceae	*Senna artemisioides* subsp. x *artemisioides*				
Fabaceae	*Senna cardiosperma*				
Fabaceae	*Senna pleurocarpa*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Fabaceae	*Senna pleurocarpa* var. *angustifolia*				
Fabaceae	*Senna pleurocarpa* var. *pleurocarpa*				
Fabaceae	*Senna* sp. Austin (A. Strid 20210)				
Fabaceae	*Senna stowardii*				
Fabaceae	*Swainsona affinis*				
Fabaceae	*Swainsona beasleyana*				
Fabaceae	*Swainsona canescens*				
Fabaceae	*Swainsona colutoides*				
Fabaceae	*Swainsona gracilis*				
Fabaceae	*Swainsona halophila*				
Fabaceae	*Swainsona incei*				
Fabaceae	*Swainsona kingii*				
Fabaceae	*Swainsona leeana*				
Fabaceae	*Swainsona oliveri*				
Fabaceae	*Swainsona oroboides*				
Fabaceae	*Swainsona paradoxa*				
Fabaceae	*Swainsona purpurea*				
Fabaceae	*Swainsona rostellata*				
Fabaceae	*Templetonia incrassata*				
Fabaceae	*Vicia monantha* subsp. *triflora*		*		
Fissidentaceae	*Fissidens megalotis*				
Frankeniaceae	*Frankenia cinerea*				
Frankeniaceae	*Frankenia desertorum*				
Frankeniaceae	*Frankenia glomerata*	P4 (DBCA list)			
Frankeniaceae	*Frankenia interioris*				
Frankeniaceae	*Frankenia interioris* var. *interioris*				
Frankeniaceae	*Frankenia pauciflora*				
Frankeniaceae	*Frankenia pauciflora* var. *pauciflora*				
Frankeniaceae	*Frankenia setosa*				
Frankeniaceae	*Frankenia tetrapetala*				
Gentianaceae	*Schenkia clementii*				
Geraniaceae	*Erodium aureum*		*		
Geraniaceae	*Erodium botrys*		*		
Geraniaceae	*Erodium cicutarium*		*		
Geraniaceae	*Erodium crinitum*				
Geraniaceae	*Erodium cygnorum*				
Goodeniaceae	*Brunonia australis*				
Goodeniaceae	*Brunonia sp. Goldfields (K.R. Newbey 6044)*				
Goodeniaceae	*Coopernookia strophiolata*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Goodeniaceae	*Dampiera eriocephala*				
Goodeniaceae	*Dampiera latealata*				
Goodeniaceae	*Dampiera lavandulacea*				
Goodeniaceae	*Dampiera luteiflora*				
Goodeniaceae	*Dampiera plumosa*	P1 (DBCA list)			
Goodeniaceae	*Dampiera stenostachya*				
Goodeniaceae	*Dampiera tenuicaulis*				
Goodeniaceae	*Dampiera tenuicaulis* var. *curvula*				
Goodeniaceae	*Dampiera tenuicaulis* var. *tenuicaulis*				
Goodeniaceae	*Goodenia concinna*				
Goodeniaceae	*Goodenia dyeri*				
Goodeniaceae	*Goodenia elderi*				
Goodeniaceae	*Goodenia havilandii*				
Goodeniaceae	*Goodenia helmsii*				
Goodeniaceae	*Goodenia mimuloides*				
Goodeniaceae	*Goodenia occidentalis*				
Goodeniaceae	*Goodenia pusilliflora*				
Goodeniaceae	*Goodenia salina*	P2 (DBCA list)			
Goodeniaceae	*Goodenia xanthosperma*				
Goodeniaceae	*Lechenaultia brevifolia*				
Goodeniaceae	*Scaevola spinescens*				
Goodeniaceae	*Velleia cycnopotamica*				
Goodeniaceae	*Velleia discophora*				
Goodeniaceae	*Velleia rosea*				
Goodeniaceae	*Verreauxia dyeri*				
Grimmiaceae	*Grimmia laevigata*				
Gyrostemonaceae	*Gyrostemon racemiger*				
Haloragaceae	*Glischrocaryon angustifolium*				
Haloragaceae	*Glischrocaryon aureum*				
Haloragaceae	*Glischrocaryon flavescens*				
Haloragaceae	*Gonocarpus confertifolius* var. *helmsii*				
Haloragaceae	*Haloragis gossei*				
Haloragaceae	*Haloragis trigonocarpa*				
Juncaceae	*Juncus subsecundus*				
Lamiaceae	*Brachysola coerulea*				
Lamiaceae	*Cyanostegia angustifolia*				
Lamiaceae	*Cyanostegia microphylla*				
Lamiaceae	*Dasymalla terminalis*				
Lamiaceae	*Dicrastylis brunnea*				
Lamiaceae	*Dicrastylis parvifolia*				
Lamiaceae	*Hemiphora elderi*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Lamiaceae	*Lachnostachys coolgardiensis*				
Lamiaceae	*Physopsis viscida*				
Lamiaceae	*Pityrodia lepidota*				
Lamiaceae	*Prostanthera althoferi* subsp. *althoferi*				
Lamiaceae	*Prostanthera campbellii*				
Lamiaceae	*Prostanthera grylloana*				
Lamiaceae	*Prostanthera incurvata*				
Lamiaceae	*Salvia reflexa*		*		
Lamiaceae	*Salvia verbenaca*		*		
Lamiaceae	*Teucrium sessiliflorum*				
Lamiaceae	*Westringia cephalantha*				
Lamiaceae	*Westringia cephalantha* var. *caterva*				
Lamiaceae	*Westringia rigida*				
Loganiaceae	*Orianthera flaviflora*				
Loganiaceae	*Orianthera tortuosa*				
Loganiaceae	*Phyllangium sulcatum*				
Loranthaceae	*Amyema benthamii*				
Loranthaceae	*Amyema gibberula* var. *gibberula*				
Loranthaceae	*Amyema linophylla* subsp. *linophylla*				
Loranthaceae	*Amyema miquelii*				
Loranthaceae	*Amyema preissii*				
Loranthaceae	*Lysiana casuarinae*				
Lythraceae	*Lythrum hyssopifolia*		*		
Malvaceae	*Abutilon cryptopetalum*				
Malvaceae	*Androcalva aphrix*				
Malvaceae	*Androcalva luteiflora*				
Malvaceae	*Brachychiton gregorii*				
Malvaceae	*Commersonia craurophylla*				
Malvaceae	*Commersonia magniflora* subsp. *oblongifolia*				
Malvaceae	*Hannafordia bissillii* subsp. *latifolia*				
Malvaceae	*Hibiscus solanifolius*				
Malvaceae	*Lawrencia glomerata*				
Malvaceae	*Lawrencia helmsii*				
Malvaceae	*Lawrencia repens*				
Malvaceae	*Lawrencia squamata*				
Malvaceae	*Malva parviflora*		*		
Malvaceae	*Malva weinmanniana*				
Malvaceae	*Radyera farragei*				
Malvaceae	*Seringia velutina*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Malvaceae	*Sida calyxhymenia*				
Malvaceae	*Sida fibulifera*				
Malvaceae	*Sida intricata*				
Malvaceae	*Sida spodochroma*				
Meliaceae	*Melia azedarach*				
Myrtaceae	*Aluta appressa*				
Myrtaceae	*Aluta aspera* subsp. *aspera*				
Myrtaceae	*Astus subroseus*				
Myrtaceae	*Baeckea elderiana*				
Myrtaceae	*Baeckea* sp. Koonadgin (B.L. Rye & M.E. Trudgen BLR 241137)				
Myrtaceae	*Calothamnus gilesii*				
Myrtaceae	*Calytrix amethystina*				
Myrtaceae	*Calytrix birdii*				
Myrtaceae	*Calytrix breviseta* subsp. *stipulosa*				
Myrtaceae	*Cyathostemon verrucosus*	P3 (DBCA list)			
Myrtaceae	*Enekbatus eremaeus*				
Myrtaceae	*Ericomyrtus serpyllifolia*				
Myrtaceae	*Eucalyptus campaspe*				
Myrtaceae	*Eucalyptus capillosa*				
Myrtaceae	*Eucalyptus celastroides*				
Myrtaceae	*Eucalyptus celastroides* subsp. *celastroides*				
Myrtaceae	*Eucalyptus clelandiorum*				
Myrtaceae	*Eucalyptus comitae-vallis*				
Myrtaceae	*Eucalyptus concinna*				
Myrtaceae	*Eucalyptus corrugata*				
Myrtaceae	*Eucalyptus cylindrocarpa*				
Myrtaceae	*Eucalyptus distuberosa* subsp. *distuberosa*				
Myrtaceae	*Eucalyptus ebbanoensis* subsp. *ebbanoensis*				
Myrtaceae	*Eucalyptus ebbanoensis* subsp. *glauciramula*				
Myrtaceae	*Eucalyptus eremicola*				
Myrtaceae	*Eucalyptus eremophila*				
Myrtaceae	*Eucalyptus eremophila* subsp. *eremophila*				
Myrtaceae	*Eucalyptus ewartiana*				
Myrtaceae	*Eucalyptus flavida*				
Myrtaceae	*Eucalyptus flocktoniae*				
Myrtaceae	*Eucalyptus flocktoniae* subsp. *hebes*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Myrtaceae	*Eucalyptus fraseri* subsp. *fraseri*				
Myrtaceae	*Eucalyptus griffithsii*				
Myrtaceae	*Eucalyptus horistes*				
Myrtaceae	*Eucalyptus incrassata*				
Myrtaceae	*Eucalyptus jutsonii* subsp. *jutsonii*	P4 (DBCA list)			
Myrtaceae	*Eucalyptus leptophylla*				
Myrtaceae	*Eucalyptus leptopoda* subsp. *subluta*				
Myrtaceae	*Eucalyptus lesouefii*				
Myrtaceae	*Eucalyptus livida*				
Myrtaceae	*Eucalyptus longicornis*				
Myrtaceae	*Eucalyptus longissima*				
Myrtaceae	*Eucalyptus loxophleba* subsp. *lissophloia*				
Myrtaceae	*Eucalyptus moderata*				
Myrtaceae	*Eucalyptus oleosa*				
Myrtaceae	*Eucalyptus oleosa* subsp. *oleosa*				
Myrtaceae	*Eucalyptus pileata*				
Myrtaceae	*Eucalyptus planipes*				
Myrtaceae	*Eucalyptus platycorys*				
Myrtaceae	*Eucalyptus prolixa*				
Myrtaceae	*Eucalyptus ravida*				
Myrtaceae	*Eucalyptus rigidula*				
Myrtaceae	*Eucalyptus salicola*				
Myrtaceae	*Eucalyptus salmonophloia*				
Myrtaceae	*Eucalyptus salubris*				
Myrtaceae	*Eucalyptus* sp. Mulga Rock (K.D. Hill & L.A.S. Johnson KH 2668)				
Myrtaceae	*Eucalyptus stricklandii*				
Myrtaceae	*Eucalyptus tenera*				
Myrtaceae	*Eucalyptus torquata*				
Myrtaceae	*Eucalyptus transcontinentalis*				
Myrtaceae	*Eucalyptus urna*				
Myrtaceae	*Eucalyptus vittata*				
Myrtaceae	*Eucalyptus websteriana*				
Myrtaceae	*Eucalyptus websteriana* subsp. *norsemanica*	P1 (DBCA list)			
Myrtaceae	*Eucalyptus websteriana* subsp. *websteriana*				
Myrtaceae	*Eucalyptus* x *brachyphylla*	P4 (DBCA list)			
Myrtaceae	*Eucalyptus yilgarnensis*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Myrtaceae	*Euryomyrtus maidenii*				
Myrtaceae	*Homalocalyx thryptomenoides*				
Myrtaceae	*Leptospermum fastigiatum*				
Myrtaceae	*Leptospermum subtenue*				
Myrtaceae	*Malleostemon peltiger*				
Myrtaceae	*Malleostemon roseus*				
Myrtaceae	*Malleostemon tuberculatus*				
Myrtaceae	*Melaleuca acuminata* subsp. *acuminata*				
Myrtaceae	*Melaleuca calyptroides*				
Myrtaceae	*Melaleuca coccinea*	P3 (DBCA list)			
Myrtaceae	*Melaleuca cordata*				
Myrtaceae	*Melaleuca elliptica*				
Myrtaceae	*Melaleuca fulgens* subsp. *fulgens*				
Myrtaceae	*Melaleuca halmaturorum*				
Myrtaceae	*Melaleuca hamata*				
Myrtaceae	*Melaleuca lanceolata*				
Myrtaceae	*Melaleuca lateriflora*				
Myrtaceae	*Melaleuca leiocarpa*				
Myrtaceae	*Melaleuca macronychia* subsp. *macronychia*				
Myrtaceae	*Melaleuca pauperiflora* subsp. *fastigiata*				
Myrtaceae	*Melaleuca sheathiana*				
Myrtaceae	*Melaleuca zeteticorum*				
Myrtaceae	*Micromyrtus erichsenii*				
Myrtaceae	*Micromyrtus monotaxis*				
Myrtaceae	*Micromyrtus obovata*				
Myrtaceae	*Micromyrtus stenocalyx*				
Myrtaceae	*Rinzia carnosa*				
Myrtaceae	*Rinzia triplex*	P3 (DBCA list)			
Myrtaceae	*Thryptomene australis* subsp. *brachyandra*				
Myrtaceae	*Thryptomene kochii*				
Myrtaceae	*Thryptomene* sp. Coolgardie (E. Kelso s.n. 1902)	P1 (DBCA list)			
Myrtaceae	*Thryptomene* sp. Londonderry (R.H. Kuchel 1763)	P1 (DBCA list)			
Myrtaceae	*Thryptomene urceolaris*				
Myrtaceae	*Verticordia chrysantha*				
Myrtaceae	*Verticordia picta*				
Myrtaceae	*Verticordia pritzelii*				
Nitrariaceae	*Nitraria billardierei*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Nyctaginaceae	*Boerhavia coccinea*				
Ophioglossaceae	*Ophioglossum polyphyllum*				
Orchidaceae	*Caladenia roei*				
Orchidaceae	*Caladenia saxicola*				
Orchidaceae	*Cyanicula amplexans*				
Orchidaceae	*Pterostylis roensis*				
Orchidaceae	*Pterostylis* sp. inland (A.C. Beauglehole 11880)				
Orchidaceae	*Pterostylis tryphera*				
Orchidaceae	*Thelymitra antennifera*				
Orchidaceae	*Thelymitra petrophila*				
Orchidaceae	*Thelymitra stellata*	EN (EPBC & BC Acts)			
Oxalidaceae	*Oxalis bowiei*		*		
Oxalidaceae	*Oxalis perennans*				
Oxalidaceae	*Oxalis pes-caprae*		*		
Papaveraceae	*Papaver hybridum*		*		
Pittosporaceae	*Billardiera fusiformis*				
Pittosporaceae	*Marianthus bicolor*				
Pittosporaceae	*Pittosporum angustifolium*				
Plantaginaceae	*Plantago debilis*				
Plantaginaceae	*Plantago drummondii*				
Plantaginaceae	*Plantago* sp. Mt Magnet (A.S. George 6793)				
Plumbaginaceae	*Limonium sinuatum*		*		
Poaceae	*Amphipogon caricinus* var. *caricinus*				
Poaceae	*Aristida contorta*				
Poaceae	*Aristida holathera* var. *holathera*				
Poaceae	*Austrostipa blackii*	P3 (DBCA list)			
Poaceae	*Austrostipa drummondii*				
Poaceae	*Austrostipa elegantissima*				
Poaceae	*Austrostipa eremophila*				
Poaceae	*Austrostipa hemipogon*				
Poaceae	*Austrostipa nitida*				
Poaceae	*Austrostipa platychaeta*				
Poaceae	*Austrostipa scabra*				
Poaceae	*Austrostipa* sp. Carlingup Road (S. Kern & R. Jasper LCH 18459)	P1 (DBCA list)			
Poaceae	*Austrostipa* sp. Dowerin (G. Wiehl F 8004)	P2 (DBCA list)			
Poaceae	*Austrostipa trichophylla*				
Poaceae	*Bromus arenarius*				
Poaceae	*Bromus diandrus*		*		

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Poaceae	*Cenchrus ciliaris*		*		
Poaceae	*Chloris truncata*				
Poaceae	*Dactyloctenium radulans*				
Poaceae	*Dichanthium sericeum* subsp. *sericeum*				
Poaceae	*Digitaria ammophila*				
Poaceae	*Digitaria brownii*				
Poaceae	*Ehrharta villosa*		*		
Poaceae	*Enneapogon avenaceus*				
Poaceae	*Enneapogon caerulescens*				
Poaceae	*Enneapogon cylindricus*				
Poaceae	*Enteropogon ramosus*				
Poaceae	*Eragrostis dielsii*				
Poaceae	*Eragrostis falcata*				
Poaceae	*Eragrostis setifolia*				
Poaceae	*Eragrostis xerophila*				
Poaceae	*Eriachne pulchella*				
Poaceae	*Hordeum glaucum*		*		
Poaceae	*Hordeum leporinum*		*		
Poaceae	*Leptochloa digitata*				
Poaceae	*Monachather paradoxus*				
Poaceae	*Panicum decompositum*				
Poaceae	*Paspalidium constrictum*				
Poaceae	*Paspalidium reflexum*				
Poaceae	*Pentameris airoides* subsp. *airoides*		*		
Poaceae	*Phalaris paradoxa*		*		
Poaceae	*Rostraria pumila*		*		
Poaceae	*Rytidosperma caespitosum*				
Poaceae	*Rytidosperma setaceum*				
Poaceae	*Schismus arabicus*		*		
Poaceae	*Schismus barbatus*		*		
Poaceae	*Setaria dielsii*				
Poaceae	*Sorghum halepense*		*		
Poaceae	*Triodia irritans*				
Poaceae	*Triodia scariosa*				
Poaceae	*Triodia tomentosa*				
Poaceae	*Urochloa panicoides*		*		
Polygalaceae	*Comesperma drummondii*				
Polygalaceae	*Comesperma scoparium*				
Polygonaceae	*Persicaria prostrata*				
Polygonaceae	*Polygonum aviculare*		*		
Polygonaceae	*Rumex vesicarius*		*		
Portulacaceae	*Calandrinia calyptrata*				
Portulacaceae	*Calandrinia eremaea*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Portulacaceae	*Calandrinia polyandra*				
Portulacaceae	*Calandrinia sculpta*				
Portulacaceae	*Calandrinia translucens*				
Portulacaceae	*Portulaca oleracea*				
Pottiaceae	*Aloina bifrons*				
Pottiaceae	*Barbula luteola*				
Pottiaceae	*Crossidium davidai*				
Pottiaceae	*Didymodon torquatus*				
Pottiaceae	*Syntrichia pagorum*				
Pottiaceae	*Tortula muralis*				
Proteaceae	*Banksia elderiana*				
Proteaceae	*Conospermum stoechadis* subsp. *stoechadis*				
Proteaceae	*Grevillea acacioides*				
Proteaceae	*Grevillea acuaria*				
Proteaceae	*Grevillea beardiana*				
Proteaceae	*Grevillea cagiana*				
Proteaceae	*Grevillea didymobotrya* subsp. *didymobotrya*				
Proteaceae	*Grevillea excelsior*				
Proteaceae	*Grevillea georgeana*	P3 (DBCA list)			
Proteaceae	*Grevillea haplantha* subsp. *haplantha*				
Proteaceae	*Grevillea hookeriana* subsp. *apiciloba*				
Proteaceae	*Grevillea huegelii*				
Proteaceae	*Grevillea nematophylla* subsp. *nematophylla*				
Proteaceae	*Grevillea obliquistigma* subsp. *obliquistigma*				
Proteaceae	*Grevillea oligomera*				
Proteaceae	*Grevillea paniculata*				
Proteaceae	*Grevillea pterosperma*				
Proteaceae	*Grevillea sarissa* subsp. *bicolor*				
Proteaceae	*Grevillea sarissa* subsp. *sarissa*				
Proteaceae	*Grevillea teretifolia*				
Proteaceae	*Grevillea uncinulata*				
Proteaceae	*Hakea francisiana*				
Proteaceae	*Hakea minyma*				
Proteaceae	*Hakea rigida*	P2 (DBCA list)			
Proteaceae	*Persoonia saundersiana*				
Proteaceae	*Petrophile seminuda*				
Pteridaceae	*Cheilanthes adiantoides*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*				
Ranunculaceae	*Myosurus australis*				
Restionaceae	*Lepidobolus chaetocephalus*				
Restionaceae	*Lepidobolus deserti*				
Rhamnaceae	*Cryptandra aridicola*				
Rhamnaceae	*Cryptandra pungens*				
Rhamnaceae	*Pomaderris forrestiana*				
Rhamnaceae	*Trymalium myrtillus* subsp. *myrtillus*				
Ruppiaceae	*Ruppia polycarpa*				
Rutaceae	*Boronia coerulescens*				
Rutaceae	*Boronia coerulescens* subsp. *spinescens*				
Rutaceae	*Boronia ternata*				
Rutaceae	*Phebalium appressum*	P1 (DBCA list)			
Rutaceae	*Phebalium canaliculatum*				
Rutaceae	*Phebalium clavatum*	P2 (DBCA list)			
Rutaceae	*Phebalium filifolium*				
Rutaceae	*Phebalium laevigatum*				
Rutaceae	*Phebalium lepidotum*				
Rutaceae	*Phebalium tuberculosum*				
Rutaceae	*Philotheca brucei* subsp. *brucei*				
Rutaceae	*Philotheca pachyphylla*	P1 (DBCA list)			
Rutaceae	*Philotheca tomentella*				
Santalaceae	*Exocarpos aphyllus*				
Santalaceae	*Santalum acuminatum*				
Santalaceae	*Santalum spicatum*				
Sapindaceae	*Alectryon oleifolius* subsp. *canescens*				
Sapindaceae	*Dodonaea adenophora*				
Sapindaceae	*Dodonaea amblyophylla*				
Sapindaceae	*Dodonaea lobulata*				
Sapindaceae	*Dodonaea microzyga*				
Sapindaceae	*Dodonaea microzyga* var. *acrolobata*				
Sapindaceae	*Dodonaea stenozyga*				
Sapindaceae	*Dodonaea viscosa* subsp. *angustissima*				
Scrophulariaceae	*Diocirea acutifolia*	P3 (DBCA list)			
Scrophulariaceae	*Diocirea microphylla*	P3 (DBCA list)			
Scrophulariaceae	*Eremophila alternifolia*				
Scrophulariaceae	*Eremophila caerulea* subsp. *caerulea*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Scrophulariaceae	*Eremophila caerulea* subsp. *merrallii*	P4 (DBCA list)			
Scrophulariaceae	*Eremophila caperata*				
Scrophulariaceae	*Eremophila clarkei*				
Scrophulariaceae	*Eremophila clavata*				
Scrophulariaceae	*Eremophila decipiens*				
Scrophulariaceae	*Eremophila decipiens* subsp. *decipiens*				
Scrophulariaceae	*Eremophila dempsteri*				
Scrophulariaceae	*Eremophila deserti*				
Scrophulariaceae	*Eremophila drummondii*				
Scrophulariaceae	*Eremophila gibbosa*				
Scrophulariaceae	*Eremophila glabra* subsp. *glabra*				
Scrophulariaceae	*Eremophila granitica*				
Scrophulariaceae	*Eremophila interstans* subsp. *interstans*				
Scrophulariaceae	*Eremophila interstans* subsp. *virgata*				
Scrophulariaceae	*Eremophila ionantha*				
Scrophulariaceae	*Eremophila longifolia*				
Scrophulariaceae	*Eremophila maculata* subsp. *brevifolia*				
Scrophulariaceae	*Eremophila miniata*				
Scrophulariaceae	*Eremophila oblonga*				
Scrophulariaceae	*Eremophila oldfieldii* subsp. *angustifolia*				
Scrophulariaceae	*Eremophila oldfieldii* subsp. *oldfieldii*				
Scrophulariaceae	*Eremophila oppositifolia* subsp. *angustifolia*				
Scrophulariaceae	*Eremophila pantonii*				
Scrophulariaceae	*Eremophila parvifolia* subsp. *auricampa*				
Scrophulariaceae	*Eremophila praecox*	P1 (DBCA list)			
Scrophulariaceae	*Eremophila psilocalyx*				
Scrophulariaceae	*Eremophila pustulata*				
Scrophulariaceae	*Eremophila rugosa*				
Scrophulariaceae	*Eremophila saligna*				
Scrophulariaceae	*Eremophila scoparia*				
Scrophulariaceae	*Eremophila serrulata*				
Scrophulariaceae	*Eremophila* sp. Mt Jackson (G.J. Keighery 4372)				
Scrophulariaceae	*Eremophila subfloccosa* subsp. *lanata*				
Scrophulariaceae	*Eremophila veronica*	P3 (DBCA list)			

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Scrophulariaceae	*Eremophila weldii*				
Scrophulariaceae	*Myoporum montanum*				
Solanaceae	*Anthotroche pannosa*				
Solanaceae	*Crenidium spinescens*				
Solanaceae	*Datura inoxia*		*		
Solanaceae	*Duboisia hopwoodii*				
Solanaceae	*Lycium australe*				
Solanaceae	*Nicotiana glauca*		*		
Solanaceae	*Nicotiana rotundifolia*				
Solanaceae	*Solanum cleistogamum*				
Solanaceae	*Solanum esuriale*				
Solanaceae	*Solanum hoplopetalum*				
Solanaceae	*Solanum lasiophyllum*				
Solanaceae	*Solanum nigrum*		*		
Solanaceae	*Solanum nummularium*				
Solanaceae	*Solanum petrophilum*				
Solanaceae	*Solanum plicatile*				
Solanaceae	*Solanum simile*				
Solanaceae	*Solanum terraneum*				
Solanaceae	*Xanthium spinosum*		*		s22(2) (C2, C3)
Stylidiaceae	*Stylidium arenicola*				
Stylidiaceae	*Stylidium dielsianum*				
Stylidiaceae	*Stylidium limbatum*				
Thymelaeaceae	*Pimelea angustifolia*				
Thymelaeaceae	*Pimelea microcephala* subsp. *microcephala*				
Thymelaeaceae	*Pimelea spiculigera* var. *thesioides*				
Thymelaeaceae	*Pimelea suaveolens* subsp. *flava*				
Urticaceae	*Urtica urens*		*		
Verbenaceae	*Glandularia aristigera*		*		
Verbenaceae	*Phyla canescens*		*		
Violaceae	*Hybanthus floribundus* subsp. *curvifolius*				
Zygophyllaceae	*Roepera apiculata*				
Zygophyllaceae	*Roepera aurantiaca*				
Zygophyllaceae	*Roepera aurantiaca* subsp. *aurantiaca*				
Zygophyllaceae	*Roepera compressa*				
Zygophyllaceae	*Roepera eremaea*				
Zygophyllaceae	*Roepera fruticulosa*				
Zygophyllaceae	*Roepera glauca*				
Zygophyllaceae	*Roepera ovata*				

Family	Species	Conservation status	Introduced	WoNS	Declared pest
Zygophyllaceae	*Roepera reticulata*				
Zygophyllaceae	*Roepera tetraptera*				
Zygophyllaceae	*Tribulus terrestris*		*		

Appendix 3 Flora species inventory

Family	Species
Aizoaceae	*Disphyma crassifolium*
Aizoaceae	*Gunniopsis quadrifida*
Amaranthaceae	*Ptilotus exaltatus*
Amaranthaceae	*Ptilotus helipteroides*
Amaranthaceae	*Ptilotus holosericeus*
Amaranthaceae	*Ptilotus obovatus*
Amaranthaceae	*Surreya diandra*
Apocynaceae	*Alyxia buxifolia*
Apocynaceae	*Marsdenia australis*
Apocynaceae	*Rhyncharrhena linearis*
Asparagaceae	*Thysanotus* ?*manglesianus*
Asparagaceae	*Thysanotus manglesianus*
Asparagaceae	*Thysanotus patersonii*
Asteraceae	*Asteridea chaetopoda*
Asteraceae	*Brachyscome ciliaris*
Asteraceae	*Brachyscome perpusilla*
Asteraceae	*Cratystylis conocephala*
Asteraceae	*Cratystylis microphylla*
Asteraceae	*Cratystylis subspinescens*
Asteraceae	*Erymophyllum ramosum* subsp. *ramosum*
Asteraceae	*Leiocarpa semicalva* subsp. *semicalva*
Asteraceae	*Minuria cunninghamii*
Asteraceae	**Monoculus monstrosus*
Asteraceae	*Olearia* ?*ciliata*
Asteraceae	*Olearia muelleri*
Asteraceae	*Olearia pimeleoides*
Asteraceae	*Podolepis capillaris*
Asteraceae	*Senecio pinnatifolius* var. *pinnatifolius*

Family	Species
Asteraceae	*Vittadinia dissecta* var. *hirta*
Asteraceae	*Vittadinia humerata*
Boraginaceae	*Halgania andromedifolia*
Boraginaceae	*Halgania cyanea*
Boraginaceae	*Heliotropium curassavicum*
Casuarinaceae	*Allocasuarina eriochlamys* subsp. *grossa* (P3 DBCA list)
Casuarinaceae	*Allocasuarina helmsii*
Casuarinaceae	*Casuarina obesa*
Casuarinaceae	*Casuarina pauper*
Chenopodiaceae	*Atriplex ?nana*
Chenopodiaceae	*Atriplex ?vesicaria*
Chenopodiaceae	*Atriplex acutibractea* subsp. *acutibractea*
Chenopodiaceae	*Atriplex amnicola*
Chenopodiaceae	*Atriplex bunburyana*
Chenopodiaceae	*Atriplex codonocarpa*
Chenopodiaceae	*Atriplex eardleyae*
Chenopodiaceae	*Atriplex holocarpa*
Chenopodiaceae	*Atriplex lindleyi* subsp. *inflata*
Chenopodiaceae	*Atriplex nana*
Chenopodiaceae	*Atriplex nummularia*
Chenopodiaceae	*Atriplex stipitata*
Chenopodiaceae	*Atriplex vesicaria*
Chenopodiaceae	*Chenopodium curvispicatum*
Chenopodiaceae	*Enchylaena tomentosa*
Chenopodiaceae	*Maireana ?amoena*
Chenopodiaceae	Maireana ?*georgei*
Chenopodiaceae	*Maireana amoena*
Chenopodiaceae	*Maireana appressa*
Chenopodiaceae	*Maireana carnosa*
Chenopodiaceae	*Maireana convexa*
Chenopodiaceae	*Maireana erioclada*
Chenopodiaceae	*Maireana eriosphaera*
Chenopodiaceae	*Maireana georgei*
Chenopodiaceae	*Maireana glomerifolia*
Chenopodiaceae	*Maireana pentatropis*
Chenopodiaceae	*Maireana pyramidata*
Chenopodiaceae	*Maireana radiata*

Family	Species
Chenopodiaceae	*Maireana sedifolia*
Chenopodiaceae	*Maireana* sp.
Chenopodiaceae	*Maireana thesioides*
Chenopodiaceae	*Maireana tomentosa* ?subsp. *tomentosa*
Chenopodiaceae	*Maireana tomentosa* subsp. *tomentosa*
Chenopodiaceae	*Maireana trichoptera*
Chenopodiaceae	*Maireana triptera*
Chenopodiaceae	*Maireana turbinata*
Chenopodiaceae	*Osteocarpum salsuginosum*
Chenopodiaceae	*Rhagodia drummondii*
Chenopodiaceae	*Rhagodia spinescens*
Chenopodiaceae	*Rhagodia ulicina*
Chenopodiaceae	*Roycea* ?*divaricata*
Chenopodiaceae	*Roycea divaricata*
Chenopodiaceae	*Sclerolaena* ?*brevifolia*
Chenopodiaceae	*Sclerolaena brevifolia*
Chenopodiaceae	*Sclerolaena cuneata*
Chenopodiaceae	*Sclerolaena diacantha*
Chenopodiaceae	*Sclerolaena drummondii*
Chenopodiaceae	*Sclerolaena eurotioides*
Chenopodiaceae	*Sclerolaena fusiformis*
Chenopodiaceae	*Sclerolaena obliquicuspis*
Chenopodiaceae	*Sclerolaena recurvicuspis*
Chenopodiaceae	*Tecticornia disarticulata*
Chenopodiaceae	*Tecticornia doliiformis*
Chenopodiaceae	*Tecticornia indica* subsp. *bidens*
Chenopodiaceae	*Tecticornia indica* subsp. *leiostachya*
Chenopodiaceae	*Tecticornia pergranulata* subsp. *pergranulata*
Chenopodiaceae	*Tecticornia pruinosa*
Chenopodiaceae	*Tecticornia* sp. (sterile 1)
Chenopodiaceae	*Tecticornia* sp. (sterile 2)
Chenopodiaceae	*Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)
Chenopodiaceae	*Tecticornia undulata*
Convolvulaceae	**Cuscuta epithymum*
Euphorbiaceae	*Euphorbia* ?*philochalix*
Euphorbiaceae	*Euphorbia porcata*
Fabaceae	*Acacia burkittii*

Family	Species
Fabaceae	*Acacia colletioides*
Fabaceae	*Acacia densiflora*
Fabaceae	*Acacia dissona* var. *dissona*
Fabaceae	*Acacia erinacea*
Fabaceae	*Acacia gibbosa*
Fabaceae	*Acacia hemiteles*
Fabaceae	*Acacia jennerae*
Fabaceae	*Acacia kalgoorliensis*
Fabaceae	*Acacia merrallii*
Fabaceae	*Acacia nyssophylla*
Fabaceae	*Acacia tetragonophylla*
Fabaceae	*Acacia xerophila* var. *brevior*
Fabaceae	**Medicago minima*
Fabaceae	*Senna* ?*stowardii*
Fabaceae	*Senna artemisioides* subsp. *artemisioides*
Fabaceae	*Senna artemisioides* subsp. *filifolia*
Fabaceae	*Senna artemisioides* subsp. x *artemisioides*
Fabaceae	*Senna cardiosperma*
Fabaceae	*Senna* sp. Austin (A. Strid 20210)
Fabaceae	*Senna stowardii*
Frankeniaceae	*Frankenia* ?*interioris*
Frankeniaceae	*Frankenia cinerea*
Frankeniaceae	*Frankenia interioris*
Frankeniaceae	*Frankenia irregularis*
Frankeniaceae	*Frankenia pauciflora*
Frankeniaceae	*Frankenia setosa*
Frankeniaceae	*Frankenia tetrapetala*
Geraniaceae	**Erodium cicutarium*
Goodeniaceae	*Goodenia havilandii*
Goodeniaceae	*Scaevola spinescens*
Haloragaceae	*Haloragis trigonocarpa*
Hemerocallidaceae	*Dianella revoluta*
Lamiaceae	*Prostanthera althoferi*
Lamiaceae	*Prostanthera grylloana*
Lamiaceae	**Salvia verbenaca*
Lamiaceae	*Westringia rigida*
Lauraceae	*Cassytha* ?*nodiflora*

Family	Species
Loranthaceae	*Amyema gibberula* var. *gibberula*
Loranthaceae	*Amyema miquelii*
Loranthaceae	*Amyema preissii*
Malvaceae	*Brachychiton gregorii*
Malvaceae	*Sida spodochroma*
Myrtaceae	*Eucalyptus campaspe*
Myrtaceae	*Eucalyptus celastroides* subsp. *celastroides*
Myrtaceae	*Eucalyptus clelandiorum*
Myrtaceae	*Eucalyptus gracilis*
Myrtaceae	*Eucalyptus griffithsii*
Myrtaceae	*Eucalyptus hypolaena*
Myrtaceae	*Eucalyptus longicornis*
Myrtaceae	*Eucalyptus loxophleba* subsp. *lissophloia*
Myrtaceae	*Eucalyptus oleosa* subsp. *oleosa*
Myrtaceae	*Eucalyptus ovularis*
Myrtaceae	*Eucalyptus salicola*
Myrtaceae	*Eucalyptus salmonophloia*
Myrtaceae	*Eucalyptus salubris*
Myrtaceae	*Eucalyptus torquata*
Myrtaceae	*Eucalyptus transcontinentalis*
Myrtaceae	*Melaleuca halmaturorum*
Myrtaceae	*Melaleuca lateriflora*
Myrtaceae	*Melaleuca pauperiflora* subsp. *fastigiata*
Oxalidaceae	**Oxalis corniculata*
Pittosporaceae	*Pittosporum angustifolium*
Poaceae	*Aristida contorta*
Poaceae	*Austrostipa blackii* (P3 DBCA list)
Poaceae	*Austrostipa elegantissima*
Poaceae	*Austrostipa nitida*
Poaceae	*Austrostipa scabra*
Poaceae	*Enneapogon caerulescens*
Poaceae	*Enteropogon ramosus*
Poaceae	*Eragrostis dielsii*
Poaceae	*Eragrostis pergracilis*
Poaceae	*Paspalidium gracile*
Poaceae	*Rytidosperma caespitosum*
Poaceae	*Triodia scariosa*

Family	Species
Portulacaceae	*Calandrinia* ?*quartzitica*
Portulacaceae	*Calandrinia eremaea*
Portulacaceae	*Calandrinia* sp. Gypsum (F. Obbens & L. Hancock FO 10/14)
Primulaceae	**Lysimachia arvensis*
Proteaceae	*Grevillea* ?*oncogyne*
Proteaceae	*Grevillea acuaria*
Proteaceae	*Grevillea berryana*
Proteaceae	*Grevillea sarissa* subsp. *bicolor*
Proteaceae	*Grevillea sarissa* subsp. *sarissa*
Pteridaceae	*Cheilanthes lasiophylla*
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*
Rhamnaceae	*Cryptandra aridicola*
Rhamnaceae	*Pomaderris forrestiana*
Rhamnaceae	*Stenanthemum stipulosum*
Rhamnaceae	*Trymalium myrtillus* subsp. *myrtillus*
Rubiaceae	*Psydrax suaveolens*
Santalaceae	*Exocarpos aphyllus*
Santalaceae	*Santalum acuminatum*
Santalaceae	*Santalum spicatum*
Sapindaceae	*Alectryon oleifolius* subsp. *canescens*
Sapindaceae	*Dodonaea lobulata*
Sapindaceae	*Dodonaea viscosa*
Scrophulariaceae	*Eremophila alternifolia*
Scrophulariaceae	*Eremophila caperata*
Scrophulariaceae	*Eremophila decipiens* subsp. *decipiens*
Scrophulariaceae	*Eremophila dempsteri*
Scrophulariaceae	*Eremophila gibbosa*
Scrophulariaceae	*Eremophila glabra*
Scrophulariaceae	*Eremophila granitica*
Scrophulariaceae	*Eremophila interstans* subsp. *interstans*
Scrophulariaceae	*Eremophila ionantha*
Scrophulariaceae	*Eremophila longifolia*
Scrophulariaceae	*Eremophila miniata*
Scrophulariaceae	*Eremophila oldfieldii*
Scrophulariaceae	*Eremophila oppositifolia*
Scrophulariaceae	*Eremophila oppositifolia* subsp. *angustifolia*
Scrophulariaceae	*Eremophila parvifolia*

Family	Species
Scrophulariaceae	*Eremophila parvifolia* subsp. *auricampa*
Scrophulariaceae	*Eremophila praecox* (P1 DBCA list)
Scrophulariaceae	*Eremophila pustulata*
Scrophulariaceae	*Eremophila scoparia*
Solanaceae	*Lycium australe*
Solanaceae	*Solanum hoplopetalum*
Solanaceae	*Solanum lasiophyllum*
Solanaceae	*Solanum nummularium*
Thymelaeaceae	*Pimelea microcephala*
Zygophyllaceae	*Roepera aurantiaca*
Zygophyllaceae	*Roepera reticulata*
Zygophyllaceae	*Roepera similis*

Appendix J: Supporting Biodiversity Survey (Targeted Flora Survey conducted for Evolution Mining, for the Cutters Ridge Haul Road area)

30th August 2019

RE: Cutters Ridge Haul Road Calandrinia Targeted Flora Survey Memorandum

Steve Halls
Environmental Advisor
Evolution Mining

Dear Steve,

Please find below the preliminary findings from our Targeted Search for *Calandrinia ?lefroyensis/quartzitica* in regards to the alignment of the Cutters Ridge Haul Road.

Please contact me if you require any further information in relation to the above.

Yours sincerely,
Carmel Forrester
Botanist

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e: info@spectrumecology.com.au

RAYJAX & CASTLE HILL TARGETED CALANDRINIA SURVEY

Evolution Mining engaged Spectrum Ecology to undertake a Targeted Flora Search for the Priority Flora species, *Calandrinia lefroyensis* and *C. quartzitica* in Evolution's proposed Cutters Ridge Haul Road and Boomer South proposed Drilling Holes. The Targeted Flora survey was carried out as part of a larger scope of works including a Reconnaissance Flora, Level 1 Fauna, SRE Targeted Habitat assessment and desktop survey.

During a previous Flora and Vegetation Survey in 2018, a species of *Calandrinia* was found by Phoenix Environmental Sciences. This species was identified as either *Calandrinia ?lefroyensis/?quartzitica*, both of which are listed as Priority 1. Subsequently, Spectrum Ecology was engaged to undertake a targeted survey for *Calandrinia* species within and surrounding the Cutters Ridge Haul Road. The aim of the targeted searches was to determine the taxonomy of the *Calandrinia* species, its local and regional extent and the potential impact of the construction of the Cutters Ridge Haul Road.

Spectrum Ecology's botanist Carmel Forrester and Senior zoologist Astrid Heidrich completed the targeted searches with the assistance of Evolution Mining's Environmental Graduate, Grace Derrick. The searches were carried out on 19th and 20th August 2019. In addition, the species was also opportunistically targeted during the Reconnaissance Flora and Vegetation survey of the surrounding proposed development envelopes between 21st and 24th August 2019. Plants superficially identified as *Calendrinia ?lefroyensis* were found at each location. Material for identification (in the form of specimens) were collected at each of the search locations. Taxonomist, Udani Sirisena received the plants for identification on Monday 26th August, as soon as practicable following the field survey.

The timing of the field survey was outside the recommended survey timing for *Calandrinia* (flowering and seeding season) (Obbens 2018[1]). The taxonomic difference between the two species is determined by mature seeds found at the end of the flowering period, late October-November. During the targeted search, *Calandrinia* species fitting the description of *C. lefroyensis* were found. Some of these plants had immature flowers, not yet seed bearing. Most plants found did not yet have the vegetative material required for conclusive identification.

Targeted *Calandrinia* Search Effort

The targeted search areas are shown in Map 1 and Map 2 and included the following areas:

- Cutters Ridge Haul Road (Evolution Mining's Tenement);
- Regional suitable *Calandrinia* habitat locations to the North-East of Cutters Ridge (Northern Star Tenements M15/0669 & M16/0260);
- Suitable *Calandrinia* habitat locations to the North and South of Cutters Ridge Haul Road (Evolution Mining's Tenement);
- Regional potentially suitable habitat north of Rayjax along Coolgardie North Road and
- Proposed Drilling sites at Boomer South 1, 2 and 3 (adjacent to Frog's Leg Site office).

The population explored at the Northern Star tenements is currently undefined to the west and east of the current *Calandrinia* records due to time constraints. Another regional population was recorded from Coolgardie North Road and has not been defined in regard to the exact extent and density. These

[1] Obbens, F.J. 2018: Three new perennial species of Calandrinia (Montiaceae) from southern Western Australia. The journal of the Western Australian Herbarium (29): 193-204

population is particularly of interest because both areas are undisturbed, and the population is dense in parts and sprawling. Time constraints for this search meant that the field team could not conclusively delineate the boundary of the population and only spot searches and single transects were completed. Other populations of dense *Calandrinia* were found on recently rehabilitated drill pads (rehabilitated in January 2019) and could become less dense once larger flora species begin to compete.

During the Reconnaissance, Targeted Flora Survey, Fauna & SRE Search additional populations of *Calandrinia* were opportunistically noted and sampled at the TSF Area and Castle Hill Mine. These populations are shown on Map 1 and their locations are provided in Appendix 1. Please note that these populations are only opportunistically recorded and the number of plants noted do not represent the total number of the population present on site. The populations were sprawling and sometimes extensive. Areas within the TSF and Castle Hill boundaries have fitting *Calandrinia* habitat and were not surveyed at all during the site visit because the scope and timeframe did not allow thorough ground truthing of these areas.

An additional detailed targeted search of the TSF Cells 3 & 4 and the Castle Hill Mine is required in order to get a better understanding of the population extent and density in these areas.

Previous Records and Population Significance

There are few previous records of either of these Priority Flora. The specimens found during the Targeted search have potential to be locally, regionally and nationally significant; particularly where the populations are high in number and in undisturbed habitat (such as the population found in the Northern Star tenements). A summary of previous records against the current survey is outlined in Table 1.

Table 1: Previous Records of *Calandrinia lefroyensis* and *C. quartzitica*

Species	WA Herbarium Records and population size	Survey Notes
C. lefroyensis	• Known from five WA Herbarium records • All populations are found in the Eastern Goldfields subregion, suggesting a possible endemic restriction • Possibly found during Phoenix Survey 2018, identification inconclusive	• Phoenix population not found again during current survey • Possibly found during current survey at different locations throughout area (awaiting ID confirmation)
C. quartzitica	• Known from nine records in the Eastern Murchison • All populations are found in the Eastern Murchison subregion, suggesting a possible range extension if identified as this species • Possibly found during Phoenix Survey 2018, identification inconclusive	• Phoenix records not found again during current survey • Possibly found during current survey at different locations throughout area (awaiting ID confirmation)

Recommendations

Based on the few known records and endemic restriction of *Calandrinia ?lefroyensis* it is recommended that any clearance of the known population records within and around the proposed Cutters Ridge Haul Road (Map 2) be avoided wherever possible. A more southern placement of the Haul Road would be optimal; however, if this is not possible due to other restrictions, a path of least impact should be chosen as shown on Map 3.

The opportunistic finding of *Calandrinia ?lefroyensis* at TSF Cells 3 & 4 and Castle Hill Mine suggests a more comprehensive Targeted search is required to verify population size, density and significance.

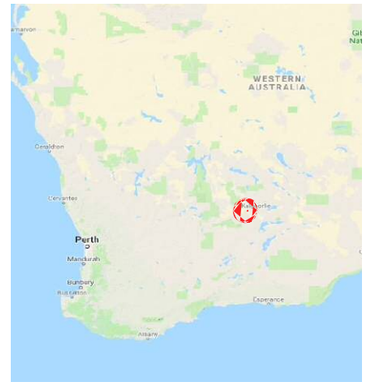
310000
315000
320000
325000
330000
335000
6610000
6605000
6600000
6595000

Legend

- Calandrinia sp. records
- Survey Tracks

Study Areas

- A: Cutters Ridge Mine & Haul Road
- B: Rajax Mine & Haul Road
- C: Burgundy Mine (not included in current survey)
- C: Burgundy to Cutters Ridge Haul Road
- D: Castle Hill Haul Road
- D: Castle Hill Mine
- E: TSF 3&4



N

0 0.75 1.5 2.25 3 km

Scale 1:85000 @ A3

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Author: AH

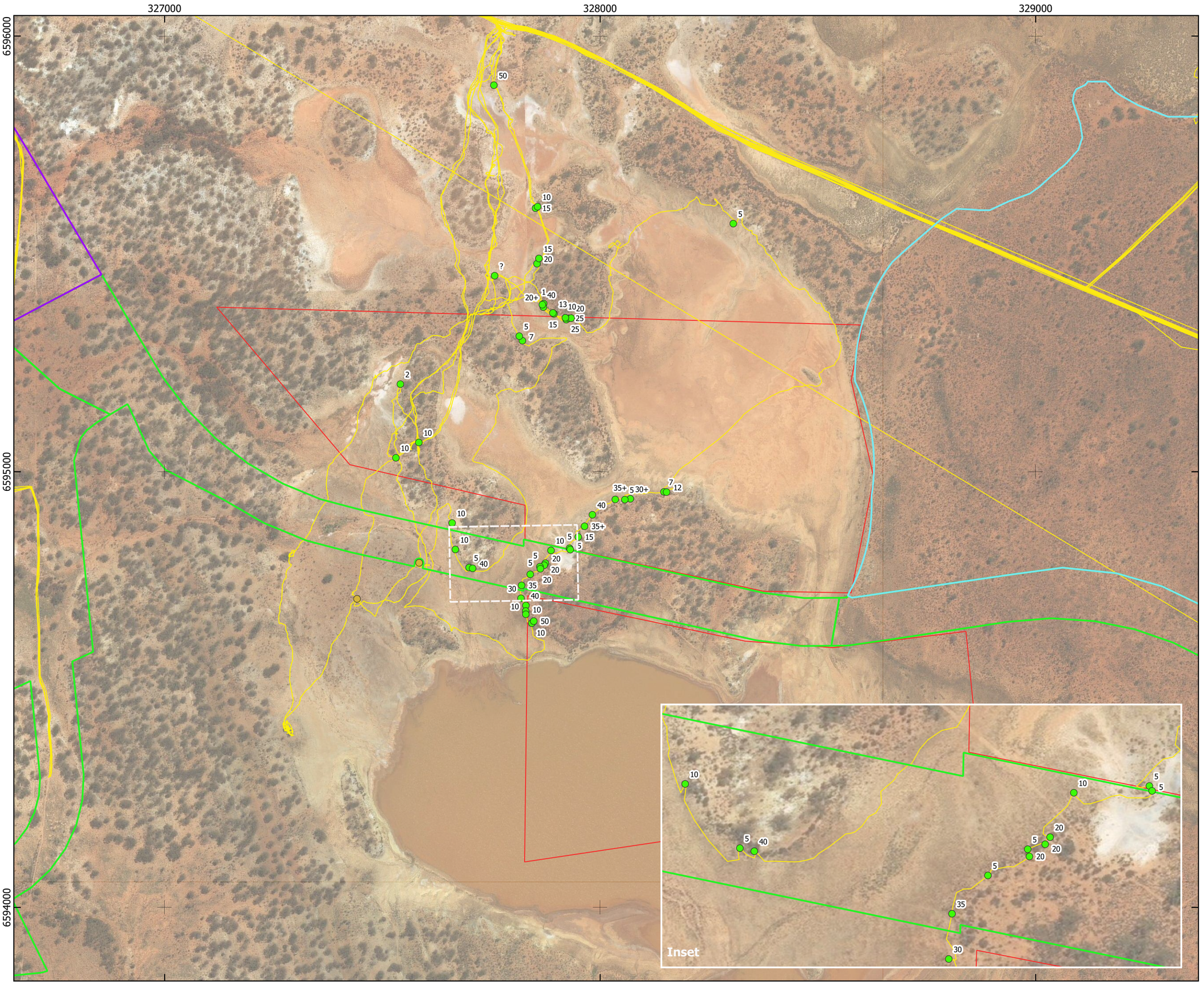
Date: 28-08-2019

Calandrinia Searches and Records

Rayjax to Castle Hill

Prepared for
Evolution Mining

Figure
01



Legend

- Calandrinia records (current survey)
- Calandrinia Records (Phoenix)
- Survey Tracks

Study Areas

- A: Cutters Ridge Mine & Haul Road
- B: Rajax Mine & Haul Road
- C: Burgundy Mine (not included in current survey)
- C: Burgundy to Cutters Ridge Haul Road
- D: Castle Hill Haul Road
- D: Castle Hill Mine
- E: TSF 3&4

N

0 0.1 0.2 km

Scale 1:8000 @ A3

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

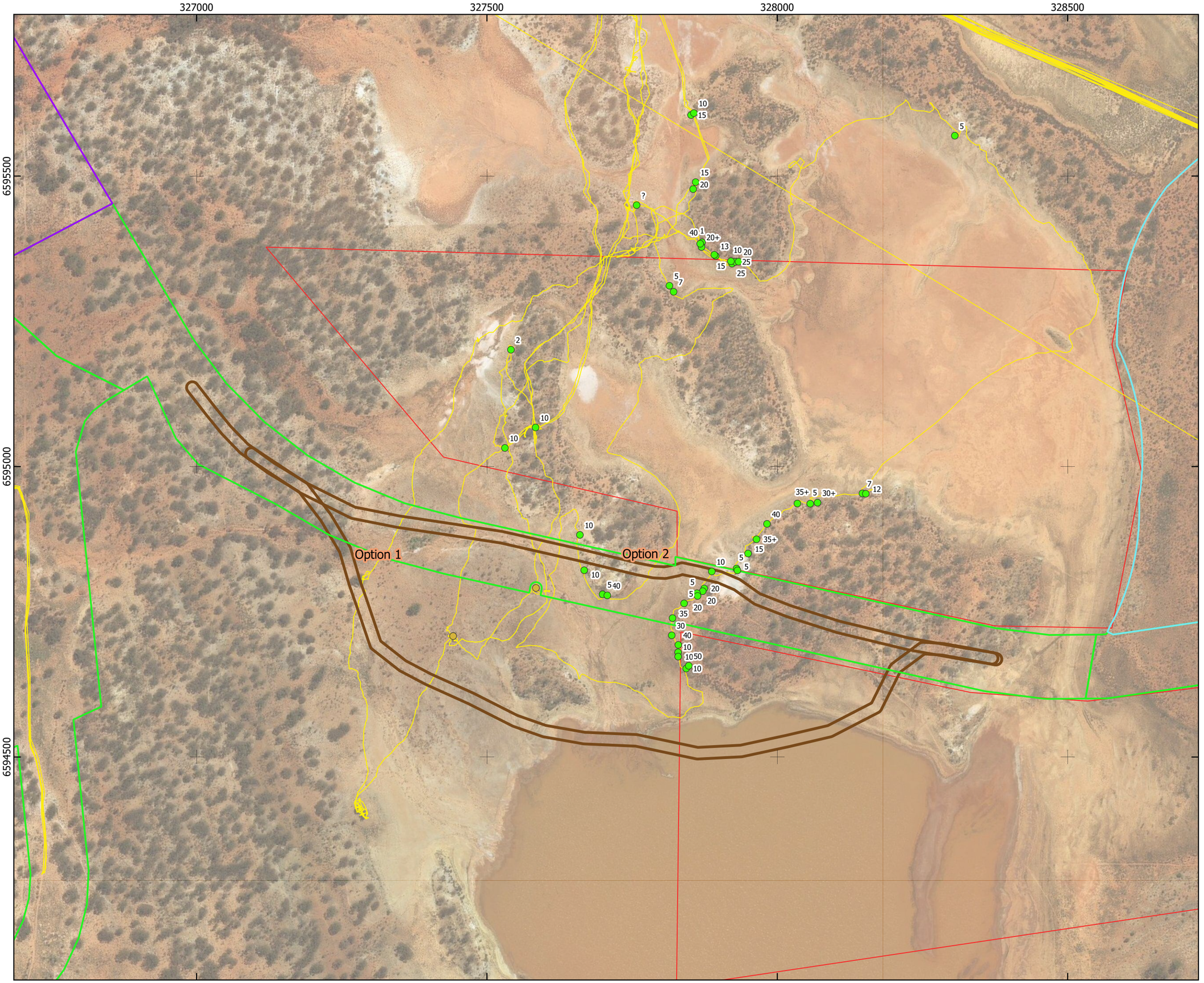
Author: AH Date: 30-08-2019

Calandrinia Searches and Records (Cutters Ridge Haul Road)

Rayjax to Castle Hill

Figure 02

Prepared for Evolution Mining



Legend

- Calandrinia records (current survey)
- Calandrinia Records (Phoenix)
- Survey Tracks
- Proposed Alignments

Study Areas

- A: Cutters Ridge Mine & Haul Road
- B: Rajax Mine & Haul Road
- C: Burgundy Mine (not included in current survey)
- C: Burgundy to Cutters Ridge Haul Road
- D: Castle Hill Haul Road
- D: Castle Hill Mine
- E: TSF 3&4

N

0 0.05 0.1 0.15 km

Scale 1:6000 @ A3

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Author: AH

Date: 30-08-2019

Proposed Cutters Ridge Haul Road Alignments

Rayjax to Castle Hill

Prepared for Evolution Mining

Figure 03

APPENDIX A: DETAILS OF CALANDRINIA RECORDS

Table 2: Details and Locations of *Calandrinia* Records

Record #	Easting	Northing	Number of plants	Area
Cutters Ridge Haul Road				
1	327930	6594824	5	Cutters Ridge Haul Road
2	327931	6594821	5	Cutters Ridge Haul Road
3	327887	6594819	10	Cutters Ridge Haul Road
4	327874	6594790	20	Cutters Ridge Haul Road
5	327872	6594785	20	Cutters Ridge Haul Road
6	327862	6594782	5	Cutters Ridge Haul Road
7	327863	6594777	20	Cutters Ridge Haul Road
8	327840	6594764	5	Cutters Ridge Haul Road
9	327820	6594739	35	Cutters Ridge Haul Road
10	327668	6594822	10	Cutters Ridge Haul Road
11	327699	6594780	5	Cutters Ridge Haul Road
12	327707	6594778	40	Cutters Ridge Haul Road
TSF 3&4				
13	330408	6596118	100	TSF 3&4
14	330006	6596232	20+	TSF 3&4
15	329949	6595916	100	TSF 3&4
16	330409	6596116	100	TSF 3&4
17	330078	6595847	10	TSF 3&4
18	329452	6596001	10	TSF 3&4
19	329526	6596110	10	TSF 3&4
20	329549	6596243	15	TSF 3&4
21	329791	6596447	15	TSF 3&4
22	329679	6595747	20	TSF 3&4
23	330066	6595868	200	TSF 3&4
24	330062	6595881	200	TSF 3&4
25	329710	6596097	200	TSF 3&4
26	329749	6596407	20	TSF 3&4
27	330342	6595757	20	TSF 3&4
28	329916	6595918	20	TSF 3&4
29	329860	6595844	20	TSF 3&4
30	329854	6595836	20	TSF 3&4
31	329510	6595762	20	TSF 3&4
32	329530	6596144	20	TSF 3&4
33	329530	6596111	25	TSF 3&4
34	329864	6595876	30	TSF 3&4
35	329862	6595847	30	TSF 3&4
36	329716	6596363	30	TSF 3&4
37	329716	6596368	40	TSF 3&4
38	329888	6595919	40	TSF 3&4
39	329718	6596369	40	TSF 3&4

40	330058	6595890	500	TSF 3&4
41	330072	6595865	50	TSF 3&4
42	329942	6595919	50	TSF 3&4
43	329532	6596139	50	TSF 3&4
44	329523	6596232	50	TSF 3&4
45	329718	6596364	50	TSF 3&4
46	329715	6596087	50	TSF 3&4
47	329521	6596061	5	TSF 3&4
48	329528	6596089	5	TSF 3&4
49	329644	6596302	5	TSF 3&4
50	330060	6595868	200	TSF 3&4
51	330059	6595872	200	TSF 3&4
52	330064	6595886	200	TSF 3&4
53	330049	6595890	200	TSF 3&4
54	330068	6595863	200	TSF 3&4
55	329925	6595916	30	TSF 3&4
56	330027	6596335	1	TSF 3&4
57	330514	6595937	10	TSF 3&4
58	330566	6595842	20	TSF 3&4
59	330665	6595506	Lots (rehab)	TSF 3&4
60	330348	6596065	70	TSF 3&4
61	330046	6596066	8	TSF 3&4
62	329938	6596067	10	TSF 3&4
Frogs Leg Mine				
63	334173	6594976	few	Estimated location
64	334205	6594941	few	Estimated location
Castle Hill				
65	311924	6607395	1	Castle Hill
66	311434	6609041	4	Castle Hill
Regional				
67	327922	6595349	25	Regional Cutters Ridge HR North
68	327982	6594901	40	Regional Cutters Ridge HR North
69	327964	6594875	35+	Regional Cutters Ridge HR North
70	327950	6594850	15	Regional Cutters Ridge HR North
71	327928	6595352	25	Regional Cutters Ridge HR North
72	327660	6594882	10	Regional Cutters Ridge HR North
73	327933	6595353	20	Regional Cutters Ridge HR North
74	327821	6595301	7	Regional Cutters Ridge HR North
75	327814	6595311	5	Regional Cutters Ridge HR North
76	327855	6595478	20	Regional Cutters Ridge HR North
77	327860	6595490	15	Regional Cutters Ridge HR North
78	327852	6595605	15	Regional Cutters Ridge HR North
79	327856	6595608	10	Regional Cutters Ridge HR North

80	327756	6595887	50	Regional Cutters Ridge HR North
81	328306	6595569	5	Regional Cutters Ridge HR North
82	328147	6594954	7	Regional Cutters Ridge HR North
83	328152	6594953	12	Regional Cutters Ridge HR North
84	328069	6594938	30+	Regional Cutters Ridge HR North
85	328057	6594936	5	Regional Cutters Ridge HR North
86	328035	6594936	35+	Regional Cutters Ridge HR North
87	327870	6595386	1	Regional Cutters Ridge HR North
88	327541	6595201	2	Regional Cutters Ridge HR North
89	327894	6595362	13	Regional Cutters Ridge HR North
90	327892	6595364	15	Regional Cutters Ridge HR North
91	327870	6595378	20+	Regional Cutters Ridge HR North
92	327867	6595383	40	Regional Cutters Ridge HR North
93	327920	6595353	10	Regional Cutters Ridge HR North
94	327531	6595032	10	Regional Cutters Ridge HR North
95	327584	6595067	10	Regional Cutters Ridge HR North
96	327758	6595450	1. ID to be confirmed	Regional Cutters Ridge HR North
97	327818	6594709	30	Regional Cutters Ridge HR South
98	327830	6594693	40	Regional Cutters Ridge HR South
99	327829	6594680	10	Regional Cutters Ridge HR South
100	327829	6594673	10	Regional Cutters Ridge HR South
101	327843	6594652	10	Regional Cutters Ridge HR South
102	327848	6594657	50	Regional Cutters Ridge HR South
103	318621	6597845	5	Coolgardie Road North
104	318632	6597850	5	Coolgardie Road North
105	318655	6597842	15	Coolgardie Road North
106	318666	6597839	20	Coolgardie Road North
107	318682	6597835	15	Coolgardie Road North
108	318676	6597840	15	Coolgardie Road North
109	318684	6597848	10	Coolgardie Road North
110	318690	6597839	10	Coolgardie Road North
111	318739	6597828	10	Coolgardie Road North
112	319037	6598336	35	Coolgardie Road North
113	319040	6598345	35+	Coolgardie Road North
114	319040	6598351	30	Coolgardie Road North
115	319036	6598355	100+	Coolgardie Road North
116	318960	6598370	20	Coolgardie Road North
117	318934	6598360	30	Coolgardie Road North
118	318747	6598328	15	Coolgardie Road North
119	318244	6598069	1	Coolgardie Road North
120	318112	6598022	15	Coolgardie Road North
121	317458	6598468	3	Coolgardie Road North
122	317462	6598472	15	Coolgardie Road North

123	317908	6598174	3	Coolgardie Road North
124	317878	6598179	3	Coolgardie Road North
125	335891	6599467	20	Northern Star Tenement
126	335816	6599474	5	Northern Star Tenement
127	335765	6599494	5	Northern Star Tenement
128	335664	6599497	15	Northern Star Tenement
129	335641	6599505	5	Northern Star Tenement
130	335683	6599501	30	Northern Star Tenement
131	335755	6599494	40	Northern Star Tenement
132	335130	6599496	200	Northern Star Tenement
133	335074	6599506	40	Northern Star Tenement
134	335159	6599499	40	Northern Star Tenement
135	335157	6599492	150	Northern Star Tenement
136	335127	6599499	200	Northern Star Tenement
137	335114	6599506	70	Northern Star Tenement
138	335071	6599512	40	Northern Star Tenement
139	335069	6599517	60	Northern Star Tenement
140	335061	6599518	20	Northern Star Tenement
141	335053	6599517	60	Northern Star Tenement
142	334989	6599538	3	Northern Star Tenement
143	335021	6599519	continued presence to west	Northern Star Tenement