

KARARA MINING LIMITED

Karara Mining Limited

Fauna Assessment for Karara Telecommunication Tower (L59/191)

April 2021

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SYNOPSIS

This document has been prepared for inclusion in the application for approval to construct a Telecommunications Tower at KML tenement L59/191.

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FAUNA SURVEY - KML TELECOMS TOWER					
REV	DESCRIPTION	ORIG	REVIEW	APPROVED	DATE
A	Issued for Internal Review	<u>A Marais</u>	<u>R Wood</u>	<u>G Trench</u>	30-Apr-2021

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1 INTRODUCTION

1.1 Background

Karara Mining Limited (KML), a joint venture between Gindalbie Metals Limited and Anshan Iron & Steel Group, operates the Karara Iron Ore Project (KIOP). The project includes processing infrastructure and a rail terminal immediately to the west of the Karara mine, with associated waste and tailings stockpiles.

A need for an improved telecommunication network capability requires the erection and construction of a new tower on a natural ridge located on tenement L59/191.

The survey area is located within the Yalgoo (358) IBRA (Interim Biogeographic Regionalisation Australia) Subregion (Department of Agriculture, Water and the Environment 2021). This region is an interzone between South-western Bioregions and Murchison Region, and the rocky ridge part of the survey area is characterised by Karara Regional Floristic Community 21a while the lower lying surrounds is covered by Community 31. Floristic Community 21a is identified by low woodlands to open woodlands of *Eucalyptus salubris* over mid sparse shrubland of mixed species including *Acacia acanthoclada subsp. glaucescens* and *Rhagodia drummondii* over low sparse chenopod shrubland of mixed species including *Sclerolaena fusiformis* and *Maireana trichoptera* on red to red-brown clay loam or sandy clay loam on flats to midslopes.

Floristic Community 31 is characterized by tall shrubland to tall open shrubland of mixed species including *Acacia burkittii*, *A. karina*, *A. tetragonophylla*, *Allocasuarina tessellata* and *A. dielsiana* over low sparse shrubland of species including *Ptilotus obovatus* over low sparse forbland of *Borya sphaerocephala* on red clay loams on hillslopes with granite and/or ironstone outcropping. (Woodman Environmental 2011).

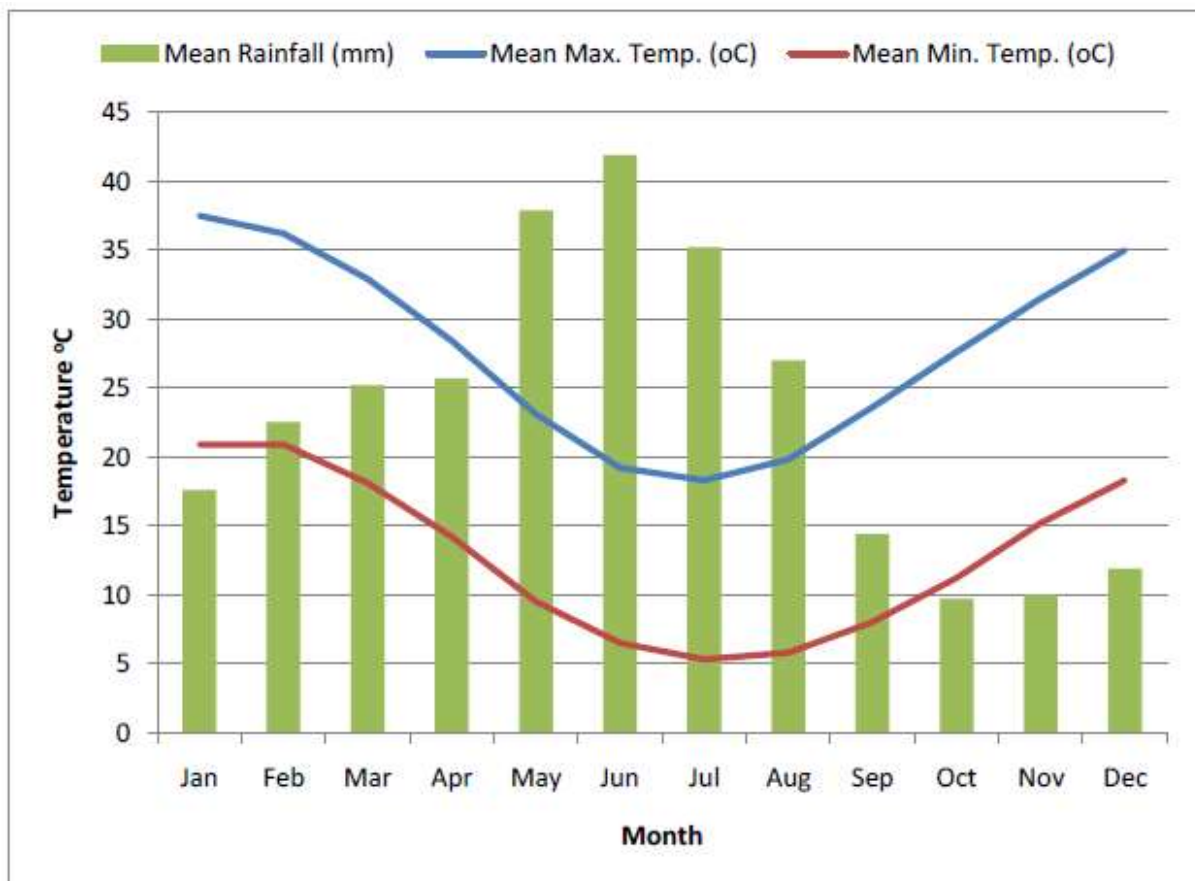
The dominant land use of the Yalgoo Subregion is grazing of natural grasses (pastoral stations), with a significant proportion of the land under conservation and mining leases. Geological surveys have mapped 76 land systems across the Sandstone-Yalgoo-Paynes Find survey area. Karara is located on the Yilgarn Plateau, particularly within the Salinaland Plateau physiogeographic unit, which is characterised by sandplains and laterite

breakaways, granitic and alluvial plains, ridges of metamorphic rocks and granitic hills and rises, calcretes, large salt lakes and dunes along valleys (Payne *et al.*, 1998).

The survey area experiences a Semi-Desert Mediterranean climate, characterised by 9 to 11 months of dry weather, with mild wet winters and hot dry summers (Beard 1990).

Historically the highest rainfall is experienced during June, with the driest months being October – December (BOM 2020; Paynes Find). Figure 1 presents the average monthly rainfall, plus maximum and minimum temperatures.

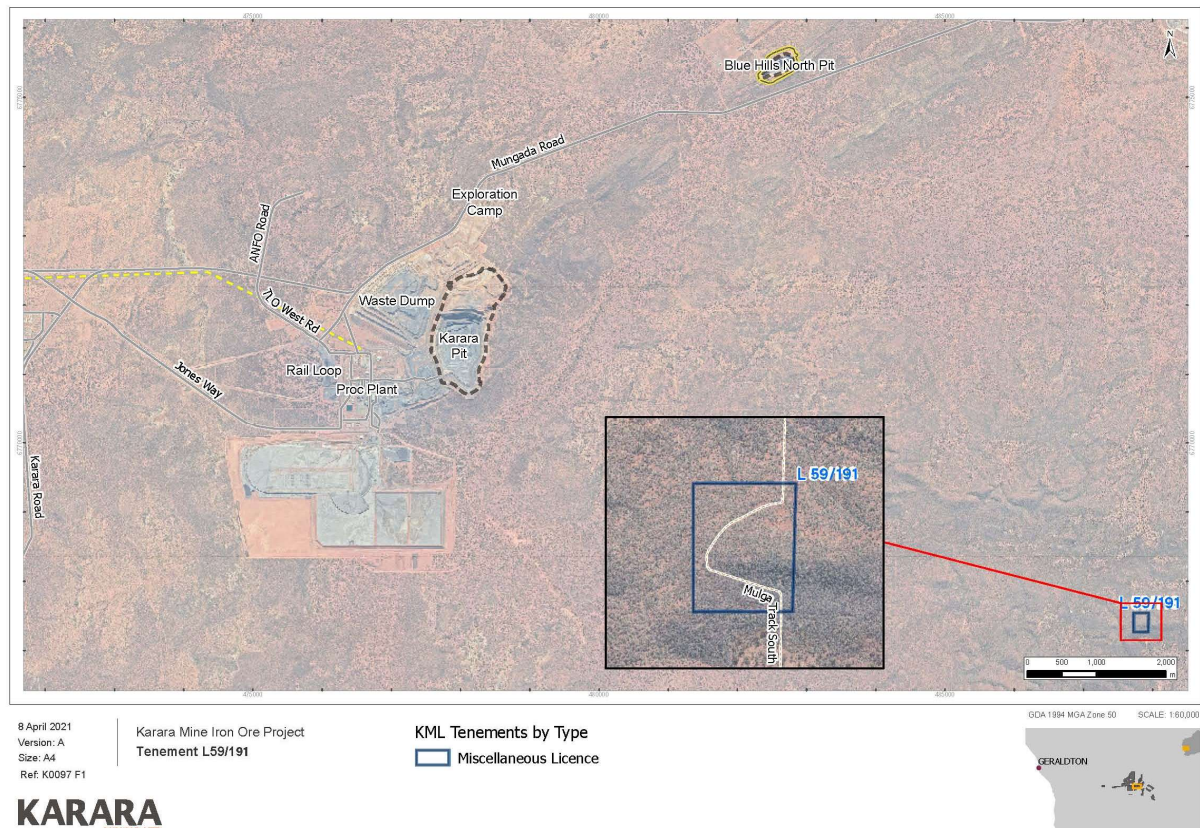
Figure 1. Monthly Mean Maximum and Minimum Temperatures (°C) (1991 – 2020) and Mean Rainfall (1991 – 2020), Paynes Find (BOM 2020).



1.2 Location

The project area is located on and around Karara Station, 55km north-east of Perenjori in Western Australia. KML tenement L59/191 is situated approximately 11km South-east of the Karara processing plant (see Figure 2).

Figure 2. Location of the proposed telecommunications tower.



The tenement covers an area of 6ha, a maximum height of 444m and has the following coordinates.

Table 1. Tenement L59/191 boundary coordinates.

L59/191 COORDINATES UTM – (50J)	
North East corner	0487985 // 6767579
North West corner	0487708 // 6767579
South East corner	0487986 // 6767233
South West corner	0487708 // 6767233
Boundary Dimensions	
East West	210m
North South	270m

The field survey for fauna covered the entire six ha of tenement L59/191. Environmental Investigations have previously been conducted along Mungada Road (Bamford and Smith, 2011; Woodman Environmental Consulting, 2011).

1.3 Study Objectives

The purpose of the assessment is to provide government agencies with the information needed to assess the significance of impacts under State and Federal Government legislation. The values and impacts approach drawn from Gleeson and Gleeson (2012) was used in the assessment.

The level of the survey is based on the EPA recommendations and determined as Desktop and Basic Survey. A basic survey is a low-intensity survey, completed to gather broad fauna and habitat information at the local scale. The main objectives are to verify the appropriateness of the desktop study, describe and map habitats, identify future survey site locations and determine site logistics / access. The results from the basic survey are also used to determine whether a detailed and/or targeted survey is required. (EPA, 2020).

This approach includes the following components:

- The identification of fauna values:
 - Assemblage characteristics: uniqueness, completeness and richness;
 - Species of conservation significance;
 - Recognition of ecotypes or vegetation/substrate associations (VSAs) that provide habitat for fauna, particularly those that are rare, unusual and/or support significant fauna;
 - Patterns of biodiversity across the landscape; and
 - Ecological processes upon which the fauna depend.
- The review of impacting processes such as:
 - Habitat loss leading to population decline;
 - Habitat loss leading to population fragmentation;
 - Degradation of habitat due to weed invasion and *Phytophthora* infestation leading to population decline;
 - Ongoing mortality from operations;
 - Species interactions including feral and overabundant native species;
 - Hydrological change;
 - Altered fire regimes; and

- Disturbance (dust, light, noise).
- The recommendation of actions to mitigate impacts.

Descriptions and background information on these values and processes can be found in Appendices A to D as described by Bamford and Smith (2020).

This report presents the results of a field surveys undertaken during April 2021. The species of conservation significance that were targeted were the Malleefowl *Leipoa ocellata* (Vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); Schedule under *WA Biodiversity Conservation Act 2016* (BC Act)), The Western Spiny-tailed Skink (WStS) *Egernia stokesii badia* (Endangered (EPBC Act); Schedule 3 (BC Act)), and trapdoor spiders of the genus *Idiosoma*.

The Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (listed as Priority 3 by the DBCA) has been found to be fairly common in the KIOP area, usually found in gravelly loam soils close to ironstone ridges (Bancroft and Bamford 2019). The Gilled Slender Blue-tongue *Cyclodomorphus branchialis* (Schedule 3 – *Biodiversity Conservation Act, 2016*) was included among the target species because it has previously been found in the area by Bamford Consulting Ecologists (BCE).

2 APPROACH AND METHODS

2.1 Desktop Assessment

According to the WA EPA Technical Guidance – *Terrestrial vertebrate fauna surveys for environmental impact assessment* (2020), a desktop study is a typical prerequisite for surveys. The Desktop Assessment is not a survey and should be undertaken to inform the choice of field survey type and to provide background information for the survey and subsequent reporting. The purpose of a desktop study is to gather contextual information about an area from existing surveys, database searches, available literature and spatial datasets. At the completion of a desktop study there should be sufficient information collated to identify the potential fauna species, habitats that may be present and set them in a regional context.

2.1.1 Sources of Information

Sources of information incorporate previous records of all fauna on KML files, *Naturemap* review (Appendix F) and 15 reports completed by BCE between 2004 and 2020. The surveys and assessments completed by BCE over the past 17 years included two level 2 studies and

targeted work on significant species: Malleefowl, Shield-backed Trapdoor Spiders, Western spiny-tailed Skinks, the Gilled Slender Blue-tongue and Short Range Endemic (SRE) invertebrates.

In addition to the above, the most recent database review sourced information from BirdData, Atlas of Living Australia and the EPBC Protected Matter Search tool. KML and BCE records contain more species and more information about these species than the databases as observed in Appendix E (Bamford and Smith, 2020).

The above-mentioned multiple surveys allowed for the accumulation of additional fauna observations with the result that the Karara project area has a noteworthy list of confirmed vertebrate species. KML (with assistance from BCE, Curtin University and other contributors), has maintained an ongoing annotated species list which includes 3 frogs, 47 reptiles, 111 birds, 25 native mammals and 3 invertebrates of significance.

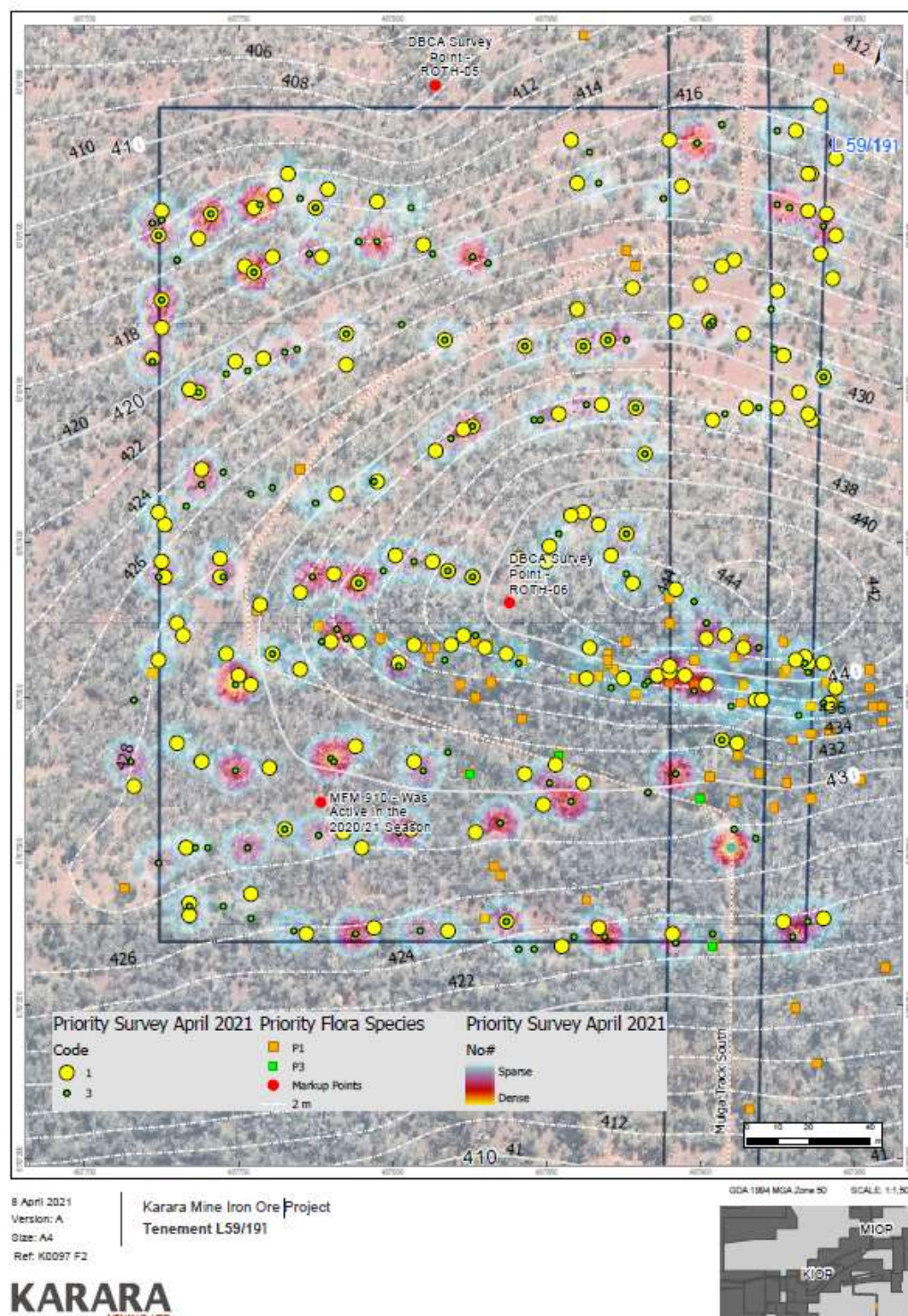
2.2 Field Survey

Field surveys for signs or presence of fauna was conducted on the 2nd and 20th of April 2021 by Adam Freeman (M.Sc. Environmental Science) and André Marais (B.Sc. Zoology and Animal Physiology, M.Sc. MEM). Adam Freeman has 10 years+ environmental management experience at Karara and Marais has 1 year+ experience at KML. Both have completed the DBCA Fauna Handling and Snake Handling courses.

The field investigations involved the personnel walking across tenement L59/191 in transects. Opportunistic searches were conducted at all noteworthy locations of interest or suitable habitat for any of the targeted species and other fauna.

- For Malleefowl, the mound was recorded with GPS coordinates in the KML Malleefowl Register, described and photographed as indicated in Figure 3.
- Searching for habitat and evidence of Western Spiny-tailed Skink presence within the study area included the assessment of any suitable habitat/log pile for the characteristic piles of scats in latrines. No suitable logs were observed or recorded during the walked transects.
- *Idiosoma* spiders. Opportunistic surveys were conducted at all vegetation sites of suitable habitat searching for burrows with distinctive lid architecture, including decorations on the lid and a fan of twigs or leaves. No burrows were recorded during the field survey.

Figure 3. Active Malleefowl Mound in relation to significant flora on tenement L59/191.



- The Gilled Slender Blue-tongue. This reptile species was searched for in rocky areas by turning over rocks, BEC reported that it had been previously recorded on Karara and Mungada ridges using this technique. No specimens were noted.

- Other fauna. Opportunistic observations on other fauna were made during all site visits, this included bird sightings and recording evidence such as tracks, bones, feathers, diggings and scats.

In addition to the above, field cameras were deployed for a total of 18 monitoring days and nights. Cameras were set up to face baiting stations (peanut butter and oats bait balls) – with exception of ants no species were recorded to have any interest in the bait provided at the site (L59/191).

2.3 Survey Limitations

The Environmental Protection Authority (2020). Technical Guidance – *Terrestrial vertebrate fauna surveys for environmental impact assessment*, describes several limitations that may arise during surveying. These survey limitations are discussed in the context of the KML investigation of the Telecommunication Tower area in Table 2.

Table 2. Survey limitations as outlined by EPA (2020).

EPA Limitation	Comment
Availability of data and information	A large number of information is available from previous surveys conducted by BEC and others over a period from 2004 to date.
Competency/experience of the survey team, including experience in the bioregion surveyed	Both environmental staff of the survey team has more than a decade experience in monitoring and surveying fauna in WA. One advisor has more than a decade of experience at KML.
Scope of the survey, e.g. where faunal groups were excluded from the survey	The survey focused on significant vertebrate and invertebrate fauna, targeting known threatened species.
Timing, weather and season	Mid-autumn was ideal in terms of reptile movement (peak season) and good in terms of other fauna, weather was warm and mild during the days surveyed.

EPA Limitation	Comment
Disturbance that may have affected results e.g. fire, flood	There has been no fire, floods or other disturbance that could have affected survey results.
The proportion of fauna identified, recorded or collected	No specimens were collected, the proportion of fauna identified and recorded is not considered a limitation due to the relatively small area of survey (6ha).
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	The extent to which the area was surveyed is considered appropriate to the level of proposed disturbance (0.1ha of 6 ha area).
Access problems	There were no access problems, a track/road runs through the survey area.
Problems with data and analysis, including sampling biases.	There are no known problems with the data and analyses or sampling biases.

2.4 Habitats and Vegetation Associations

Vegetation and Soil Associations (VSAs) combine broad vegetation types, the soils or other substrate with which they are associated, and the landform. VSAs are the environments that provide habitats for fauna. A single VSA was identified during the field investigation.

VSA 1 - This landform consists of an ironstone-based ridge with outcropping rock and slopes with cobbles and gravel supporting a mixed shrubland dominated by *Allocasuarina* spp., *Acacia* spp., and *Melaleuca* spp. Although this VSA is well represented locally it is not common on a regional basis. This Vegetation and Soil Association appears fit for both Malleefowl and Shield-backed Trapdoor Spiders, one active Malleefowl Mound was found at the foot of the hill, but no Spiders or burrows were noted during the field survey.

The proposed hill top area of the tenement is unsuitable for Malleefowl mound habitat as seen from the photos below and the limited clearing is unlikely to impact on the species.

Photos 1 and 2: Habitat and Vegetation associations on the ridge at L59/191. (Photo 1 facing south and 2 is facing north).



3. RESULTS

3.1 Observations on significant species

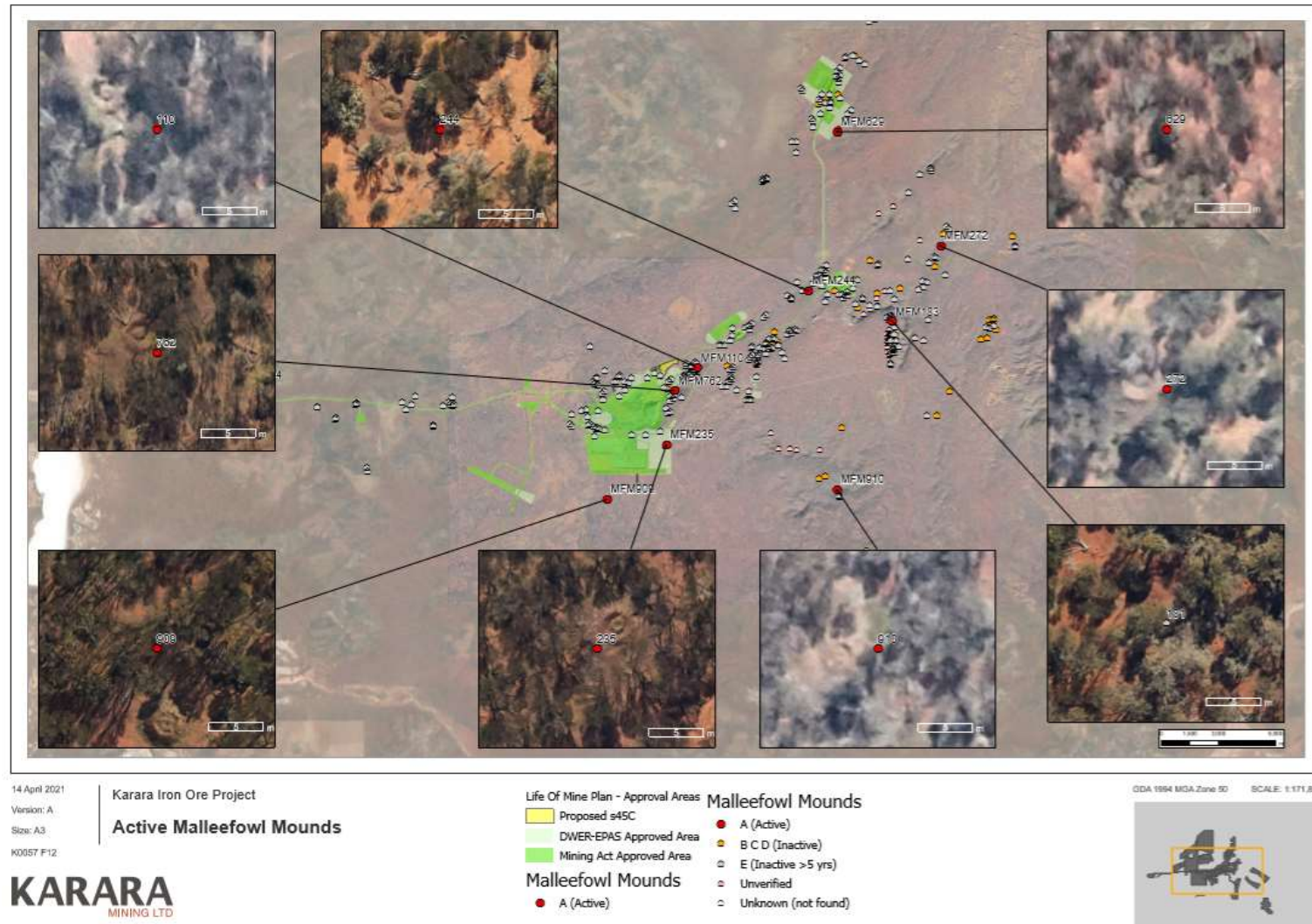
The findings of this survey results were that a detailed fauna survey is not required. The Basic field survey conducted identified one active Malleefowl mound, and no Western Spiny-tailed Skinks, Gilled Slender Bluetongue or Shield-backed Trapdoor Spiders was noted.

3.1.1 Malleefowl

One active Malleefowl mound was located within tenement L59/191. Fresh tracks, pieces of egg shell, feathers and scats were recorded at the mound on both survey dates (2nd and 20th of April 2021).

The active mound is located on the lower southern slope with doleritic gravel, the location of the mound (910) is provided in Figure 4. [Location: UTM (50J) 0487781 // 6767304].

Figure 4. Location of the active Malleefowl mound (MFM 910) SE - in relation to the other 8 active mounds.



Photos 3 and 4: The active Malleefowl mound and fresh scat.



3.1.2 Western Spiny-tailed Skink

No suitable habitat were found in relation to WStS at the survey site, no appropriate fallen logs were found and thus no scat piles of WStS. The closest suitable skink habitat to the survey site is approximately 1.2km to the north as indicated by the map in Figure 5 on the next page.

WStS monitoring sites and suitable or potential Gilled Slender Blue tongue Skink habitat is also depicted on the map.

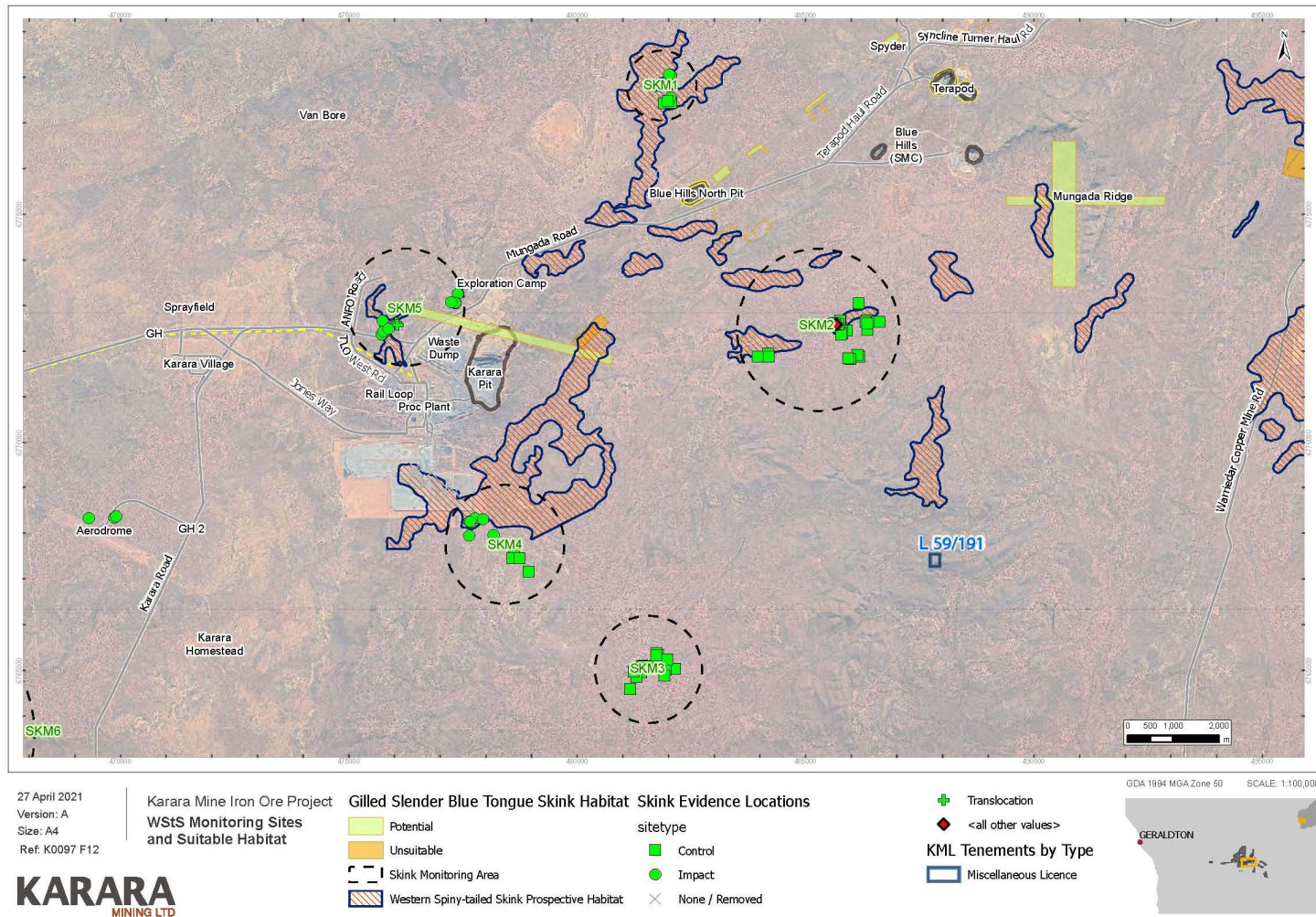
3.1.3 Shield-backed Trapdoor Spider

No evidence of any of the three *Idiosoma* spp. were recorded. However, Wolf Spider (*Lycosa* spp.) and Golden Orb Weaving Spider (*Nephila* spp.) were documented during the survey.

Photo 5 and 6: Wolf spider burrow and motion camera deployed during survey.



Figure 5. Current WStS monitoring sites, suitable habitat and Gilled Slender Blue Tongue habitat in relation to the survey site.



3.2 Observation of other Fauna

Amphibians: With water not common at this site, the presence of amphibians were not expected or noted.

Reptiles: Two reptile scats were recorded but these are yet to be identified (scats were verified by Curtin herpetology researcher as not being WStS or Gilled Slender Blue tongue lizard).

Birds: Evidence of Malleefowl, Emu and Australian Ringneck parrot were found on site (tracks/feathers/scats).

Mammals: Evidence of kangaroo, dog/dingo, cat, rabbit and echidna were found as scats and diggings.

Photos 7 and 8: Unidentified reptile scat and echidna scat.



Table 3 below indicates the number of species per taxon recorded at KML since 2004 and the number noted at this six ha tenement during the recent survey.

Table 3. Composition of vertebrate fauna assemblage of the survey area.

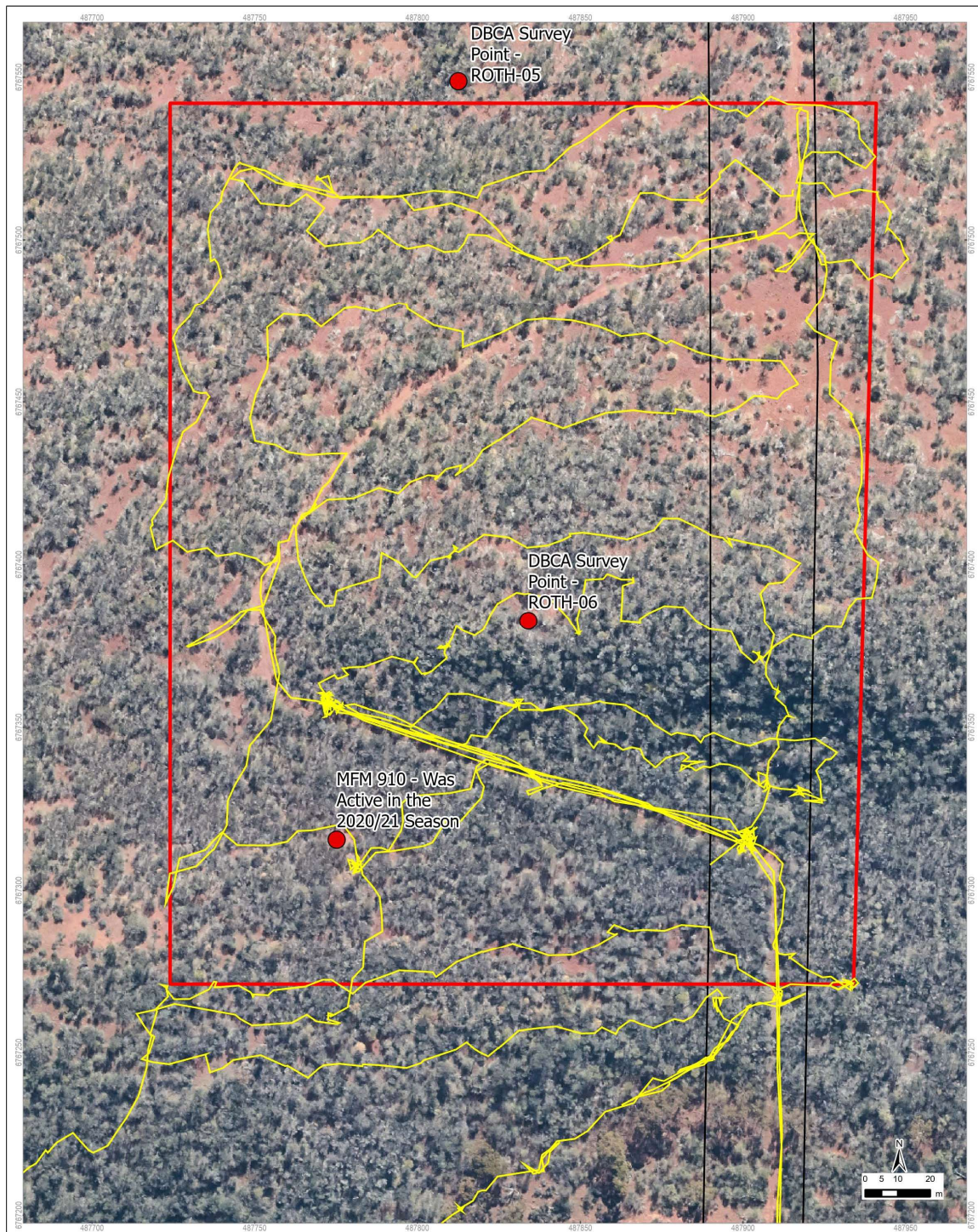
Taxon	Number of potential KML species	Species recorded during the survey
Frogs	7	0
Reptiles	57	0 (2*)
Birds	117	3
Native Mammals	24	2
Introduced Mammals	5	3
TOTAL	210	8

Reptiles (2) – two scat samples/photos (yet to be identified)*

Photos 9 and 10: Rabbit and dog/dingo scats.



Figure 6. The GPS track log of the survey conducted on 02/04/2021.



Karara Iron Ore Project

Fauna Track Logs

KARARA
 MINING LTD

- MarkupPoints
- Fauna Track Log (Indy 210402)
- L59/191



Ref: K0097 F18 Proj: GDA94 MGAZ50
 Version: A Scale: 1:1,500
 27 July 2021 Size: A4

4. CONCLUSIONS

4.1 Summary of Fauna Values

The desktop study identified 210 vertebrate fauna species as potentially occurring in the two expansion areas: 7 frogs, 57 reptiles, 117 birds, and 24 native and 5 introduced mammals. Of these, 3 frogs, 47 reptiles, 102 birds and 20 native and 5 introduced mammals have been confirmed in the greater Karara area by Bamford Consulting Ecologists (BCE) over the past 13 years.

Fauna values within the survey area can be summed up as:

- Fauna assemblage is moderately intact. The relative small size of the tenement area and even smaller potential impact area did not necessitate an intensive study, thus the limited number of species recorded is considered to be consistent with the available habitat and size of the survey area.
- Across KML a total of 26 potential species of conservation significance are expected to be present. Of these only one – the Malleefowl, listed under state and federal legislation (Vulnerable) were found on the survey area. No evidence was found of any of the other listed fauna species previously recorded at KML.
- Patterns of biodiversity, the vegetation type is fairly homogenous across the study area and includes a number of Priority floristic species. The distinctive patterns associated with the rocky hill and outcrop were considered to be associated with SRE invertebrates but none of the *Idiosoma* species were noted during the survey. Malleefowl signs (feathers, tracks and scats), and presence of the mound was limited to the lower lying slope.

4.2 Impacts

The proposed development area is small (0.1ha) in the regional landscape and therefore impacts on fauna in general should be minimal. Impacts upon significant species is thus considered to be negligible because of the extent of surrounding intact landscapes and assuming key management actions are taken: minimise mortality/impact on Malleefowl and their mound. Potential impacts to the Malleefowl were assessed against federal significant impact guidelines 1.1 (DotE 2014), as shown in Table 4. The conclusion is that no significant impacts will occur but stress the importance of management to avoid fauna mortality or mound disturbance during clearing for the tower construction.

Table 4. Malleefowl assessed as per Guidelines 1.1 (DotE, 2014).

Significance Criteria under Guidelines 1.1	Likelihood and rationale
	Malleefowl
Lead to a long-term decrease in the size of a population ¹ (or an important population ²).	Unlikely to occur. No Malleefowl will be displaced by clearing or the altering of extensive alternative habitat. No long-term change is envisaged.
Reduce the area of occupancy of the species (or an important population).	Unlikely to occur. Area of loss of habitat will be small (0.1ha) relative to the available habitat in the region.
Fragment an existing population (or important population) into two or more populations.	Unlikely to occur. This is a mobile species and clearing within the proposed area is unlikely to affect its ability to move through the landscape.
Adversely affect habitat critical to the survival of a species ³ .	Unlikely to occur. No nesting habitat will be lost, proposed clearing area is on crest with bedrock. Suitable habitat is regionally extensive.
Disrupt the breeding cycle of a population (or important population).	Unlikely to occur. One pair may be temporarily disrupted but unlikely if the disturbance is planned outside of the breeding period.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely to occur. No loss of breeding habitat expected (clearing of 0.1ha of rocky substrate area) no impact at the regional population scale.
Result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat.	Unlikely to occur. Feral predators (e.g. cats and foxes) are likely to be present in the region already and management is recommended to ensure these species do not adversely affect Malleefowl. (Trapping of feral predators is an ongoing project).
Introduce disease that may cause the species to decline.	Unlikely to occur. Vehicle and equipment hygiene management plan will be implemented.
Interfere with the recovery of the species.	Unlikely to occur. Localised impacts only. Broad-scale threatening processes (such as feral predators and herbivores) are of greatest concern for the species.

¹ A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area (includes a geographically distinct regional population, or collection of local populations, or a population, or collection of local populations, that occurs within a particular bioregion). Pertains to endangered and vulnerable species.

² An 'important population' is a population that is necessary for a species' long-term survival and recovery (includes populations identified as such in recovery plans, and/or key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range). Pertains to vulnerable species.

³ 'Habitat critical to the survival of a species' refers to areas that are necessary: for activities such as foraging, breeding, roosting, or dispersal; for the long-term maintenance of the species; to maintain genetic diversity and long term evolutionary development; or for the reintroduction of populations or recovery of the species or ecological community. Pertains to endangered and vulnerable species.

Due to the fact that no WStS or *Idiosoma* species were recorded during the survey, these species were not assessed as for Malleefowl per Guidelines 1.1.

4.3 Recommendations

Effects of impacting processes are mostly considered to be negligible (Bamford and Smith, 2020); this is mainly due to the scale and type of impact and the continuous, extensive and fairly uniform environment. Impacts that may need to be addressed are:

- Mortality of fauna or disturbance of nesting Malleefowl during construction.
- Possibility of off-site impacts such as disturbance to vegetation (fauna habitat) during access improvement to the site.
- Potential of introducing weeds or pathogens to the area from equipment or vehicles used in the construction of the tower.

Management actions that can be taken to minimise impacts are summarised by the following recommendations:

- Minimise footprint on the site, access route and rehabilitate where possible.
- Implement the existing KML management procedures for minimising impacts on the Malleefowl during clearing and operations (*CORP-EN-PRO-1035 - Malleefowl Management and Monitoring Procedure*).
- Employ industry standard hygiene to avoid introducing weeds into the project areas.

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6. GLOSSARY

An alphabetical list of terms and acronyms used in this report are documented below in Table 5. Glossary.

Table 5. Glossary

Term	Definition
BC	Biodiversity Conservation
BCE	Bamford Consulting Ecologists (M.J. and A.R. Bamford)
BOM	Bureau of Meteorology
CAMBA	China Australia Migratory Bird Agreement
CMS	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
DBCA	Department of Biodiversity, Conservation and Attractions
DoEE	Department of the Environment and Energy
DOtE	Department of the Environment
DPaW	Department of Parks and Wildlife
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for the Conservation of Nature and Natural Resources
JAMBA	Japan Australia Migratory Bird Agreement
KML	Karara Mining Limited
MEM	Masters Environmental Management
ROKAMBA	Republic of South Korea Australia Migratory Bird Agreement
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SER	Short Range Endemics
VSA	Vegetation and Soil Associations
WA	Western Australia
WEC	Woodman Environmental Consulting

Appendices

Appendix A.

Explanation of fauna values.

Bamford and Smith (2020) describe the fauna values as the features of a site and its fauna that contribute to biodiversity, and it is these values that are potentially at threat from a development proposal. Fauna values can be examined under the five headings outlined below. Understanding fauna values provides opportunities to predict and therefore mitigate impacts.

Assemblage characteristics

Uniqueness. This refers to the combination of species present at a site. For example, a site may support an unusual assemblage that has elements from adjacent biogeographic zones, it may have species present or absent that might be otherwise expected, or it may have an assemblage that is typical of a very large region. For the purposes of impact assessment, an unusual assemblage has greater value for biodiversity than a typical assemblage.

Completeness. An assemblage may be complete (i.e., has all the species that would have been present at the time of European settlement) or it may have lost species due to a variety of factors. Note that a complete assemblage, such as on an island, may have fewer species than an incomplete assemblage (such as in a species-rich but degraded site on the mainland).

Richness. This is a measure of the number of species at a site. At a simple level, a species-rich site is more valuable than a species-poor site, but value is also determined by other factors, for example, by the sorts of species present.

Vegetation and Substrate Associations

Vegetation and Substrate Associations (VSAs) combine broad vegetation types, the soils or other substrate with which they are associated, and the landform. In the context of fauna assessment, VSAs are the environments that provide habitats for fauna. By definition an animal's habitat is the environment that it utilises, not the environment as a whole. Habitat is a function of the animal and its ecology, rather than being a function of the environment. For example, a species may occur in eucalypt canopy or in leaf-litter on sand, and that habitat may be found in only one or in several VSAs. VSAs are not the same as vegetation types since these may not incorporate soil and landform, and recognise floristics to a degree that VSAs do not. Vegetation types may also not recognise minor but often significant (for fauna) structural differences in the environment, which VSAs will recognise.

Because VSAs provide the habitat for fauna, they are important in determining assemblage characteristics. For the purposes of impact assessment, VSAs can also provide a surrogate for detailed information on the fauna assemblage. For example, rare or restricted VSAs should automatically be considered a significant fauna value. Impacts may be significant if the VSA is rare, a large proportion of the VSA is affected and/or the VSA supports significant fauna. The disturbance of even small amounts of habitat in a localised area can have significant impacts to fauna if rare or unusual habitats are disturbed.

Patterns of biodiversity across the landscape

This fauna value relates to how the assemblage is organised across the landscape. Generally, the fauna assemblage is not distributed evenly across the landscape or even within one VSA. There may be zones of high biodiversity, such as particular environments or ecotones (transitions between VSAs). There may also be zones of low biodiversity. Impacts may be significant if a wide range of species is affected even if most of those species are not significant per se.

Species of conservation significance

Species of conservation significance are of special importance in impact assessment. The conservation status of fauna species in Australia is assessed under Commonwealth and State Acts such as the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Western Australian Biodiversity Conservation Act 2016* (Biodiversity Conservation Act). In addition, the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) recognises priority levels, while local populations of some species may be significant even if the species as a whole has no formal recognition. Therefore, three broad levels of conservation significance can be recognised and are used for the purposes of this report and are outlined below. A full description of the conservation significance levels, schedules and priority levels mentioned below is provided in Appendix 3.

Conservation Significance (CS) level 1: Species listed under State or Commonwealth Acts.

Species listed under the EPBC Act are assigned to categories recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN) or are listed as migratory. Migratory species are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA), the Republic of South Korea Australia Migratory Bird Agreement (ROKAMBA), and/or the Convention on the Conservation of Migratory Species of Wild Animals (CMS; also referred to as the Bonn Convention).

Conservation Significance (CS) level 2: Species listed as Priority by the DBCA but not listed under State or Commonwealth Acts.

In Western Australia, the DBCA has produced a supplementary list of Priority Fauna, being species that are not considered threatened under the Biodiversity Conservation Act but for which the DBCA believes there is cause for concern. Some Priority species are also assigned to the Conservation Dependent category of the IUCN.

Conservation Significance (CS) level 3: Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

This level of significance has no legislative or published recognition and is based on interpretation of distribution information and expert judgment, but is used here as it may have links to preserving biodiversity at the genetic level. If a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Conservation significance is applied to allow for the preservation of genetic richness at a population level, and not just at a species level. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as CS3, as may colonies of waterbirds. The Western Australian Department of Environmental Protection, now DBCA, used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of the Perth Bushplan.

Invertebrate species considered to be short range endemics (SREs) also fall within the CS3 category, as they have no legislative or published recognition and their significance is based on interpretation of distribution information. The majority of species that have been classified as short-range endemics have common life history characteristics such as poor powers of dispersal or confinement to discontinuous habitats. Several groups, therefore, have particularly high instances of short-range endemic species: Gastropoda (snails and slugs), Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Pseudoscorpionida (pseudoscorpions), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish).

Introduced species

In addition to these conservation levels, species that have been introduced (INT) are indicated throughout the report. Introduced species may be important to the native fauna assemblage through effects by predation and/or competition.

Ecological processes upon which the fauna depend

These are the processes that affect and maintain fauna populations in an area and as such are very complex; for example, populations are maintained through the dynamic of mortality, survival and recruitment being more or less in balance, and these are affected by a myriad of factors. The dynamics of fauna populations in a project may be affected by processes such as fire regime, landscape patterns (such as fragmentation and/or linkage), the presence of feral species and hydrology. Impacts may be significant if processes are altered such that fauna populations are adversely affected, resulting in declines and even localised loss of species. Threatening processes as outlined below are effectively the ecological processes that can be altered to result in impacts upon fauna.

Appendix B. Explanation of threatening processes.

Bamford and Smith (2020), provides the following in terms of threatening processes. Potential impacts of proposed developments upon fauna values can be related to threatening processes. This is recognised in the literature and under the EPBC Act, in which threatening processes are listed. Processes that may impact fauna values are discussed below. Rather than being independent of one another, processes are complex and often interrelated. They are the mechanisms by which fauna can be affected by development. Impacts may be significant if large numbers of species or large proportions of populations are affected.

Note that the terms direct and indirect impacts are used by the Department of DotE, SEWPaC and EPA, but there is some inconsistency in how these are defined. The federal guidance does not define direct impact but has a very broad definition of indirect, and makes the statement (DotE 2013) *‘Consideration should be given to all adverse impacts that could reasonably be predicted to follow from the action, whether these impacts are within the control of the person proposing to take the action or not. Indirect impacts will be relevant where they are sufficiently close to the proposed action to be said to be a consequence of the action, and they can reasonably be imputed to be within the contemplation of the person proposing to take the action.’* Indirect impacts therefore can even include what the DotE (2013) calls facilitated impacts, which are the result of third party actions triggered by the primary action. In contrast, the EPA defines direct impacts to *‘include the removal, fragmentation or modification of habitat, and mortality or displacement of individuals or populations.’* This document then lists as indirect impacts what in many cases are the consequences of the removal, fragmentation or modification of habitat. For example, *‘disruption of the dispersal of individuals required to colonise new areas inhibiting maintenance of genetic diversity between populations’* is a consequence of habitat fragmentation. Impacts of light, noise and even roadkill are defined as indirect but they are clearly the result of the action and in control of the person taking the action. Roadkill is as direct a form of mortality as can be observed, but it is considered as an indirect impact in the context of a development presumably because it is not directly linked to land clearing. The EPA makes a strong distinction between removal of vegetation (direct impact) and the consequences of such clearing and other aspects of a development (indirect impacts). It is not obvious how this distinction between direct and indirect impacts is helpful in the EIA process, as the key aim is to ensure that all impacts that result from a project are addressed in this assessment process. Interestingly, Gleeson and Gleeson, in a major review of impacts of development on wildlife, do not use the terms direct or indirect. In the following outlines of threatening processes that can cause impacts, the emphasis is upon interpreting how a threatening process will cause an impact. For example, loss of habitat (threatening process) can lead to population decline and to population fragmentation, which are two distinct impacts.

Loss of habitat affecting population survival

Clearing for a development can lead to habitat loss for a species with a consequent decline in population size. This may be significant if the smaller population has reduced viability. Conservation significant species or species that already occur at low densities may be particularly sensitive to habitat loss affecting population survival.

Loss of habitat leading to population fragmentation

Loss of habitat can affect population movements by limiting movement of individuals throughout the landscape as a result of fragmentation. Obstructions associated with the development, such as roads, pipes and drainage channels, may also affect movement of small, terrestrial species. Fragmented populations may not be sustainable and may be sensitive to effects such as reduced gene flow.

Degradation of habitat due to weed invasion leading to population decline

Weed invasion, such as through introduction by human boots or vehicle tyres, can occur as a result of development and if this alters habitat quality, can lead to effects similar to habitat loss.

Increased mortality

Increased mortality can occur during project operations; for example, roadkill, animals striking infrastructure, and entrapment in trenches. Roadkill as a cause of population decline has been documented for several medium-sized mammals in eastern Australia. Increased mortality due to roadkill is often more prevalent in habitats that have been fragmented. Increased mortality of common species during development is unavoidable and may not be significant for a population. However, the cumulative impacts of increased mortality of conservation significant species or species that already occur at low densities may have a significant impact on the population.

Species interactions, including predation and competition

Changes in species interactions often occur with development. Introduced species, including the feral Cat, Red Fox and Rabbit, may have adverse impacts upon native species and development can alter their abundance. In particular, some mammal species are very sensitive to introduced predators and the decline of many mammals in Australia has been linked to predation by the Red Fox, and to a lesser extent, the feral cat. Introduced grazing species, such as the Rabbit, Goat, Camel and domestic livestock, can also degrade habitats and deplete vegetation that may be a food source for other species.

Changes in the abundance of some native species at the expense of others, due to the provision of fresh watering points, can also be a concern. The presence of artificial fresh water points in the semi-arid mallee rangelands was found to influence the abundance and distribution of certain bird species. Common, water-dependent birds were found to out-compete some less common, water-independent species. Similarly a decline in some bird species but an increase in others in the vicinity of active mines was noted and concluded this was due to the mine attracting large and aggressive species that displaced other species. Over-abundant native herbivores, such as kangaroos, can also adversely affect less abundant native species through competition and displacement.

Hydroecology

Interruptions of hydroecological processes can have major effects because they underpin primary production in ecosystems and there are specific, generally rare habitats that are hydrology-dependent. Fauna may be impacted by potential changes to groundwater level and chemistry and altered flow regime. These changes may alter vegetation across large areas and may lead to habitat degradation or loss. Impacts upon fauna can be widespread and major. Changes to flow regime across the landscape may alter vegetation and may lead to habitat degradation or loss, affecting fauna. For example, Mulga has a shallow root system and relies on surface sheet flow during flood events. If surface sheet flow is impeded, Mulga can die, which may impact on a range of fauna associated with this vegetation type.

Fire

The role of fire in the Australian environment and its importance to vertebrate fauna has been widely acknowledged. It is also one of the factors that has contributed to the decline and local extinction of some mammal and bird species. Fire is a natural feature of the environment but frequent, extensive fires may adversely impact some fauna, particularly mammals and short-range endemic species. Changes in fire regime, whether to more frequent or less frequent fires, may be significant to some

fauna. Impacts of severe fire may be devastating to species already occurring at low densities or to species requiring long unburnt habitats to survive. In terms of conservation management, it is not fire *per se* but the fire regime that is important, with evidence that infrequent, extensive and intense fires adversely affect biodiversity, whereas frequent fires that cover small areas and are variable in both season and intensity can enhance biodiversity. Fire management may be considered the responsibility of managers of large tracts of land, including managers of mining tenements.

Dust, light, noise and vibration

Impacts of dust, light, noise and vibration upon fauna are difficult to predict. Some studies have demonstrated the impact of artificial night lighting on fauna, with lighting affecting fauna behaviour more than noise. Effects can include impacts on predator-prey interactions, changes to mating and nesting behaviour, and increased competition and predation within and between invertebrates, frogs, birds and mammals.

The death of very large numbers of insects has been observed around some remote mine sites and attracts other fauna, notably native and introduced predators (M. Bamford, pers. obs). The abundance of some insects can decline due to mortality around lights, although this has previously been recorded in fragmented landscapes where populations are already under stress. Artificial night lighting may also lead to disorientation of migratory birds. Aquatic habitats and open habitats such as grasslands and dunes may be vulnerable to light spill.

Appendix C. Categories used in the assessment of conservation status.

IUCN categories as used for the Western Australian *Biodiversity Conservation Act 2016*.

Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild (Ex)	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 (E)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (V)	Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not Threatened.

Schedules used in the WA *Biodiversity Conservation Act 2016*.

Schedule 1 (S1)	Critically Endangered fauna
Schedule 2 (S2)	Endangered fauna
Schedule 3 (S3)	Vulnerable Migratory species listed under international treaties
Schedule 4 (S4)	Presumed extinct fauna
Schedule 5 (S5)	Migratory birds under international agreement
Schedule 6 (S6)	Conservation dependent fauna
Schedule 7 (S7)	Other specially protected fauna

WA Department of Biodiversity, Conservation and Attractions Priority species (species not listed under the *Biodiversity Conservation Act 2016*, but for which there is some concern).

Priority 1 (P1)	Taxa with few, poorly known populations on threatened lands.
Priority 2 (P2)	Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
Priority 3 (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa in need of monitoring.
Priority 4. (P4)	Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.
Priority 5 (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependent).

Appendix D. Ecological and threatening processes identified under legislation and in the literature (Bamford and Smith, 2020).

Ecological processes are processes that maintain ecosystems and biodiversity. They are important for the assessment of impacts of development proposals because ecological processes make ecosystems sensitive to change. The interaction of ecological processes with impacts and conservation of biodiversity has an extensive literature. Following are examples of the sorts of ecological processes that need to be considered (Bamford and Smith, 2020).

Ecological processes relevant to the conservation of biodiversity in Australia (Soule *et al.* 2004):

- Critical species interactions (highly interactive species);
- Long distance biological movement;
- Disturbance at local and regional scales;
- Global climate change;
- Hydroecology;
- Coastal zone fluxes;
- Spatially-dependent evolutionary processes (range expansion and gene flow); and
- Geographic and temporal variation of plant productivity across Australia.

Threatening processes (EPBC Act)

Under the EPBC Act, a key threatening process is an ecological interaction that threatens or may threaten the survival, abundance or evolutionary development of a threatened species or ecological community. There are currently 20 key threatening processes listed by the federal Department of the Environment and Energy (DoEE 2019):

- Competition and land degradation by rabbits.
- Competition and land degradation by unmanaged goats.
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*).
- Incidental catch (bycatch) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28 degrees South.
- Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations.
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis.
- Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris.
- Invasion of northern Australia by Gamba Grass and other introduced grasses.
- Land clearance.
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
- Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (*Anoplolepis gracilipes*) on Christmas Island, Indian Ocean.
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases.
- Novel biota and their impact on biodiversity.
- Predation by European red fox.
- Predation by exotic rats on Australian offshore islands of less than 1000 km² (100,000 ha).
- Predation by feral cats.
- Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs.
- Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species.

- The biological effects, including lethal toxic ingestion, caused by Cane Toads (*Bufo marinus*).
- The reduction in the biodiversity of Australian native fauna and flora due to the red imported fire ant, *Solenopsis invicta* (fire ant).

General processes that threaten biodiversity across Australia (The National Land and Water Resources Audit, 2008):

- Vegetation clearing;
- Increasing fragmentation, loss of remnants and lack of recruitment;
- Firewood collection;
- Grazing pressure;
- Feral animals;
- Exotic weeds;
- Changed fire regimes;
- Pathogens;
- Changed hydrology—dryland salinity and salt water intrusion;
- Changed hydrology— such as altered flow regimes affecting riparian vegetation; and
- Pollution.

In addition to the above processes, DSEWPaC (2013) (now DAWE) has produced Significant Impact Guidelines that provide criteria for the assessment of the significance of impacts. These criteria provide a framework for the assessment of significant impacts. The criteria are:

- Will the proposed action lead to a long-term decrease in the size of a population?
- Will the proposed action reduce the area of occupancy of the species?
- Will the proposed action fragment an existing population?
- Will the proposed action adversely affect habitat critical to the survival of a species?
- Will the proposed action disrupt the breeding cycle of a population?
- Will the proposed action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?
- Will the proposed action result in introducing invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?
- Will the proposed action introduce disease that may cause the species to decline?
- Will the proposed action interfere with the recovery of the species?

Appendix E. Comprehensive species list of fauna recorded at Karara since 2004 (Bamford and Smith, 2020). (KML Fauna Register, 2021) including the species noted during the survey (scats, feathers, tracks, etc.).

These lists are derived from the results of database and literature searches and from previous field surveys conducted in the local area by BCE and KML recent surveys. These are:

- Nat Map = Naturemap Database, searched April, 2021 (KML);
- Bird Data = Birdlife Australia's Birddata database, searched January 2017 (BCE);
- Karara Surveys = BCE surveys undertaken for Karara Mining Limited 2004 to 2019 (BCE); and
- KML April 2021 (Physical survey of tenement L59/191).

Frogs

Latin Name	English Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
Hylidae (Tree frogs)									
Cyclorana platycephala	Water-holding Frog					Resident			
Litoria rubella	Desert Tree Frog				X	Irregular visitor		X	
Myobatrachidae (Ground frogs)									
<i>Neobatrachus centralis</i>	Desert Trilling Frog			CS3		Resident?; uncertain		X	
<i>Neobatrachus kunapalari</i>	Kunapalari Frog					Resident			
<i>Neobatrachus pelobatoides</i>	Humming Frog					Resident			
<i>Neobatrachus sutor</i>	Shoemaker Frog					Resident			
<i>Pseudophryne occidentalis</i>	Western Toadlet					Resident		X	
Total Species : 7				1	1		-	2	-

KML 2021* - No frogs or signs of frogs were noted during the survey.

Reptiles

Latin Name	English Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
Gekkonidae (geckoes)									
<i>Diplodactylus granariensis</i>	Western Stone Gecko					Resident		X	
<i>Diplodactylus pulcher</i>						Resident		X	
<i>Lucasium maini</i>						Resident			
<i>Lucasium squarossum</i>						Resident		X	
<i>Hesperoedura reticulata</i>	Reticulated Velvet Gecko			CS3		Resident		X	
<i>Rhynchoedura ornata</i>	Beaked Gecko					Resident		X	

Latin Name	English Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
<i>Underwoodisaurus milii</i>	Barking Gecko					Resident		X	
<i>Gehyra variegata</i>	Variegated Dtella					Resident		X	
<i>Heteronotia binoei</i>	Bynoe's Gecko					Resident		X	
Pygopodidae (legless lizards)									
<i>Delma australis</i>						Resident		X	
<i>Lialis burtonis</i>	Burton's Legless Lizard					Resident		X	
<i>Pygopus lepidopodus</i>	Common Scaly-foot					Resident			
Agamidae (dragon lizards)									
<i>Caimanops (Diporiphora) amphiboluroides</i>	Mulga Dragon			CS3		Resident		X	
<i>Ctenophorus nuchalis</i>	Central Netted Dragon					Resident		X	
<i>Ctenophorus reticulatus</i>	Western Netted Dragon					Resident		X	
<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon					Resident		X	
<i>Moloch horridus</i>	Thorny Devil					Resident		X	
<i>Pogona minor</i>	Western Bearded Dragon					Resident		X	
Varanidae (monitors or goannas)									
<i>Varanus caudolineatus</i>	Stripe-tailed Monitor					Resident		X	
<i>Varanus giganteus</i>	Perentie					Resident		X	
<i>Varanus gouldii</i>	Sand Goanna					Resident		X	
<i>Varanus tristis</i>	Black-headed Monitor					Resident		X	
<i>Varanus panoptes</i>	Yellow-spotted Monitor					Resident		X	
Scincidae (skink lizards)									
<i>Cryptoblepharus buchananii</i>	Buchanan's snake-eyed skink					Resident		X	
<i>Ctenotus mimetes</i>						Resident		X	
<i>Ctenotus schomburgkii</i>						Resident		X	
<i>Ctenotus severus</i>						Resident			
<i>Ctenotus uber</i>						Resident		X	
<i>Cyclodomorphus branchialis</i>	Gilled Slender Blue-tongue	S3				Resident		X	
<i>Egernia depressa</i>						Resident		X	
<i>Egernia stokesii badia</i>	Western Spiny-tailed Skink	E S3				Resident		X	
<i>Eremiascincus richardsonii</i>	Broad-banded Sand-swimmer					Resident		X	
<i>Liopholis inornata</i>	Desert Skink					Resident			
<i>Lerista gerrardii</i>						Resident		X	
<i>Lerista kingi</i>						Resident		X	
<i>Lerista macropisthopus</i>						Resident			
<i>Lerista nichollsi</i>						Resident			

Latin Name	English Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
<i>Lerista timida</i>						Resident		X	
<i>Menetia greyii</i>	Common Dwarf Skink					Resident		X	
<i>Morethia butleri</i>						Resident		X	
<i>Morethia obscura</i>	Dusky Morethia					Resident			
<i>Tiliqua occipitalis</i>	Western Blue-tongue					Resident		X	
Typhlopidae (blind snakes)									
<i>Anilius australis</i>	Southern Blind Snake					Resident			
<i>Anilius hamatus</i>						Resident		X	
<i>Anilius waitii</i>	Beaked Blind Snake					Resident		X	
Boidae (pythons)									
<i>Antaresia stimsoni</i>	Stimson's Python					Resident		X	
<i>Morelia spilota</i>	Carpet Python			CS3		Irregular Visitor			
Elapidae (front-fanged snakes)									
<i>Brachyuropsis semifasciata</i>	Shovel-nosed Snake					Resident			
<i>Demansia psammophis</i>	Yellow-faced Whipsnake					Resident		X	
<i>Furina ornata</i>	Moon Snake					Resident			
<i>Parasuta monachus</i>	Monk Snake					Resident		X	
<i>Pseudechis australis</i>	Mulga Snake					Resident		X	
<i>Pseudechis butleri</i>	Yellow-spotted Mulga Snake					Resident		X	
<i>Pseudonaja mengdeni</i>	Mengden's Snake					Resident		X	
<i>Pseudonaja modesta</i>	Ringed Brown Snake					Resident		X	
<i>Simoselaps bertholdi</i>	Jan's Banded Snake					Resident		X	
<i>Suta fasciata</i>	Rosen's Snake					Resident		X	
Total Species: 57		2	-	3	-		-	47	-

KML 2021* - No reptiles were recorded during the survey but scats of two unidentified species were noted/samples and photographed.

Birds

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
CASUARIIDAE (Cassowaries and emus)										
<i>Dromaius novaehollandiae</i>	Emu					Resident		X	X	X
MEGAPODIIDAE (Megapodes)										
<i>Leipoa ocellata</i>	Malleefowl	V S3				Resident	X	X	X	X
COLUMBIDAE (Pigeons and doves)										
<i>Phaps chalcoptera</i>	Common Bronzewing					Resident		X	X	

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
<i>Ocyphaps lophotes</i>	Crested Pigeon					Resident		X	X	
<i>Geopelia cuneata</i>	Diamond Dove					Resident			X	
PODARGIDAE (Australian frogmouths)										
<i>Podargus strigoides</i>	Tawny Frogmouth					Resident			X	
CAPRIMULGIDAE (Nightjars and allies)										
<i>Eurostopodus argus</i>	Spotted Nightjar					Resident			X	
AEGOTHELIDAE (Owlet-nightjars)										
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar					Resident		X	X	
APODIDAE (Typical swifts)										
<i>Apus pacificus</i>	Fork-tailed Swift	Mig S5				Irregular visitor				
ACCIPITRIDAE (Osprey, hawks and eagles)										
<i>Elanus axillaris</i>	Black-shouldered Kite					Visitor				
<i>Lophoictinia isura</i>	Square-tailed Kite					Visitor			X	
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard					Irregular visitor			X	
<i>Milvus migrans</i>	Black Kite					Vagrant			X	
<i>Haliastur spheurnus</i>	Whistling Kite					Visitor			X	
<i>Circus assimilis</i>	Spotted Harrier					Visitor				
<i>Accipiter fasciatus</i>	Brown Goshawk					Resident		X	X	
<i>Accipiter cirrhocephalus</i>	Collared Sparrowhawk					Resident		X	X	
<i>Aquila audax</i>	Wedge-tailed Eagle					Resident		X	X	
<i>Hieraaetus morphnoides</i>	Little Eagle					Resident			X	
FALCONIDAE (Falcons)										
<i>Falco berigora</i>	Brown Falcon					Resident		X	X	
<i>Falco longipennis</i>	Australian Hobby					Resident			X	
<i>Falco peregrinus</i>	Peregrine Falcon	S7				Visitor			X	
<i>Falco cenchroides</i>	Nankeen Kestrel					Visitor		X	X	
OTIDIDAE (Bustards)										
<i>Ardeotis australis</i>	Australian Bustard			CS 3		Irregular visitor			X	

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
BURHINIDAE (Stone-curlews)										
<i>Burhinus grallarius</i>	Bush Stone-curlew			CS 3		Irregular visitor			X	
TURNICIDAE (Button-quails)										
<i>Turnix velox</i>	Little Button-quail					Visitor			X	
<i>Turnix varia</i>	Painted Button-quail					Resident			X	
CACATUIDAE (Cockatoos)										
<i>Calyptorhynchus banksii esconditus</i>	Inland Red-tailed Black-Cockatoo					Resident		X	X	
<i>Eolophus roseicapilla</i>	Galah					Resident	X	X	X	
<i>Cacatua sanguinea</i>	Little Corella					Vagrant				
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo			CS 3		Resident		X	X	
<i>Nymphicus hollandicus</i>	Cockatiel					Irregular visitor			X	
PSITTACIDAE (Parrots)										
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet					Vagrant			X	
<i>Polytelis anthopeplus</i>	Regent Parrot			CS 3		Visitor		X	X	
<i>Barnardius zonarius</i>	Australian Ringneck					Resident	X	X	X	X
<i>Psephotus varius</i>	Mulga Parrot					Resident		X	X	
<i>Melopsittacus undulatus</i>	Budgerigar					Vagrant			X	
<i>Neosephotus bourkii</i>	Bourke's Parrot					Visitor		X	X	
<i>Neophema splendida</i>	Scarlet-chested Parrot			CS 3		Vagrant				
CUCULIDAE (Old world cuckoos)										
<i>Cuculus pallidus</i>	Pallid Cuckoo					Migrant		X	X	
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo					Migrant			X	
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo					Migrant		X	X	
<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo					Migrant		X	X	
<i>Chrysococcyx lucidus</i>	Shining Bronze-Cuckoo					Migrant			X	
STRIGIDAE (Hawk owls)										

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
<i>Ninox novaeseelandiae</i>	Southern Boobook					Resident			X	
TYTONIDAE (Barn owls)										
<i>Tyto alba</i>	Barn Owl					Visitor		X		
HALCYONIDAE (Kingfishers)										
<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher					Resident		X	X	
<i>Todiramphus sanctus</i>	Sacred Kingfisher					Migrant			X	
MEROPIDAE (Bee-eaters)										
<i>Merops ornatus</i>	Rainbow Bee-eater					Migrant		X	X	
CLIMACTERIDAE (Australo-Papuan treecreepers)										
<i>Climacteris affinis</i>	White-browed Treecreeper			CS 3		Resident			X	
<i>Climacteris rufa</i>	Rufous Treecreeper			CS 3		Visitor		X	X	
PTILINORHYNCHIDAE										
<i>Ptilonorhynchus guttatus</i>	Western Bowerbird					Irregular visitor		X		
MALURIDAE (Fairy-wrens, emu-wrens, grasswrens)										
<i>Malurus splendens</i>	Splendid Fairy-wren					Resident		X	X	
<i>Malurus lamberti</i>	Variegated Fairy-wren					Resident		X	X	
<i>Malurus leucopterus</i>	White-winged Fairy-wren					Resident		X	X	
PARDALOTIDAE (Pardalotes, scrubwrens, thornbills)										
<i>Pardalotus striatus</i>	Striated Pardalote					Resident	X	X	X	
<i>Calamanthus campestris</i>	Rufous Fieldwren			CS 3		Irregular visitor				
<i>Pyrrholaemus brunneus</i>	Redthroat			CS 3		Resident		X	X	
<i>Smicronis brevirostris</i>	Weebill					Resident	X	X	X	
<i>Gerygone fusca</i>	Western Gerygone					Resident	X	X	X	
<i>Acanthiza apicalis</i>	Inland Thornbill					Resident		X	X	
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill					Resident	X	X	X	
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill					Resident		X	X	

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill					Resident		X	X	
<i>Aphelocephala leucopsis</i>	Southern Whiteface					Resident		X	X	
MELIPHAGIDAE (Honeyeaters)										
<i>Anthochaera carunculata</i>	Red Wattlebird					Resident	X	X	X	
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater					Resident	X	X	X	
<i>Manorina flavigula</i>	Yellow-throated Miner					Resident	X	X	X	
<i>Lichenostomus virescens</i>	Singing Honeyeater					Resident		X	X	
<i>Lichenostomus leucotis</i>	White-eared Honeyeater					Resident		X	X	
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater					Resident		X	X	
<i>Lichmera indistincta</i>	Brown Honeyeater					Resident		X	X	
<i>Phylidonyris albifrons</i>	White-fronted Honeyeater					Visitor		X	X	
<i>Certhionyx niger</i>	Black Honeyeater					Visitor		X	X	
<i>Certhionyx variegatus</i>	Pied Honeyeater					Visitor		X	X	
<i>Epthianura tricolor</i>	Crimson Chat					Visitor		X		
<i>Epthianura albifrons</i>	White-fronted Chat					Visitor		X		
POMATOSTOMIDAE (Babblers)										
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler					Irregular visitor				
<i>Pomatostomus superciliosus</i>	White-browed Babbler			CS 3		Resident		X	X	
CINCLOSOMATIDAE (Quail-thrushes and allies)										
<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush					Resident		X	X	
NEOSITTIDAE (Sittellas)										
<i>Daphoenositta chrysoptera</i>	Varied Sittella					Resident			X	
CAMPEPHAGIDAE (Cuckoo-shrikes and trillers)										
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike					Resident		X	X	
<i>Coracina maxima</i>	Ground Cuckoo-shrike					Irregular visitor				
<i>Lalage sueurii</i>	White-winged Triller					Resident		X	X	
PACHYCEPHALIDAE (Whistlers, shrike-thrushes)										

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
<i>Oreoica gutturalis</i>	Crested Bellbird			CS 3		Resident	X	X	X	
<i>Pachycephala pectoralis</i>	Golden Whistler					Resident		X	X	
<i>Pachycephala rufiventris</i>	Rufous Whistler					Resident	X	X	X	
<i>Colluricincla harmonica</i>	Grey Shrike-thrush					Resident		X	X	
ARTAMIDAE (Woodswallows, butcherbirds, currawongs)										
<i>Artamus cyanopterus</i>	Dusky Woodswallow					Visitor		X	X	
<i>Artamus personatus</i>	Masked Woodswallow					Irregular visitor		X	X	
<i>Artamus cinereus</i>	Black-faced Woodswallow					Resident		X	X	
<i>Artamus minor</i>	Little Woodswallow					Resident		X	X	
<i>Cracticus torquatus</i>	Grey Butcherbird					Resident	X	X	X	
<i>Cracticus nigrogularis</i>	Pied Butcherbird					Resident	X	X	X	
<i>Gymnorhina tibicen</i>	Australian Magpie					Resident		X	X	
<i>Strepera versicolor</i>	Grey Currawong					Resident		X	X	
DICRURIDAE (Monarchs, fantails and drongoes)										
<i>Grallina cyanoleuca</i>	Magpie-lark					Resident		X	X	
<i>Rhipidura albiscapa</i>	Grey Fantail					Visitor		X	X	
<i>Rhipidura leucophrys</i>	Willie Wagtail					Resident		X	X	
CORVIDAE (Crows and allies)										
<i>Corvus coronoides</i>	Australian Raven					Resident		X	X	
<i>Corvus bennetti</i>	Little Crow					Resident		X	X	
<i>Corvus orru</i>	Torresian Crow					Visitor		X	X	
PETROICIDAE (Robins)										
<i>Microeca leucophaea</i>	Jacky Winter					Irregular visitor			X	
<i>Petroica goodenovii</i>	Red-capped Robin					Resident	X	X	X	
<i>Melanodryas cucullata</i>	Hooded Robin					Irregular visitor				
<i>Eopsaltria griseogularis</i>	Western Yellow Robin			CS 3		Resident		X	X	
SYLVIIDAE (Old world warblers)										

Latin Name	English Name	CS 1	CS 2	CS 3	Int	Potential status in survey area	Nat. Map	Bird Data	KML Surveys	KML 2021 *
<i>Cinclorhampus mathewsi</i>	Rufous Songlark					Migrant			X	
<i>Cinclorhampus cruralis</i>	Brown Songlark					Migrant				
ZOSTEROPIDAE (White-eyes)										
<i>Zosterops lateralis</i>	Silvereye					Irregular visitor		X		
HIRUNDINIDAE (Swallows and martins)										
<i>Cheramoeca leucosternum</i>	White-backed Swallow					Visitor			X	
<i>Hirundo neoxena</i>	Welcome Swallow					Resident		X	X	
<i>Hirundo nigricans</i>	Tree Martin					Resident		X	X	
<i>Hirundo ariel</i>	Fairy Martin					Visitor		X	X	
DICAEIDAE (Flowerpeckers)										
<i>Dicaeum hirundinaceum</i>	Mistletoebird					Resident		X	X	
PASSERIDAE (Finches)										
<i>Taeniopygia guttata</i>	Zebra Finch					Visitor	X	X	X	
MOTACILLIDAE (Old world wagtails and pipits)										
<i>Anthus novaeseelandiae</i>	Australasian Pipit					Resident		X	X	
Total Species Expected: 116		3	-	13	-		16	80	102	3

KML 2021* - Evidence of 3 bird species found during the survey (feathers/tracks/scats)

Mammals

Species Name	Common Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
TACHYGLOSSIDAE (Echidnas)									
<i>Tachyglossus aculeatus</i>	Echidna					Resident		X	X
DASYURIDAE (Dasyurids)									
<i>Antechinomys laniger</i>	Kultarr			CS3		Resident		X	
<i>Pseudantechinus woolleyae</i>	Woolley's Pseudantechinus			CS3		Resident		X	
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart					Visitor			
<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart					Resident		X	

Species Name	Common Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
MACROPODIDAE (Kangaroos, wallabies)									
<i>Macropus fuliginosus</i>	Western Grey Kangaroo					Resident		X	
<i>Macropus robustus</i>	Euro, Biggada					Resident		X	X
<i>Macropus rufus</i>	Red Kangaroo, Marlu					Resident		X	
<i>Notamacropus irma</i>	Brush Wallaby		P4			Irregular visitor		X	
BURRAMYIDAE (pygmy-possums)									
<i>Cercartetus concinnus</i>	Western Pygmy-possum					Resident			
PHALANGERIDAE (brush-tailed possums)									
<i>Trichosurus vulpecula</i>	Brush-tailed Possum			CS3		Irregular visitor		X	
EMBALLONURIDAE (Sheath-tail bats)									
<i>Taphozous hilli</i>	Hill's Sheath-tail-bat					Resident			
VESPERTILIONIDAE (Vesper bats)									
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat					Resident		X	
<i>Chalinolobus morio</i>	Chocolate Wattled Bat					Resident		X*	
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat					Resident		X	
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat					Resident		X*	
<i>Scotorepens greyii</i>	Little Broad-nosed Bat					Resident		X	
<i>Vespadelus baverstocki</i>	Inland Forest Bat					Resident		X	
<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat					Resident			
MOLOSSIDAE (Freetail bats)									
<i>Mormopterus sp.</i> Listed as Species 3 by Adams et al. (1988).	Inland Freetail-bat					Resident		X*	
<i>Austronomus (Tadarida) australis</i>	White-striped Freetail-bat					Migrant		X	
MURIDAE (Rats and mice)									
<i>Mus musculus</i>	House Mouse				Int	Resident		X	
<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse					Resident		X	
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse					Resident		X	
LEPORIDAE (Rabbits and hares)									
<i>Oryctolagus cuniculus</i>	Rabbit				Int	Resident		X	X

Species Name	Common Name	CS1	CS2	CS3	Int	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
CANIDAE (Dogs and foxes)									
<i>Canis lupus</i>	Dog/Dingo					Resident		X	X
<i>Vulpes</i>	Red Fox				Int	Resident		X	
FELIDAE (Cats)									
<i>Felis catus</i>	Cat				Int	Resident		X	X
BOVIDAE (Horned ruminants)									
<i>Capra hircus</i>	Goat				Int	Visitor		X	
Total Species: 29		-	1	3	5		-	25*	5

KML 2021* - Evidence of five mammals were found in the form of tracks/scats.

Invertebrates

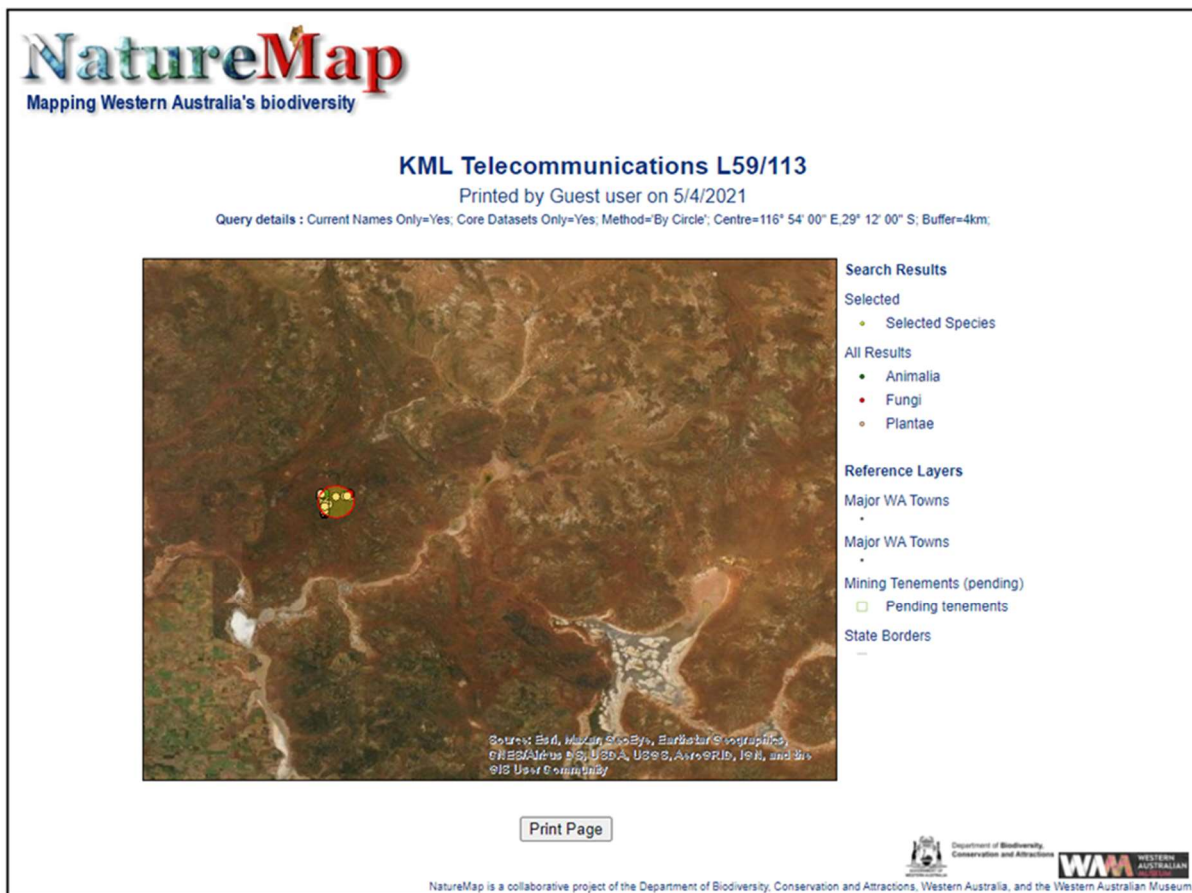
Species Name	Common Name	CS1	CS2	CS3	Potential status in survey area	Nat. Map	KML Surveys	KML 2021*
Mygalamorph spiders								
<i>Idiosoma clypeatum</i>	Northern Shield-backed Trapdoor Spider		P3		Resident		X	
<i>Idiosoma formosum</i>	Ornate Trapdoor Spider	S2			Resident		X	
<i>Idiosoma (Aganippe) sp.</i>				X	Resident			
Total Species: 3		1	1	1		-	2	-

KML 2021* - None of the three potential *Idiosoma* species were noted, evidence of Wolf Spider (*Lycosa* spp.) and Golden Orb Weaving Spider (*Nephila* spp.) during the survey.

Status codes:

- CS1, CS2, CS3 = (summary) levels of conservation significance. See Appendix A for full explanation. Int = introduced.
- EPBC Act listings: E = Endangered, V = Vulnerable, Mig = Migratory, (see Appendix C).
- Biodiversity Conservation Act listings: for all CS1 species S1 to 7 = Schedules 1 to 7 respectively, (see Appendix C) with rankings shown in square parentheses: [e] = endangered, [v] = vulnerable.
- DPaW Priority species: P1 to P5 = Priority 1 to 5 (see Appendix C).

Appendix F: L59/113 (L59/191) assessment on DBCA's *Naturemap* April 2021.



The NatureMap report generated from the search on 5/4/2021 and 21/4/2021 identified 16 fauna species (all birds) of which one is Threatened – Malleefowl (*Leipoa ocellata*).

Search was set at 4km circular buffer around a central point on the 6ha tenement.



NatureMap Species Report

Created By Guest user on 21/04/2021

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	116° 54' 00" E, 29° 12' 00" S
Buffer	4km
Group By	Kingdom

Kingdom	Species	Records
Animalia	16	16
Fungi	8	10
Plantae	123	338
TOTAL	147	364

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Animalia				
1.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
2.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
3.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
4.	<i>Barnardius zonarius</i>			
5.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
6.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
7.	<i>Eolophus roseicapillus</i>			
8.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
9.	24557 <i>Leipoa ocellata</i> (Malleefowl)		T	
10.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
11.	24618 <i>Oreocia gutturalis</i> (Crested Bellbird)			
12.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
13.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
14.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
15.	30948 <i>Smicromis brevirostris</i> (Weebill)			
16.	30870 <i>Taeniopygia guttata</i> (Zebra Finch)			
Fungi				
17.	27579 <i>Acarospora sinopica</i>			
18.	<i>Calophaea</i> sp.			
19.	<i>Lecidea</i> sp.			
20.	46014 <i>Myriophora smaragdula</i>			
21.	18001 <i>Xanthoparmelia clayiana</i>		P3	
22.	28172 <i>Xanthoparmelia reptans</i>			
23.	<i>Xanthoparmelia</i> sp.			
24.	28356 <i>Xanthoparmelia verrucella</i>			
Plantae				
25.	14613 <i>Acacia acanthoclada</i> subsp. <i>glaucescens</i>			
26.	3248 <i>Acacia burkittii</i> (Sandhill Wattle)			
27.	31925 <i>Acacia dilalaga</i>		P1	
28.	3324 <i>Acacia erinacea</i>			
29.	3330 <i>Acacia exocarpoides</i>			
30.	30632 <i>Acacia karra</i>		P1	
31.	19499 <i>Acacia ramulosa</i> var. <i>ramulosa</i>			
32.	3577 <i>Acacia tetragonophylla</i> (Kurara, Wakaipuka)			
33.	31071 <i>Acacia umbraculiformis</i>			
34.	1725 <i>Allocasuarina dieisiana</i> (Northern Sheoak)			
35.	1738 <i>Allocasuarina tessellata</i>		P1	
36.	6565 <i>Alyxia buxifolia</i> (Dysentery Bush)			
37.	38501 <i>Anthosachne scabra</i>			
38.	207 <i>Aristida contorta</i> (Bunched Kerosene Grass)			
39.	1266 <i>Artropodium dyeri</i>			
40.	17232 <i>Austrostipa blackii</i>		P3	





Name ID	Species Name	Naturalized	Conservation Code	Endemic To Query Area
41.	17237 <i>Austrostipa elegantissima</i>			
42.	17246 <i>Austrostipa nitida</i>			
43.	17255 <i>Austrostipa trichophylla</i>			
44.	7852 <i>Bellida graminea</i> (Rosy Bellida)			
45.	7856 <i>Blennospora drummondii</i>			
46.	1273 <i>Borya sphaerocephala</i> (Pincushions)			
47.	7871 <i>Brachyscome ciliata</i>			
48.	29439 <i>Caesia</i> sp. Wongan (K.F. Kenneally 0820)			
49.	2846 <i>Calandrinia calyptata</i> (Pink Purslane)			
50.	2853 <i>Calandrinia eremaea</i> (Twining Purslane)			
51.	7995 <i>Calceophalus multiflorus</i> (Yellow-top)			
52.	7903 <i>Calotis hispida</i> (Blind Eye)			
53.	7922 <i>Cephalopterum drummondii</i> (Pompom Head)			
54.	32016 <i>Chamaelacium</i> sp. Wartedra (A.P. Brown & S. Patrick APB 1100)		P1	
55.	12796 <i>Chelanthus adiantoides</i>			
56.	7933 <i>Chthonocephalus pseudovar</i> (Woolly Groundheads)			
57.	4555 <i>Comesperma integerrimum</i>			
58.	11709 <i>Crassula colorata</i> var. <i>acuminata</i>			
59.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
60.	11021 <i>Cuscuta planiflora</i>	Y		
61.	6218 <i>Daucus glochidiatus</i> (Australian Carrot)			
62.	11636 <i>Dianella revoluta</i> var. <i>divaricata</i>			
63.	4766 <i>Dodonaea inaequalifolia</i>			
64.	2510 <i>Enchylaena lanata</i>			
65.	7189 <i>Eremophila clarkii</i> (Turpentine Bush)			
66.	17168 <i>Eremophila oldfieldii</i> subsp. <i>oldfieldii</i>			
67.	49081 <i>Eremophila oldfieldii</i> subsp. <i>papula</i>		P1	Y
68.	18570 <i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>			
69.	7250 <i>Eremophila pantonii</i>			
70.	49082 <i>Eremophila sericea</i>		P1	
71.	<i>Eremophila</i> sp.			
72.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			
73.	12720 <i>Erymophyllum glossanthus</i>			
74.	13038 <i>Eucalyptus loxophleba</i> subsp. <i>supraelevata</i>			
75.	5767 <i>Eucalyptus salubris</i> (Gimlet)			
76.	12097 <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> (Desert Spurge)			
77.	8002 <i>Gnephosis tenuisima</i>			
78.	6159 <i>Gonocarpus nodulosus</i>			
79.	7495 <i>Goodenia beardiana</i>			
80.	7519 <i>Goodenia krauseana</i>			
81.	7527 <i>Goodenia mimuloides</i>			
82.	7531 <i>Goodenia occidentalis</i>			
83.	2090 <i>Grevillea scabrida</i>		P1	
84.	2100 <i>Grevillea subdiffusa</i>		P3	
85.	6180 <i>Haloragis trigonocarpa</i>			
86.	46414 <i>Hemigenia yalgensis</i>			
87.	12742 <i>Hyalosperma demissum</i>			
88.	15448 <i>Hyalosperma glutinosum</i> subsp. <i>venustum</i>			
89.	11546 <i>Hydrocotyle plicata</i> var. <i>glabrata</i>			
90.	8087 <i>Isotopis graminifolia</i> (Cushion Grass)			
91.	13284 <i>Lawrencella rosea</i>			
92.	7407 <i>Lobelia rhytidisperma</i> (Wrinkled-seeded Lobelia)			
93.	2544 <i>Malreana georgii</i> (Sedgy Bluebush)			
94.	2590 <i>Malreana marginata</i>			
95.	2568 <i>Malreana trichoptera</i> (Downy Bluebush)			
96.	5908 <i>Melaleuca eleuterostachya</i>			
97.	15486 <i>Melaleuca hamata</i>			
98.	5958 <i>Melaleuca radula</i> (Graceful Honey-myrtle)			
99.	30412 <i>Micromyrtus acuta</i>		P3	
100.	31845 <i>Micromyrtus trudgei</i>		P3	
101.	14335 <i>Mitella dimorpha</i>		P1	
102.	4094 <i>Mitella microphylla</i>			
103.	8145 <i>Olearia pimeleoides</i> (Pimelea Daisybush, Burrobunga)			
104.	12670 <i>Parletaria carlostegia</i>			
105.	40424 <i>Pentameris aroides</i> subsp. <i>aroides</i>	Y		
106.	14569 <i>Persoonia pentasticha</i>		P3	
107.	18508 <i>Phlotoeca sericea</i>			
108.	16824 <i>Phyllanthum sulcatum</i>			
109.	7299 <i>Plantago debilis</i>			
110.	8174 <i>Podolepis gardneri</i>			

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.



Department of Biodiversity
Conservation and Attractions





	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
111.	8177	<i>Podolepis lessonii</i>			
112.	8188	<i>Pogonolepis stricta</i>			
113.	34154	<i>Prostanthera</i> sp. Karara (D. Coultas & K. Greenacre Opp 5)		P1	
114.	10878	<i>Pterostylis insectifera</i>			
115.	2721	<i>Ptilotus exaltatus</i> (Tail Mulla Mulla)			
116.	2731	<i>Ptilotus heliopteroides</i> (Hairy Mulla Mulla)			
117.	2747	<i>Ptilotus obovatus</i> (Cotton Bush)			
118.	2757	<i>Ptilotus schwartzii</i>			
119.	2581	<i>Rhagodia drummondii</i>			
120.	13243	<i>Rhodanthe collina</i>		P3	
121.	13294	<i>Rhodanthe laevis</i>			
122.	13234	<i>Rhodanthe manglesi</i>			
123.	13296	<i>Rhodanthe polyccephala</i>			
124.	48898	<i>Roepera ovata</i>			
125.	40425	<i>Rydiosperma caespitosum</i>			
126.	2359	<i>Santalum spicatum</i> (Sandalwood, Willarak)			
127.	7544	<i>Scaevola sphrescens</i> (Currant Bush, Maroon)			
128.	8200	<i>Schoenia cassiniana</i> (Schoenia)			
129.	1002	<i>Schoenus nanus</i> (Tiny Bog Rush)			
130.	2607	<i>Sclerolaena densiflora</i>			
131.	2609	<i>Sclerolaena diacantha</i> (Grey Copperburr)			
132.	12276	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			
133.	18444	<i>Senna charlesiata</i>			
134.	14579	<i>Senna</i> sp. Austin (A. Strid 20210)			
135.	19712	<i>Sida</i> sp. dark green fruits (S. van Leeuwen 2060)			
136.	7018	<i>Solanum lasiophyllum</i> (Flannel Bush, Mndjulu)			
137.	14233	<i>Stenanthemum policum</i>		P3	
138.	3076	<i>Stenopetalum filifolium</i>			
139.	1338	<i>Thysanotus manglesianus</i> (Fringed Lily)			
140.	1346	<i>Thysanotus pyramidalis</i>			
141.	6268	<i>Trachymene cyanopetala</i>			
142.	6279	<i>Trachymene ornata</i> (Spongefruit)			
143.	7664	<i>Velleia rosea</i> (Pink Velleia)			
144.	8268	<i>Vittadinia humerata</i>			
145.	7389	<i>Wahlbergia preissii</i>			
146.	13331	<i>Waltzia acuminata</i> var. <i>acuminata</i>			
147.	31272	<i>Wurmbia</i> sp. <i>Paynes Find</i> (C.J. French 1237)			

Conservation Codes
 T - Rare or likely to become extinct
 X - Presumed extinct
 IA - Protected under international agreement
 S - Other specially protected fauna
 1 - Priority 1
 2 - Priority 2
 3 - Priority 3
 4 - Priority 4
 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.