TETRIS ENVIRONMENTAL

Crimson Metals Pty Ltd

Native Vegetation Clearing Permit Application - Area Permit

Accommodation Village

Supporting Document

May 2023

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1 Introduction

Tetris Environmental Pty Ltd (Tetris Environmental) was commissioned by Crimson Metals Pty Ltd to prepare a Native Vegetation Clearing Permit (NVCP) application (Area Permit) in accordance with the requirements of Part V Division 2 of the *Environmental Protection Act 1986* (EP Act).

1.1 Scope and Purpose

Crimson Metals Pty Ltd (Crimson), a wholly owned subsidiary of Capricorn Metals Ltd, is the owner of the Mt Gibson Gold Project (MGGP), located approximately 280 km northeast of Perth and less than 10 km east from the main arterial Great Northern Highway, in the Murchison region of Western Australia and Shire of Yalgoo (**Figure 1**). Previous mining occurred at the MGGP in the 1980's and 1990's and as a result, historical disturbance and infrastructure remain in the area.

An accommodation village and associated infrastructure (Proposal) is required to support local and regional exploration operations and will be utilised for the subsequent construction and operation of the MGGP should it proceed. Land disturbance for the Proposal has been kept to a minimum by using previously disturbed ground within the domain of the previous accommodation village that supported the previous operations. Construction of the accommodation village will require a disturbance area of approximately 7.7 hectares, comprising 5.7 hectares of native vegetation and 2 hectares of previously disturbed land. (**Figure 2**).

This supporting document present's results of an assessment against the ten clearing principles as outlined in the then Department of Environmental Regulation (now DWER) *Guide to Assessment: Clearing of Native Vegetation under the Environmental Protection Act 1986 (DER, 2014)*. It identifies the potential environmental impacts associated with the clearing based on the best available data and defines the Crimson approach to managing the impacts of the clearing to as low as reasonably practicable. This NVCP application will be submitted to the Department of Mines, Industry Regulation and Safety as clearing is to be carried out on *Mining Act 1978* tenure.

1.2 Proposal Tenure

The Proposal is located on unallocated crown land, entirely on *Mining Act 1978* tenement G 59/48 held by Crimson.

Table 1: Tenement Status

Tenement	Holder	Area (HA)	Date of Grant	Status
G 59/48	Crimson Metals Pty Ltd	236.0 HA	21/02/2013	Live

1.3 Legislative Context

Other approvals relevant to the Proposal include:

- *Mining Act 1978* (Small Mining Proposal and Mine Closure Plan – submitted 11 April 2023)

1.4 Responsible Person

Crimson is responsible for implementation of the clearing described within this document. Correspondence relating to this NVCP application should be addressed to:

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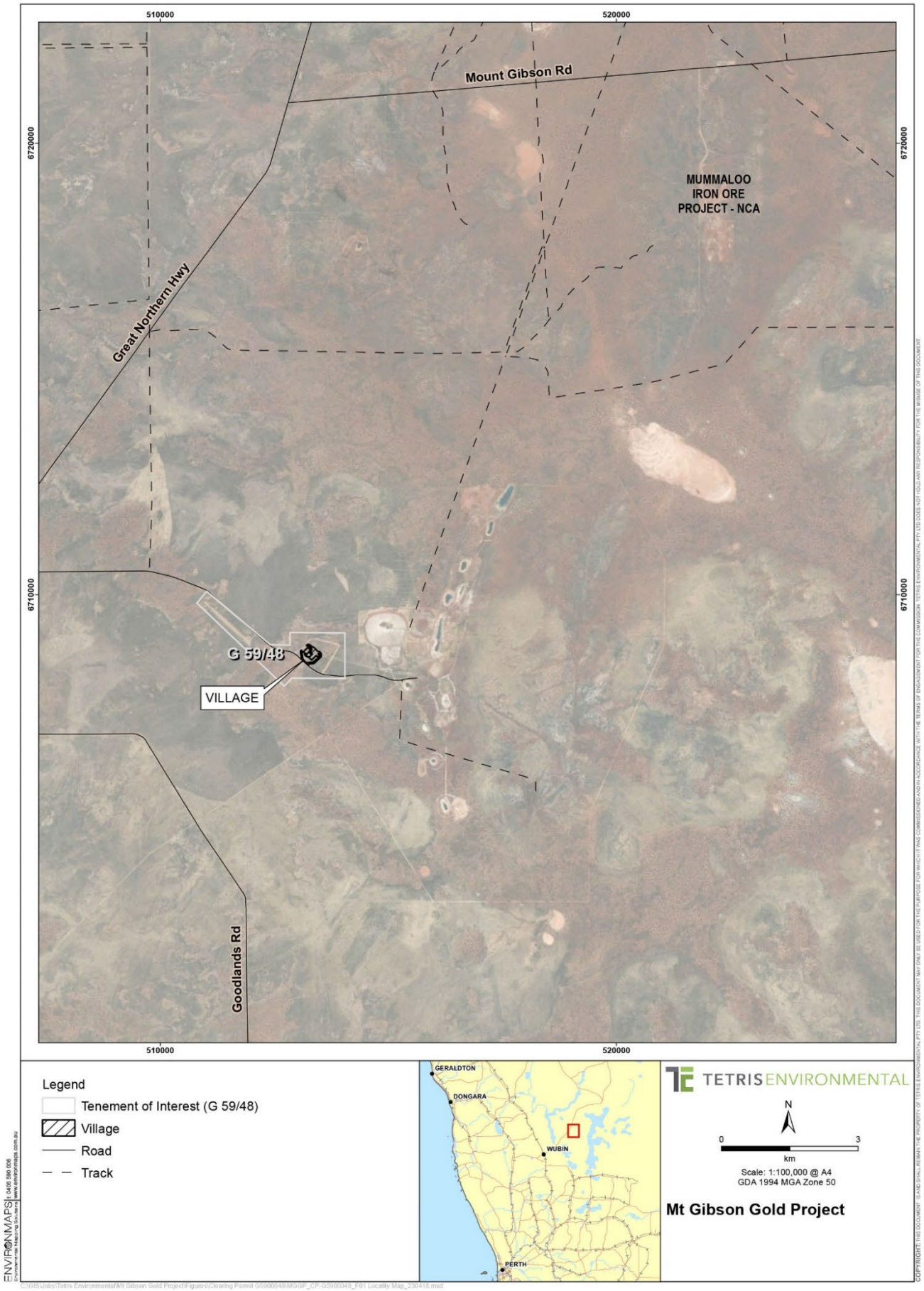

Figure 1: Proposal Location and Area Permit Context

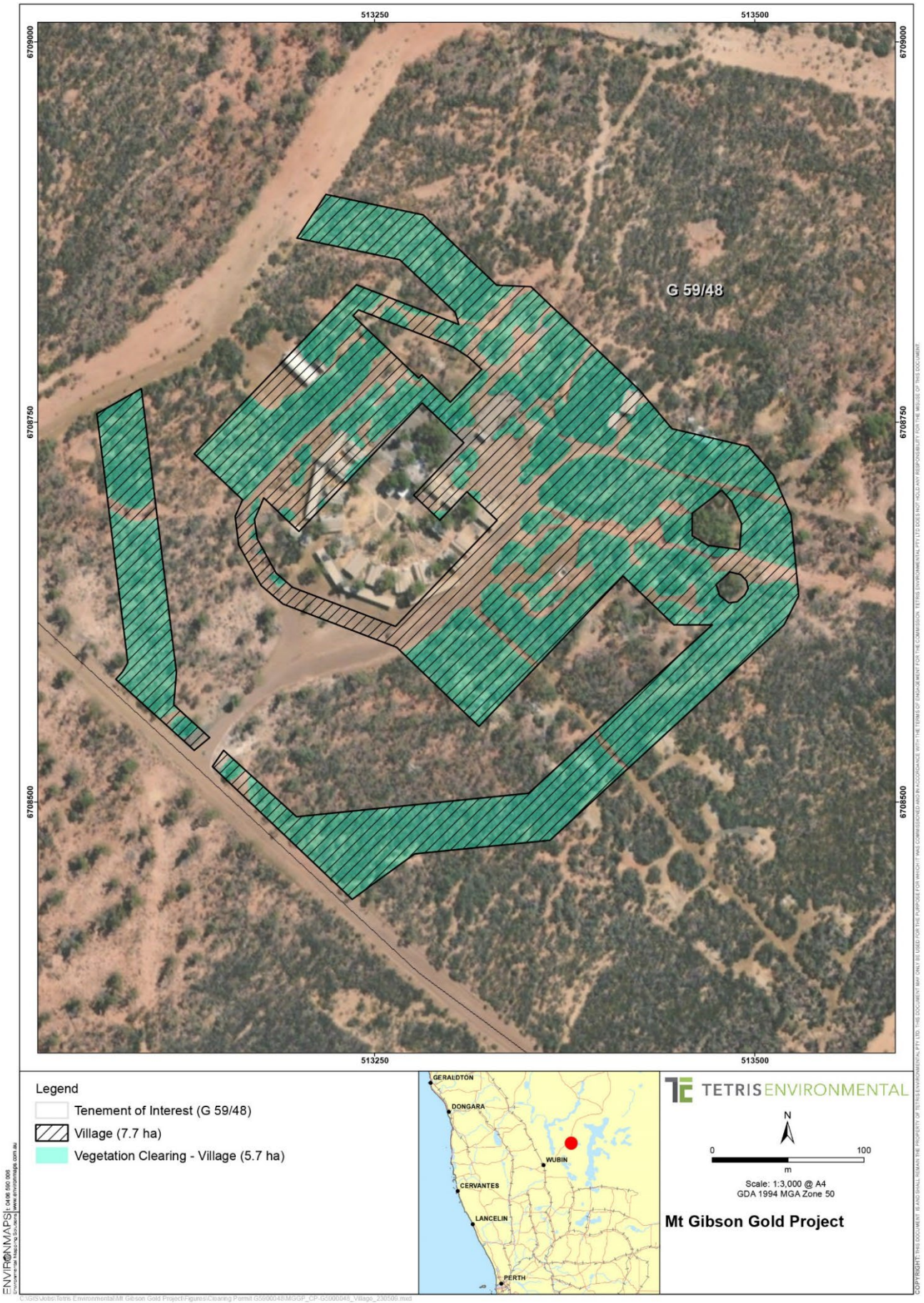

Figure 2: Accommodation Village Layout and Proposed Clearing

2 Assessment Methodology

2.1 Desktop Assessment

Desktop assessments were undertaken by the study team to review current and relevant literature sources, databases and GIS Information (constraints mapping) to determine:

- The existing environment at a local and regional scale, potential environmental sensitivities and the environmental risk associated with the proposed clearing
- Whether the proposed clearing is exempt under the EP Act or the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

The desktop study provided background information on the fauna, flora and vegetation of the Proposal area. Database searches, as described in **Table 2**, of the Department of Biodiversity Conservation and Attractions (DBCA) databases as well as the Department of Climate Change, Energy, the Environment and Water (DCCEEW) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) were undertaken to compile a list of potential Threatened or Priority species and TECs or Priority Ecological Communities (PECs) that may occur in the area.

Table 2: Database Searches Undertaken to Identify Potential Environmental Constraints

Potential Environmental Constraint(s)	Database Searches
Matters of National Environmental Significance (MNES)	• EPBC Act PMST, 40 km radial search.
Threatened and Priority species	• DBCA Threatened and Priority Flora database, 40 km radial search. • DBCA NatureMap Fauna Search, 40 km radial search. • Western Australian Museum (WAM) database, specifically for Short Range Endemics (SREs).
TECs and / or PECs	• DBCA Threatened and Priority Ecological Community database, 50 km radial search. • EPBC Act PMST, 50 km radial search

2.2 Field Assessment

Jenny Borger from JB Botanical Consulting, with assistance from Tetris Environmental, undertook a targeted reconnaissance survey for conservation significant flora and vegetation within the village proposed clearing area (**Figure 3**). Jenny is a qualified botanist with over 25 years' experience and extensive knowledge of the flora and vegetation within the Avon Wheatbelt region; including undertaking recent flora and vegetation surveys in the area to support Programme of Works (PoWs) and the potential operations of the MGGP.

Biota Environmental Sciences (Biota) undertook a targeted conservation significant terrestrial vertebrate and Short Range Endemic fauna survey of the Proposal area and surrounds in September 2022.

Table 3 outlines the survey work undertaken in support of this NVCP application for the proposed accommodation village.

Table 3: Summary of Environmental Studies and Surveys

Consultant/ Survey Name	Study Area, Type and Timing	Study Standard/ Guidance and Limitations	Appendix
Tetris Environmental and JB Botanical Consulting (2023) **Proposed Village Survey**	Desktop review and Reconnaissance/targeted field survey covering 8 ha. March 2023	EPA Environmental Factor Guideline - Flora and Vegetation 2016 EPA Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment 2016 Proposed disturbance area surveyed on foot. Targeted survey for conservation significant flora and vegetation. **Limitations:** No significant limitations noted.	Appendix A
Biota (2023) **Mount Gibson Gold Project Extended Area Basic and Targeted Fauna Survey**	Desktop review and field survey covering 6,322 ha. September 2022	EPA Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment 2020. EPA Technical Guidance: Sampling of Short-range Endemic Invertebrate Fauna 2016 Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Survey Guidelines for Threatened Mammals 2011 DSEWPaC Survey Guidelines for Threatened Reptiles 2011 DSEWPaC Survey Guidelines for Threatened Birds 2010 **Limitations:** Bat recordings invalid due to equipment malfunction.	Appendix B

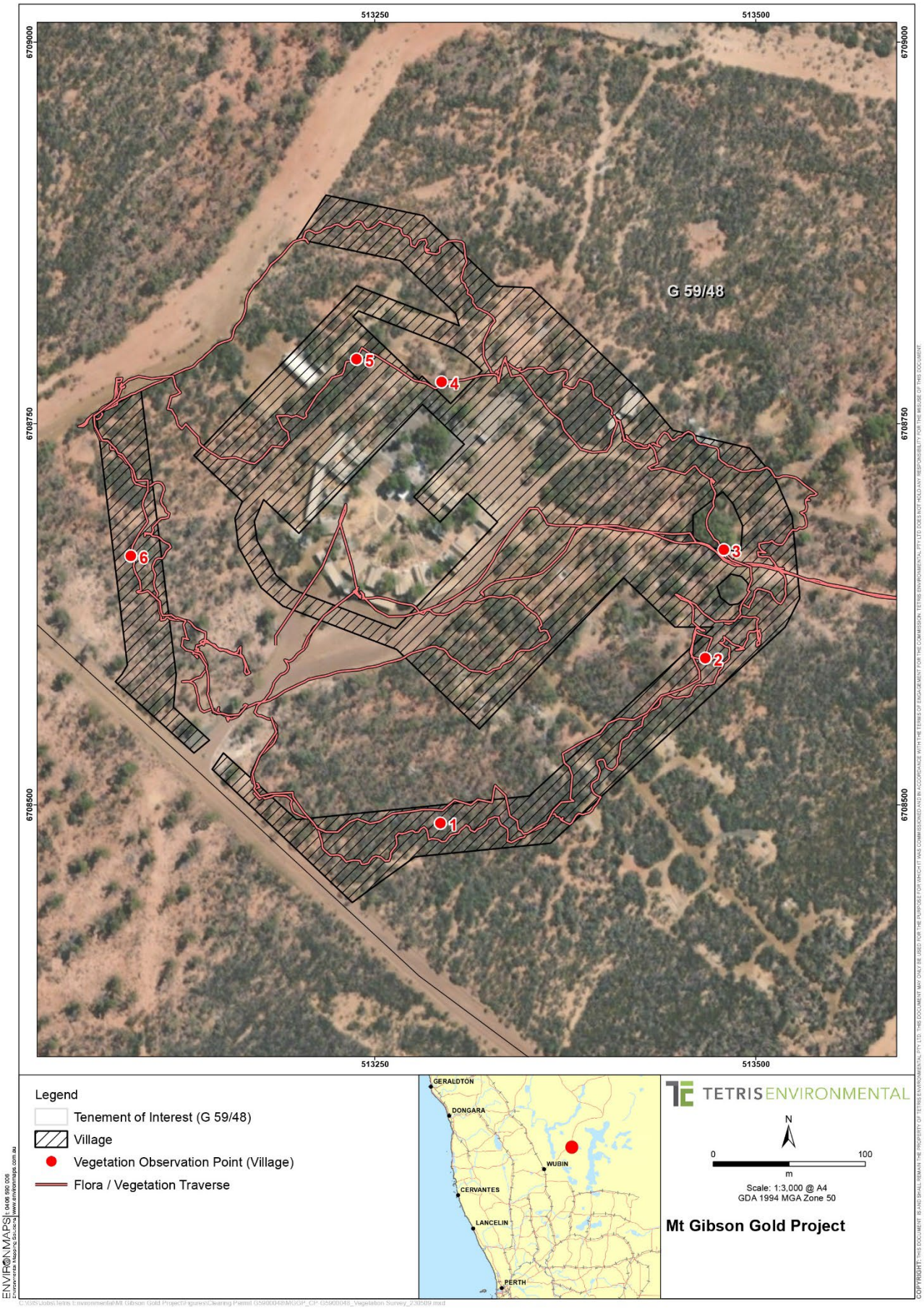

Figure 3: Targeted Flora/Vegetation Survey

3 Assessment Against Clearing Principles

The proposed clearing for the extension of mining operations has been assessed against the ten clearing principles outlined in the (then) Department of Environmental Regulation's (DER) *Guide to the assessment of applications to clear native vegetation: under the EP Act 1986* (DER 2014*)*, and in consideration of the current extent and condition of the native vegetation on the site.

The outcomes of the assessment are presented in **Table 4**.

Table 4: Assessment against the Ten Clearing Principles

Principle	Assessment
Principle (a) – Native vegetation should not be cleared it if comprises a high level of biological diversity.	The general fauna assemblage within the proposed clearing area and is well represented both locally and regionally. 78 Malleefowl (*Leipoa ocellata*, Threatened fauna species) mounds were recorded in the surrounding area, however none were recorded in the Project area (Biota 2023 – **Appendix B**). The nearest active mound is approximately 1.5 km to the south east of the proposed village (**Figure 4**). No mounds will be impacted by the proposed clearing. Six Priority or Threatened flora species as listed under the EPBC Act (1999) and BC Act (2016) have been recorded in the surrounding area, however none were recorded within the Proposal survey area. Vegetation Condition was generally considered Very Good to Degraded based on historical disturbance for the existing (abandoned) village domain (**Appendix A**). Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (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.	The fauna survey (Biota 2023) found the habitat of the Proposal is typical of the surrounding landscape and the wildlife typical of the environment. There are no unusual features which suggest that the fauna of the sites may be of regional significance. The fauna habitat to be impacted by the Proposal is well represented in the surrounding area and accounts for a very small proportion of available habitat. Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (c) – Native vegetation should not be cleared if it includes or is necessary for the continued existence of rare flora.	No rare flora were recorded in the Proposal area during the targeted survey. The Proposal area is not considered necessary for the continued existence of rare flora. Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (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).	Eucalypt Woodlands of the Western Australian Wheatbelt Priority Ecological Community (P3) has been identified adjacent to the proposed development (**Figure 4**) however is in a relatively degraded condition. Based on the reconnaissance targeted flora survey by JB Botanical Consulting and Tetris Environmental, no PEC vegetation will be cleared as a result of Proposal development. The Proposal area is not considered necessary for the maintenance of a threatened ecological community. Clearing of native vegetation within the area is not considered to be at variance to this principle.

Principle	Assessment
Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The Proposal area is situated within the broad Vegetation Association 437 (Beard 1990) of which approximately 94% of its pre-European extent remaining at 2018. At a local scale, three broad vegetation types were defined (*Acacia* Shrubland, *Eucalyptus* Woodland, *Allocasuarina* Shrubland, **Appendix A)**, none of which have been extensively cleared nor can be considered remnant vegetation. Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The nearest defined waterways to the Proposal are Karpa Lake and Lake Moore, which are located approximately 3 km and 20 km east of the Proposal area respectively. There are no other rivers, lakes, defined watercourses or other areas of significant surface water bodies in the Proposal area, or within ten kilometres of the Proposal. Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The Proposal lies within the Euchre (258Eu) and Joseph (258Jo) Land Systems (Payne et. al. 1998). The Joseph Land System is not susceptible to soil erosion in its natural state, whilst the Euchre Land System is moderately susceptible. Clearing for the accommodation village is minor in nature and within a previously disturbed domain utilised for the same purpose. Appropriate surface water drainage and containment around cleared areas (where required) will minimise the potential for surface water erosion. Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (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.	The Proposal area is not located within or near any Department of Biodiversity Conservation and Attractions managed conservation reserves. The Charles Darwin Conservation Reserve (owned by Bush Heritage Australia) is located approximately 5 km west of the Proposal area, whist the Mt Gibson Private Nature Reserve (owned by the Australian Wildlife Conservancy) is located adjacently to the east, south and west. The total proposed clearing is 5.7 ha of native vegetation (new disturbance). Accordingly, clearing can be considered minor in extent and is unlikely to impact environmental values of the nearby conservation areas. Clearing of native vegetation within the area is not considered to be at variance to this principle.

Principle	Assessment
Principle (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.	The Proposal is located within the *Rights in Water and Irrigation Act 1914* (RIWI Act) East Murchison Groundwater Area however is not located within any surface water proclamation area. Depth to groundwater is approximately 30 m below ground level and hyper saline, therefore clearing of vegetation will not have any deleterious impact on the groundwater system. No changes to drainage lines will occur as a result of Proposal implementation. Drainage and containment structures incorporated into the Proposal (if required) will ensure surface water runoff is controlled and minimise the potential for contaminants and sediment to enter the surface water system. Accordingly, clearing can be considered minor in extent and is unlikely to impact the quality of surface water. Clearing of native vegetation within the area is not considered to be at variance to this principle.
Principle (j) – Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	The Proposal area experiences an average annual rainfall of 290.2 millimetres (mm). The mean number of days where more than 1 mm of rain is received is less than four days per month and annual evaporation is approximately 2,500 mm (BoM 2023). Intermittent and short duration runoff can be expected following large rainfall events. The absence of defined drainage channels in the area indicates sheet flows are the dominant hydrological flow response. High evaporation and low relief play a major role in the local hydrological response, limiting opportunities for the concentration of surface flows. Flooding of the Proposal area is considered very unlikely. Clearing of native vegetation within the area is not considered to be at variance to this principle.

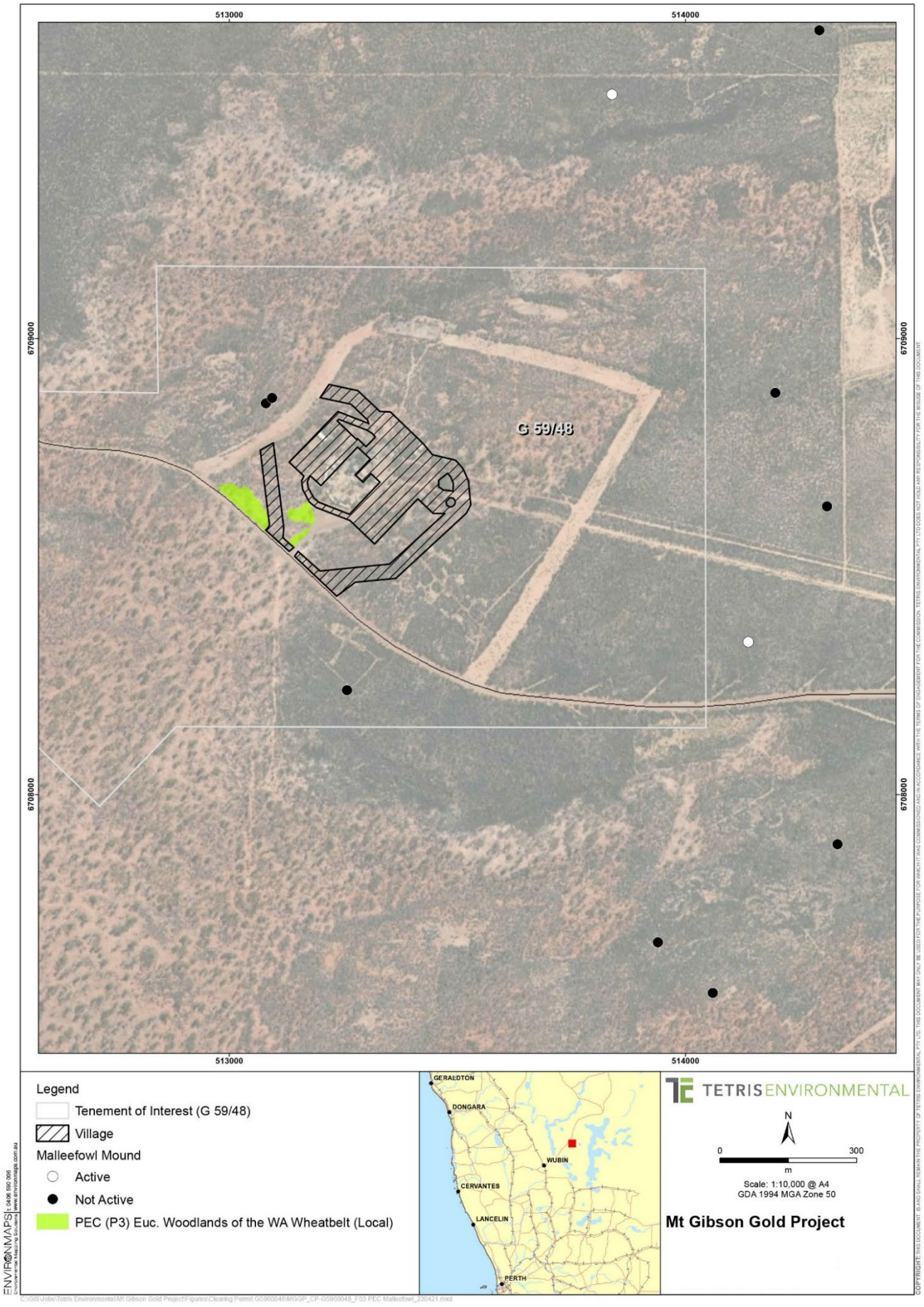

Figure 4: Recorded Locations of Malleefowl Mounds and PEC Distribution

4 Environmental Management Measures and Rehabilitation

All construction and operation activities associated with the Proposal will be undertaken in accordance with the MGGP Environmental Management Plan and relevant operating Procedures such as:

- MGGP-EMP-WI01 Site Disturbance Permit Work Instruction
- MGGP-EMP-WI02 Clearing Work Instruction
- MGGP-EMP-WI03 Aboriginal Heritage Work Instruction
- MGGP-EMP-WI04 Topsoil Management Work Instruction
- MGGP-EMP-WI05 Fauna Work Instruction
- MGGP-EMP-WI06 Dust Management Work Instruction
- MGGP-EMP-WI07 Weed Management Work Instruction
- MGGP-EMP-WI08 Bushfire Management Work Instruction
- MGGP-EMP-WI09 Hydrocarbon and Chemical Management Work Instruction
- MGGP-EMP-WI11 Waste Management Work Instruction
- MGGP-EMP-WI12 Borrow Pits Work Instruction
- MGGP-EMP-WI15 Surface Water Work Instruction.

Should the MGGP progress to mining operations, the accommodation village and supporting infrastructure will remain until closure of the larger project. Rehabilitation and closure of these facilities will then be addressed in the Mine Closure Plan for the broader MGGP. Should the project not proceed, rehabilitation will be undertaken in accordance with the approved Mine Closure Plan for Small Mining Operations:

- all above ground infrastructure will be removed from site unless agreed to be retained for post-mining purposes. Below ground infrastructure will be removed to 1 m below the surface
- scrap and waste materials will be appropriately disposed onsite or removed from the site if on site disposal is not permissible
- the area will be spread with stockpiled topsoil and contour ripped
- rehabilitation and reference vegetation monitoring sites will be established if required
- weed survey and control measures will be undertaken if required
- soil sampling and analysis will be undertaken if deemed necessary for site contamination investigation
- feral fauna control will be undertaken if required.

5 Bibliography

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6 Appendices

Appendix A: J Borger (2023) Vegetation Descriptions

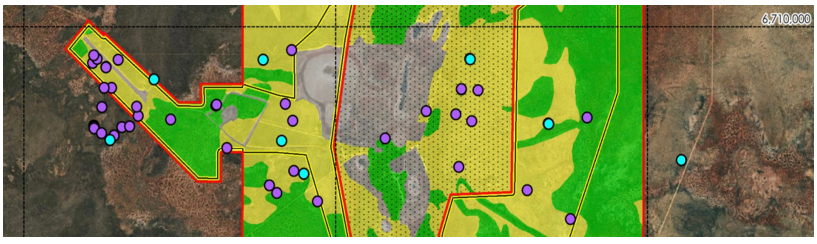
Observation Point (Figure 3)	Description	Photograph
1	*Eucalyptus loxophleba* subsp. *supralaevis* open woodland over *Acacia acuminata, Melaleuca eleuterostachya, Allocasuarina acutivalvis subsp. acutivalvis* tall open shrubland over *Philotheca brucei subsp. brucei, Eremophila clarkei, Rhagodia drummondii* sparse shrubland over *Amphipogon caricinus, Eremophila clarkei, Dodonaea inaequifolia, Ptilotus obovatus* low sparse tussock grassland Condition: very good; mostly intact; some rubbish and minor land surface disturbances	
2	*Acacia acuminata, Allocasuarina acutivalvis* subsp. *acutivalvis, Eucalyptus loxophleba* subsp. *supralaevis, Eremophila oldfieldii* subsp. *oldfieldii, Melaleuca stereophloia* tall shrubland over *Eremophila clarkei, Ptilotus obovatus* low sparse shrubland over *Amphipogon caricinus* low open tussock grassland Other species: *Acacia andrewsii, A. erinacea, Eucalyptus ?subangusta, Hakea recurva subsp. recurva, Olearia muelleriana, Sclerolaena diacantha* Condition: mostly very good	
3	*Eucalyptus loxophleba* subsp. *supralaevis* woodland over *Acacia acanthoclada, Eremophila oppositifolia* subsp. *angustifolia, Acacia acuminata* sparse shrubland over *Acacia erinacea, Rhagodia drummondii, Ptilotus obovatus* low open shrubland Condition: very good in patches, dense cover of leaf litter and fallen branches; disturbances at edges	

Observation Point (Figure 3)	Description	Photograph
4	*Eucalyptus salubris* woodland over *Atriplex sp., Rhagodia drummondii*, *Sclerolaena diacantha* low open chenopod shrubland Condition: Good; small areas in good condition; most areas lacking understorey; high levels of historic disturbances	
5	*Acacia burkittii, Melaleuca radula, Allocasuarina acutivalvis* subsp. *acutivalvis, Acacia acuminata, Dodonaea inaequifolia* tall shrubland over *Melaleuca radula, Aluta aspera* subsp. *hesperia, Dianella revoluta* subsp. *divaricata* open shrubland over *Borya sphaerocephala, Amphipogon caricinus* low open to sparse forbland Other species: *Acacia duriuscula, A. stereophylla var. stereophylla, Malleostemon tuberculatus* Condition: small good patches with high levels of disturbances at edges	
6	Granite at surface > 20 % surface rock *Allocasuarina acutivalvis* subsp. *acutivalvis, Eucalyptus loxophleba* subsp. *supralaevis, Acacia acuminata, Eremophila oldfieldii* subsp. *oldfieldii, Santalum spicatum, Melaleuca leiocarpa* tall open shrubland over *Eremophila oldfieldii* subsp. *oldfieldii, Dodonaea inaequifolia, Acacia andrewsii* sparse shrubland over *Borya sphaerocephala* low forbland Other species: *Philotheca brucei* subsp. *brucei* Condition: good; disturbances at edges	

Appendix B: Biota (2023) Terrestrial Fauna Survey

Biota Environmental Sciences

Mount Gibson Gold Project Extended Area Basic and Targeted Fauna Survey



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January 2023

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Mt Gibson Extended Area Basic and Targeted Fauna Survey

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1.0 Executive Summary

1.1 Background

Crimson Metals Pty Ltd (Crimson), a subsidiary of Capricorn Metals Ltd, plans to recommence mining at the recently acquired Mount Gibson Gold Project, located in the Midwest region of Western Australia, approximately 50 km northeast of Wubin and 70 km southwest of Paynes Find. In 2021, on behalf of Crimson, Tetris Environmental Pty Ltd (Tetris) commissioned Biota Environmental Sciences Pty Ltd (Biota) to conduct a targeted vertebrate and short-range endemic (SRE) invertebrate fauna survey (Biota 2022), to inform mine planning and future environmental impact assessment.

Subsequently to that survey, Crimson has now revised the project's development envelope and as a result, Tetris engaged Biota to conduct a basic and targeted fauna survey of the study area, to assess and map fauna habitats, and to document any significant taxa present. This report represents an addendum to the findings of the initial survey presented in Biota (2022).

The revised study area comprises:

- the extended study area (ESA); and
- the extended development envelope (EDE) which is a subset of the ESA.

The original 'study area' in Biota (2022) is referred to as the original development envelope (ODE) for the purpose of this report.

1.2 Methodology

The survey was conducted by a Biota zoologist and a Tetris environmental scientist from 19-23 September 2022. The survey was completed in accordance with relevant Environmental Protection Authority policy and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* guidance. Survey methods included:

- Targeted searches for the following significant taxa known to occur in the locality:
  - Western Spiny-tailed Skink (*Egernia stokesii badia*) in or near fallen log piles and tree stumps, i.e. habitat features the species is known to shelter in;
  - Common Slender Bluetongue *(Cyclodomorphus branchialis*) under leaf litter and fallen logs; and
  - Burrows of Shield-backed trapdoor spiders of the *Idiosoma nigrum* group, specifically *I. kopejtkaorum* and *I. formosum* as these are known to occur in the locality.
- Opportunistic observations of Malleefowl (*Leipoa ocellata)* individuals and nesting mounds, Peregrine Falcon (*Falco peregrinus*) and other significant fauna species potentially occurring.
- Fauna habitat assessment and mapping.

1.3 Significant Fauna

Sixty-five Malleefowl mounds were recorded within the ESA and surrounding locality. Ten mounds were deemed active, all of which occurred in mixed shrubland habitat (seven in the ESA and two in the EDE). No evidence of other significant vertebrate fauna species was recorded from the ESA.

Twelve *Idiosoma* sp. burrows were recorded from seven sites within the ESA, with records from both within and outside the EDE. Based on previous records from the locality, these likely represent either the Endangered Lake Goorly Shield-backed Trapdoor Spider (*Idiosoma kopejtkaorum*) or the Endangered Ornate Shield-backed Trapdoor Spider (*Idiosoma formosum*).

1.4 Fauna Habitats

Three broad fauna habitats were identified in the ESA:

- mixed shrubland (accounting for 31.6% of the ESA by area);
- eucalypt woodland (66.4% of the ESA); and
- previously cleared habitat (2.0% of the ESA).

Based on substrate, landform and vegetation types, the mixed shrubland and eucalypt woodland habitats identified in the ESA represent the same fauna habitats previously identified in the ODE, with both habitats extending contiguously across the areas. Therefore, using habitat as a surrogate for distributional boundaries, it can be inferred that taxa recorded in the ODE would be likely to also occur in the ESA and beyond.

2.0 Introduction

2.1 Project Background

Crimson Metals Pty Ltd (Crimson), a subsidiary of Capricorn Metals Ltd, plans to recommence mining at the recently acquired Mount Gibson Gold Project, located in the Midwest region of Western Australia, approximately 50 km northeast of Wubin and 70 km southwest of Paynes Find. In 2021, on behalf of Crimson, Tetris Environmental Pty Ltd (Tetris) commissioned Biota Environmental Sciences Pty Ltd (Biota) to conduct a targeted vertebrate and short-range endemic (SRE) invertebrate fauna survey (Biota 2022), to inform mine planning and future environmental impact assessment (EIA).

Following the initial 2021 survey (Biota 2022), Crimson revised the project's development envelope and given this, Tetris engaged Biota to conduct a basic and targeted survey to describe and map fauna habitats, and conduct sampling for significant species (i.e. species listed as specially protected at State or Commonwealth level; Appendix 1) to document the ecological values of the revised study area.

The revised study area is depicted in Figure 2.1 and comprises:

- the 6,322 ha extended study area (ESA); and
- the extended development envelope (EDE) which is a subset of the ESA.

The original 'study area' in Biota (2022) is referred to as the original development envelope (ODE) for the purpose of this report.

2.2 Purpose and Structure of this Report

The purpose of this report is to document the results from the survey conducted in the ESA, as an addendum to the findings of the initial survey presented in Biota (2022).

Details of the initial survey conducted in November 2021, including the desktop study are presented in Biota (2022). While this addendum primarily addresses the ESA survey, a summary of the original findings is provided here for context (Section 2.3), and overall conclusions are also provided (Section 6.0).

2.3 Summary of Previous Survey

2.3.1 Vertebrate Fauna

Fourteen significant vertebrate species were identified as having the potential to occur in the locality based on the results of the 2021 desktop study. Three of these were recorded from the ODE during the 2021 survey, a further three have the potential to occur there based on their known distribution and the availability of preferred habitat (Table 2.1).

During the 2021 survey, 12 Malleefowl mounds were located, but all were deemed inactive for over 10 years. Malleefowl tracks were recorded from two locations within the ODE and one individual Malleefowl was observed approximately 1.5 km north of the ODE, confirming that Malleefowl were active in the locality.

Table 2.1: Significant vertebrate species recorded or potentially occurring in the ODE.

Common Name	Species	Conservation Status		Likelihood of Occurrence*
		State	Commonwealth	
Western Spiny-tailed Skink	*Egernia stokesii badia*	Vulnerable	Endangered	Likely to occur
Common Slender Blue-tongue	*Cyclodomorphus branchialis*	Vulnerable	Vulnerable	May occur
Malleefowl	*Leipoa ocellata*	Vulnerable	Vulnerable	Recorded in ODE Biota 2022
Peregrine Falcon	*Falco peregrinus*	Specially Protected	–	Recorded in ODE Biota 2022
Central Long-eared Bat	*Nyctophilus major tor*	Priority 3	–	Recorded in ODE Biota 2022
Red Backed Western Rosella	*Platycercus icterotis xanthogenys*	Priority 4	–	May occur

* See Section 4.3 on methodology of likelihood of occurrence assessment.

2.3.2 Potential SRE Invertebrates

Mygalomorph spiders, millipedes and land snails were recorded in the ODE and represent higher-order taxonomic groups that have the potential to include SRE species. Of the 18 potential SRE invertebrate taxa collected during the survey, ten nominal mygalomorph spider species from three taxonomic families were known solely from the ODE. However, the habitat attributes of the ODE and wider locality make it unlikely that these nominal species would be restricted to the ODE.

Although not restricted to the ODE, the Endangered Lake Goorly Shield-backed Trapdoor Spider (*Idiosoma kopejtkaorum*) was recorded, while the Endangered Ornate Shield-backed Trapdoor Spider (*Idiosoma formosum*) and the Priority 4 Tree Stem Trapdoor Spider (*Aganippe castellum*) were considered likely to occur. The millipede species recorded is a potential SRE but was confirmed to occur beyond the ODE. The land snail species recorded is widespread and not an SRE.

2.4 Scope and Objectives

The scope of this study was to undertake a basic and targeted terrestrial fauna survey consistent with relevant Environmental Protection Authority (EPA) technical guidance and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) guidance. Specific objectives were to:

- conduct a basic and targeted fauna survey of the ESA, including targeted sampling within the ESA;
- describe and map broad scale fauna habitats in the ESA and assess habitat suitability to support known or potential populations of significant fauna;
- identify any key ecological values or Matters of National Environmental Significance (MNES); and
- discuss the ESA and EDE survey results, considering ODE targeted survey results (Biota 2022), to inform project EIA.

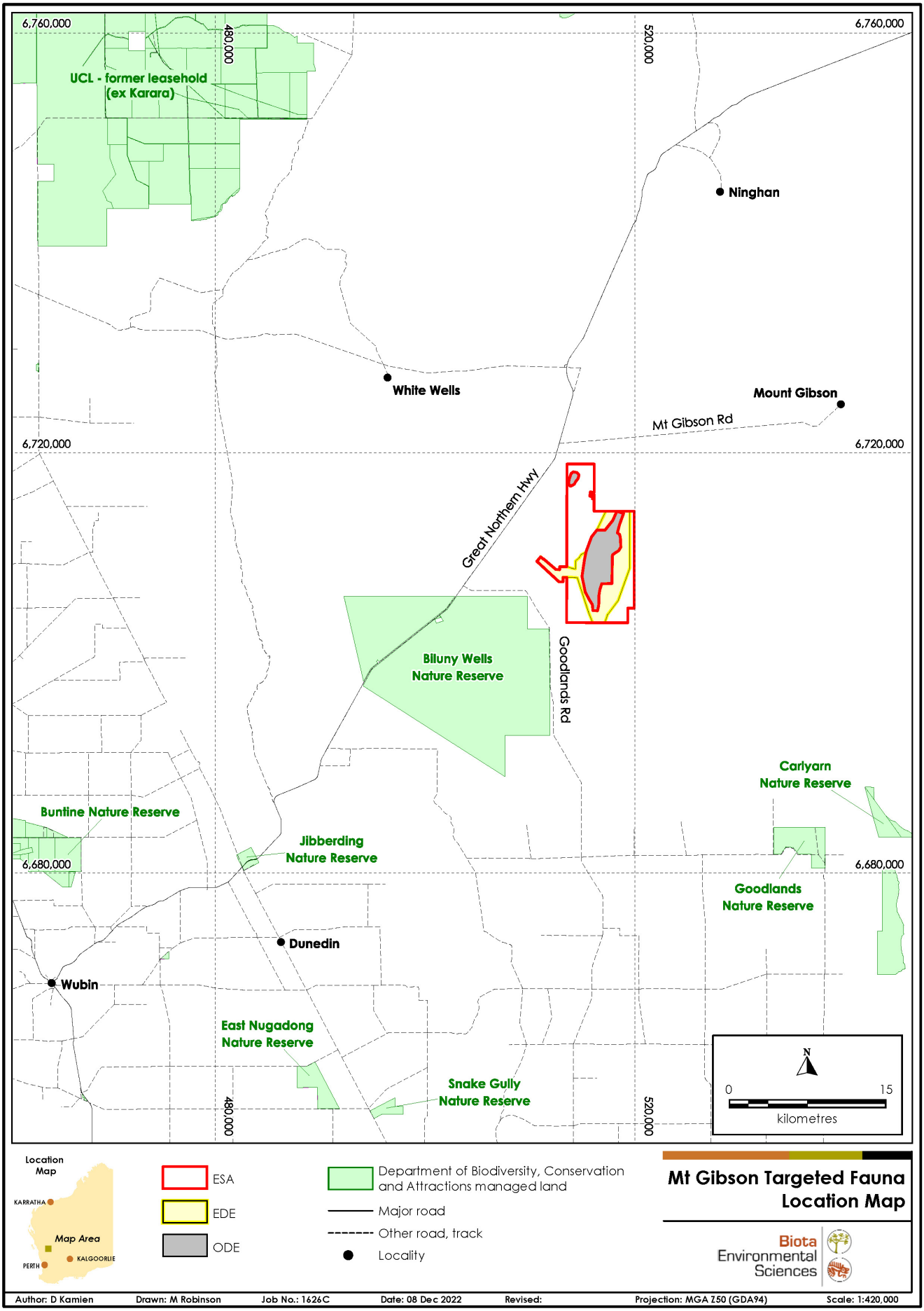

Figure 2.1: Study area location map.

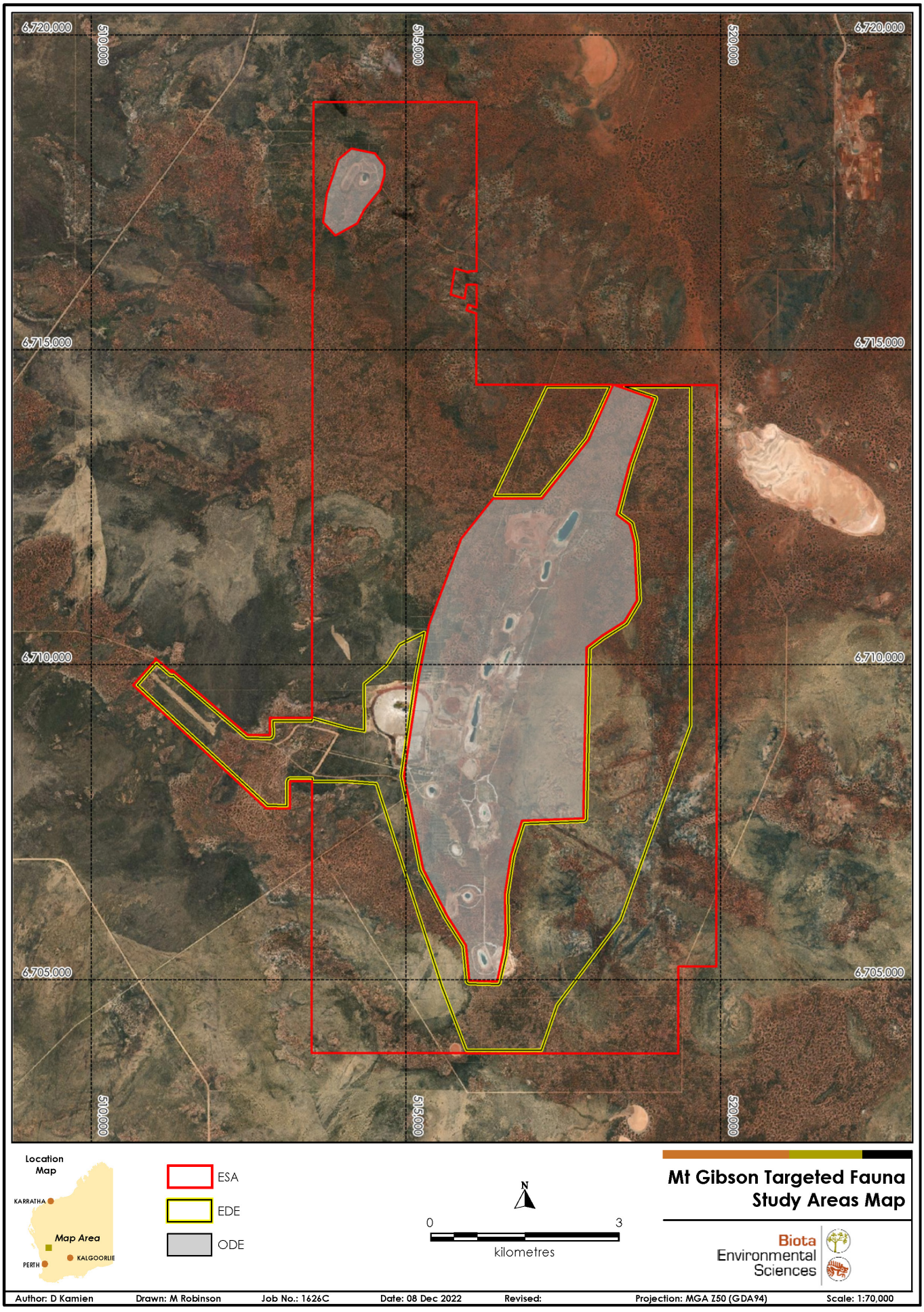

Figure 2.2: Study area extent.

3.0 Survey Timing and Weather

3.1 Survey Team

The field survey was conducted by a Biota zoologist and a Tetris environmental scientist from 19-23 September 2022 (Table 3.1).

Table 3.1: Summary of personnel involved in the fauna survey.

Name	Position at Biota	Qualification	Years of Experience	Survey Role
Dan Kamien	Principal Zoologist	BSc. Hons	25	Project Manager Project coordination Reporting
Michael Greenham	Senior Zoologist	BSc.	22	Field survey (team leader)
Jacob Jones	Environmental Scientist	BSc. Env	1	Field survey

3.2 Daily Weather Observations

Weather data were obtained from the closest Bureau of Meteorology weather station at Paynes Find (No. 007139), located approximately 70 km northeast of the ESA. Initial weather conditions were cool and wet but were warmer from September 21 onward (Table 3.2).

Table 3.2: Weather at Paynes Find during the survey period.

	19/9	20/9	21/9	22/9	23/9	Mean/Total
Maximum temperature (°C)	17.0	20.3	23.6	23.4	27.0	22.3
Minimum temperature (°C)	9.7	5.6	7.1	8.1	7.5	7.6
Rainfall (mm)	4.6	0.4	0.0	0.0	0.0	5.0

3.3 Climate

Long-term climate data were also obtained from the Paynes Find weather station (Figure 3.1). Average monthly maximum and minimum temperatures in the year preceding the survey were mostly consistent with long-term averages. The month prior to the survey and the month of the survey were wetter than average and the total rainfall for the 12 months preceding the survey (445.7 mm) was also above average (262.9 mm).

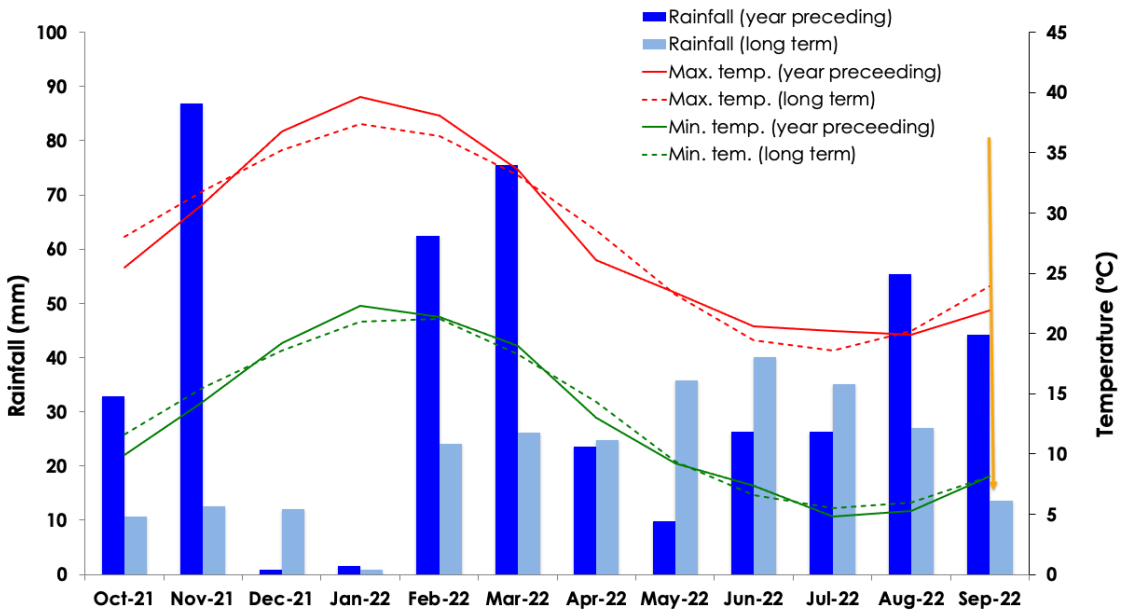

Figure 3.1: Climate and weather graph depicting long-term averages and 2021/2022 data.
(Long-term data: rainfall 1919-2021, temperatures 1975 – 2021; orange arrow indicates survey timing).

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4.0 Methodology

4.1 Basic Fauna Survey

A basic fauna survey, including low intensity sampling was conducted on general faunal values, as a detailed survey was deemed unnecessary because quantitative data on species occurrence and species assemblages in the locality is available from previous studies conducted (see Biota 2022).

Habitat descriptions were conducted in the field to inform fauna habitat assessment. Fauna habitats were then mapped and assessed based primarily on identified vegetation units. Digital aerial imagery was also considered in combination with regional soil landscape mapping and geology, to inform the extent of identified habitats.

4.2 Targeted Fauna Survey

4.2.1 Survey Design

The basic and targeted sampling methodology was developed with reference to the following documents:

- Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020);
- National Malleefowl Monitoring Manual (National Malleefowl Recovery Team 2020);
- Technical Guidance – Sampling of Short-range Endemic Invertebrate Fauna (EPA 2016);
- Survey Guidelines for Threatened Mammals (DSEWPaC 2011a);
- Survey Guidelines for Threatened Reptiles (DSEWPaC 2011b); and
- Survey Guidelines for Threatened Birds (DSEWPaC 2010).

4.2.2 Significant Terrestrial Vertebrates Targeted

The vertebrate survey component consisted of a combination of foot traverses and targeted searches and sampling, with potentially occurring Commonwealth and State listed threatened fauna species, and Department of Biodiversity, Conservation and Attractions (DBCA) listed Priority fauna species targeted during the survey (Figure 4.1).

4.2.2.1 Targeted Searches

Western Spiny-tailed Skink *(Egernia stokesii badia)* – Vulnerable (State); Endangered (Commonwealth)
Targeted searches for the Western Spiny-tailed Skink were conducted within the ESA in eucalypt woodland (Table 4.1 and Figure 4.1). Searches were focussed on detecting individuals and faecal piles in or near fallen logs (particularly log piles) and tree stumps in which the skinks are known to shelter (How et al. 2003, Pearson 2012).

Common Slender Bluetongue *(Cyclodomorphus branchialis)* – Vulnerable (State and Commonwealth)
Targeted searches for the Common Slender Bluetongue were conducted within the ESA under leaf litter and fallen logs (Table 4.1; Cogger 2014).

Table 4.1: Western Spiny-tailed Skink and Common Slender Bluetongue sampling locations and effort.

Site	Easting (mE)	Northing (mN)	Habitat	Search Date	Search Effort (mins)
MGT01TS_MG	511892	6708884	Mixed shrubland	20/9/2022	156
MGT02TS_MG	510967	6709941	Eucalypt woodland	20/9/2022	43
MGT03TS_MG	513283	6708586	Mixed shrubland	20/9/2022	87
MGT04TS_MG	518118	6714251	Eucalypt woodland	21/9/2022	63
MGT05TS_MG	516980	6704724	Eucalypt woodland	21/9/2022	108
MGT06TS_MG	514848	6713471	Eucalypt woodland	22/9/2022	20
MGT07TS_MG	516983	6715580	Eucalypt woodland	22/9/2022	102
				Total	**579**

4.2.2.2 Bat Call Recordings

Central Long-eared Bat (*Nyctophilus major tor)* – Priority 3 (State)
Song Meter Mini Bat recorders were deployed at four locations within the EDE in an effort to record Central Long-eared Bat echolocation calls emitted during flight. However, the Song Meter configurator application malfunctioned, rendering all recordings invalid.

4.2.2.3 Significant Species Opportunistic Records

Malleefowl (*Leipoa ocellata)* – Vulnerable (State and Commonwealth)
Evidence of Malleefowl activity (mounds, individuals, scats and tracks) were recorded opportunistically during the survey, while traversing the ESA and conducting other survey activities. Additional Malleefowl mound locations within the ESA were also provided and verified by Tetris.

Peregrine Falcon (*Falco peregrinus*) – Specially Protected (State)
Opportunistic bird observations were recorded to confirm the occurrence of Peregrine Falcon or any other significant birds in the ESA.

4.2.3 Significant Invertebrates Targeted

The invertebrate survey consisted of targeted searches for significant species (Section 4.2.3). Sampling sites were selected through initial assessment of aerial photography and thematic layers including soil landscapes and geology, and subsequent on-ground assessment.

Searches targeted threatened Shield-backed trapdoor spiders of the *Idiosoma nigrum* group comprising:

- Lake Goorly Shield-backed Trapdoor Spider (*Idiosoma kopejtkaorum*) – Endangered (State); and
- Ornate Shield-backed Trapdoor Spider (*Idiosoma formosum*) - Endangered (State)[1].

These Endangered species construct burrows characterised by the "*presence of a 'moustache-like' arrangement of twig-lines and thin flap-type or wafer-type doors which are adorned with leaf litter debris*" (Rix et al. 2018). Locations of such burrows were marked, but spiders were not excavated due their likely Endangered status. Search effort focussed on eucalypt woodland, as this represents critical habitat (Avon Catchment Council 2008, Table 4.2 and Figure 4.1), but opportunistic searches were also conducted while traversing the study area.

The Priority 4 Tree Stem Trapdoor Spider (*Aganippe castellum*) was also targeted during the survey, concurrently with *Idiosoma* species searches (Table 2.1).

Table 4.2: Targeted *Idiosoma* sp. site locations and search effort.

Site	Easting (mE)	Northing (mN)	Habitat	Search Date	Search Effort (mins)
MGT01SRE_M	519457	6711446	Eucalypt woodland	21/9/2022	24
MGT02SRE_M	516838	6705328	Eucalypt woodland	21/9/2022	10
MGT03SRE_M	516204	6704449	Eucalypt woodland	21/9/2022	12
MGT04SRE_M	514874	6712242	Eucalypt woodland	22/9/2022	11
MGT06SRE_M	514912	6716373	Eucalypt woodland	22/9/2022	15
MGT07SRE_M	514831	6713512	Eucalypt woodland	22/9/2022	24
MGT08SRE_M	512981	6707939	Eucalypt woodland	22/9/2022	23
				Total	**119**

[1] *Idiosoma kopejtkaorum* and *I. formosum* are not currently specified in the Commonwealth EPBC Act threatened fauna list. However, these species have been re-diagnosed from *I. nigrum* (Rix et al. 2018) which is listed as Vulnerable under the Commonwealth listing. It is therefore likely that *I. kopejtkaorum* and *I. formosum* will also be considered threatened under the EPBC Act on assessment by the Threatened Species Scientific Committee.

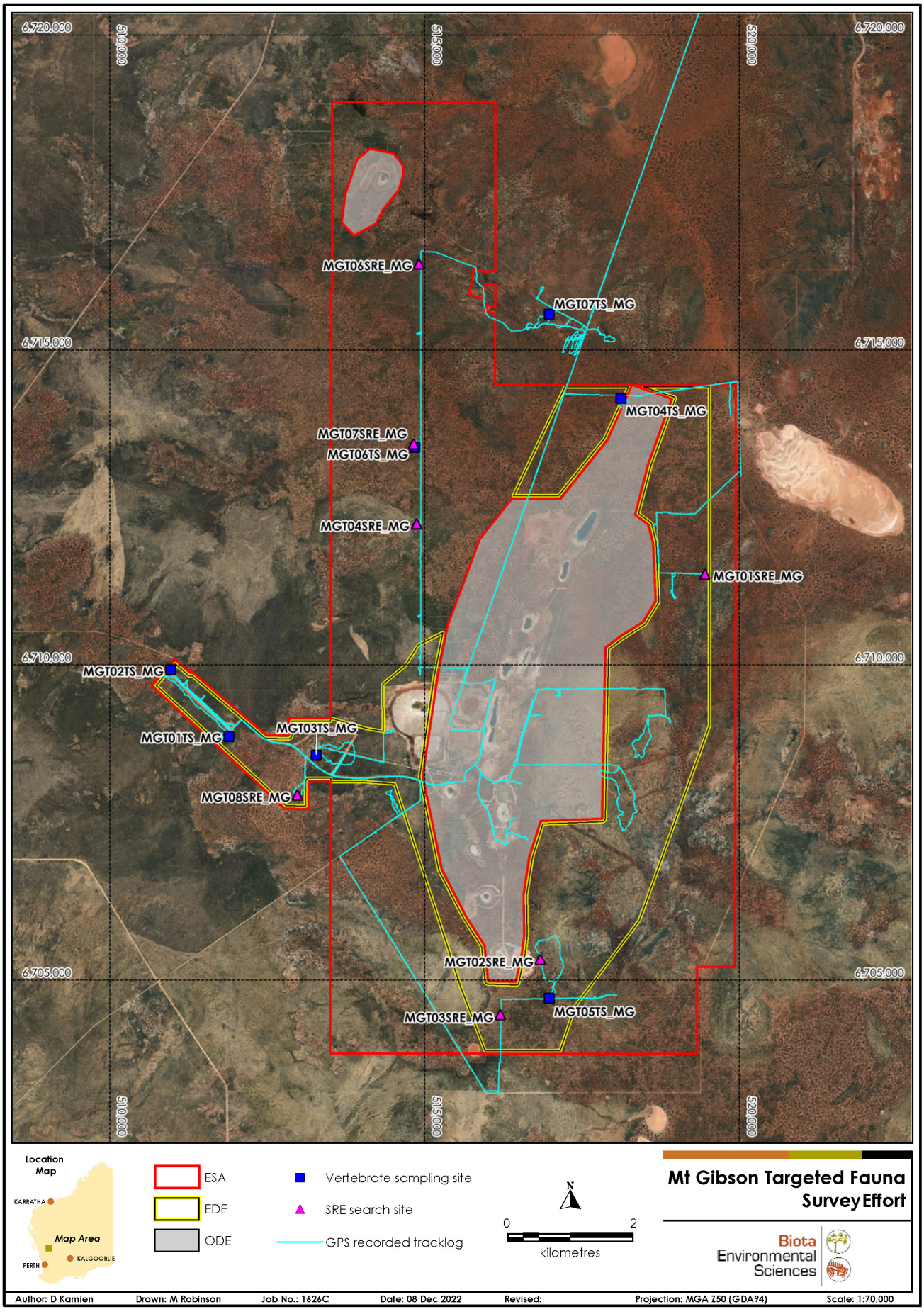

Figure 4.1: Targeted fauna sampling locations and track logs.

4.3 Likelihood of Occurrence

Results from the literature review and database searches (conducted in Biota (2022)) were used to compile a list of terrestrial fauna species of significance that had previously been recorded from the study area locality. The likelihood that each taxon would occur in the study area was then assessed using the rankings and criteria provided in Table 4.3, based on consideration of:

- the results of the database and literature searches (Biota 2022);
- the ODE survey results (Biota 2022);
- the known habitat preferences of each species compared to the habitats available within the study area; and
- distributions and last known records for each species.

For each significant vertebrate fauna species, defined rankings and criteria were subsequently applied as per Table 4.3. The term "close proximity" has been defined as being within 20 km of the study area, while the broader "locality" comprises the area up to 40 km from the centre of the study area.

Table 4.3: Criteria used to assign the likelihood of occurrence of a species within the study area.

Rank	Criteria
Recorded	1. The species has been previously recorded in the study area.
Likely to occur	1. There are existing records of the species in close proximity to the study area; and • the species is strongly linked to a specific habitat, which is present in the study area; or • the species has more general habitat preferences, and suitable habitat is present.
May occur	1. There are existing records of the species from the locality, however • the species is strongly linked to a specific habitat, of which only a small amount is present in the study area; or • the species has more general habitat preferences, but only some suitable habitat is present. 2. There is suitable habitat in the study area, but the species is recorded infrequently in the locality.
Unlikely to occur	1. The species is linked to a specific habitat, which is absent from the study area; or 2. Suitable habitat is present, however there are no existing records of the species from the locality despite reasonable previous search effort in suitable habitat; or 3. There is some suitable habitat in the study area, however the species is very infrequently recorded in the locality or the only records are historic (>40 years ago).
Would not occur	1. The species is strongly linked to a specific habitat, which is absent from the study area; or 2. The species' range is very restricted and does not include the study area; or 3. The species is not considered extant in the locality.

The likelihood of occurrence for each taxon was revised following habitat ground-truthing conducted during the survey (see Section 5.2.2).

4.4 Study Limitations

The results presented within this report should be interpreted with consideration to the limitations outlined below.

- Not every section of the ESA was ground-truthed or sampled, as parts of the ESA were inaccessible by vehicle. Fauna sampling was, however, completed at locations considered to represent the range of habitats present in the ESA.
- The Song Meter configurator application malfunctioned in the field, rendering all bat recordings invalid.

5.0 Survey Results

5.1 Fauna Habitats

Three broad fauna habitats were identified in the ESA (Figure 5.1).

- **Mixed shrubland:** This represented 1,967.3 ha within the ESA (31.6%). It comprised the Focused Vision Consulting (2022) vegetation units dominated by *Acacia* sp. shrubland and heath, *Allocasuarina* sp. shrubland, or *Callitris columellaris* woodland, often with *Melaleuca* spp., *Eremophila* spp. and *Olearia* spp. mixed shrubland with scattered *Eucalyptus* spp. mallee. Associated with sandy clay loam and sandy loam plains and distributed continuously throughout the ESA (Plate 5.1 and Figure 5.1).
- **Eucalypt woodland:** This represented 4,140.6 ha within the ESA (66.4%). It comprised the Focused Vision Consulting (2022) vegetation units dominated by *Eucalyptus loxophleba* (York Gum), *Eucalyptus salmonophloia* (Salmon Gum) or *Eucalyptus salubris* (Gimlet). Associated with clay loam and sandy clay loam plains and distributed in large patches throughout the ESA (Plate 5.2 and Figure 5.1).
- **Previously cleared:** This represented 124.1 ha within the ESA (2.0%). It comprised the Focused Vision Consulting (2022) vegetation units that have been cleared of vegetation, but left for natural regeneration to occur. Regeneration was dominated by young, open *Acacia acuminata* regrowth (Plate 5.3 and Figure 5.1).

Plate 5.1: Mixed shrubland.

Plate 5.2: Eucalypt woodland.

Plate 5.3: Previously cleared.

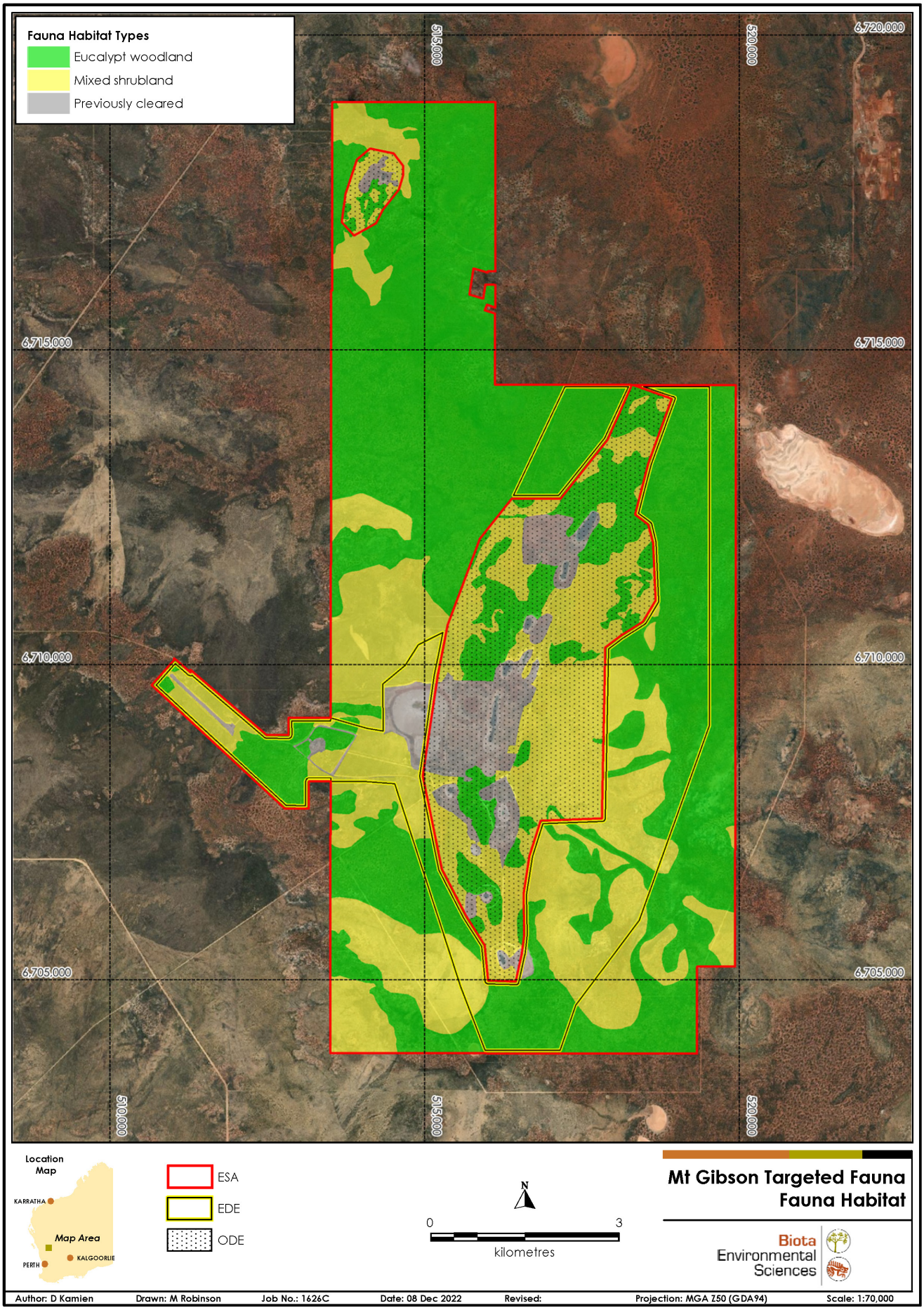

Figure 5.1: Fauna habitats within the ESA in relation to the EDE and ODE.

5.2 Vertebrate Fauna

5.2.1 Malleefowl

In total, 65 Malleefowl mounds were recorded, 44 of which were within the ESA (22 of these were within the EDE). A further 13 Malleefowl mounds were opportunistically recorded in the surrounding locality but were outside the ESA, and seven were recorded within the ODE (Figure 5.2 and Appendix 2). Sixty mounds were recorded in mixed shrubland habitat and five were recorded in eucalypt woodland habitat. Ten mounds were deemed active, all of which were in mixed shrubland habitat (Figure 5.2 and Plate 5.4).

Plate 5.4: Active Malleefowl mound MGM01.

5.2.2 Western Spiny-tailed Skink

No evidence of the Vulnerable Western Spiny-tailed Skink (*Egernia stokesii badia*) was recorded from the study area.

5.2.3 Common Slender Bluetongue

No evidence of the Vulnerable Common Slender Bluetongue (*Cyclodomorphus branchialis*) was recorded from the study area.

5.2.4 Peregrine Falcon

No evidence of the Specially Protected Peregrine Falcon (*Falco peregrinus*) was recorded from the study area.

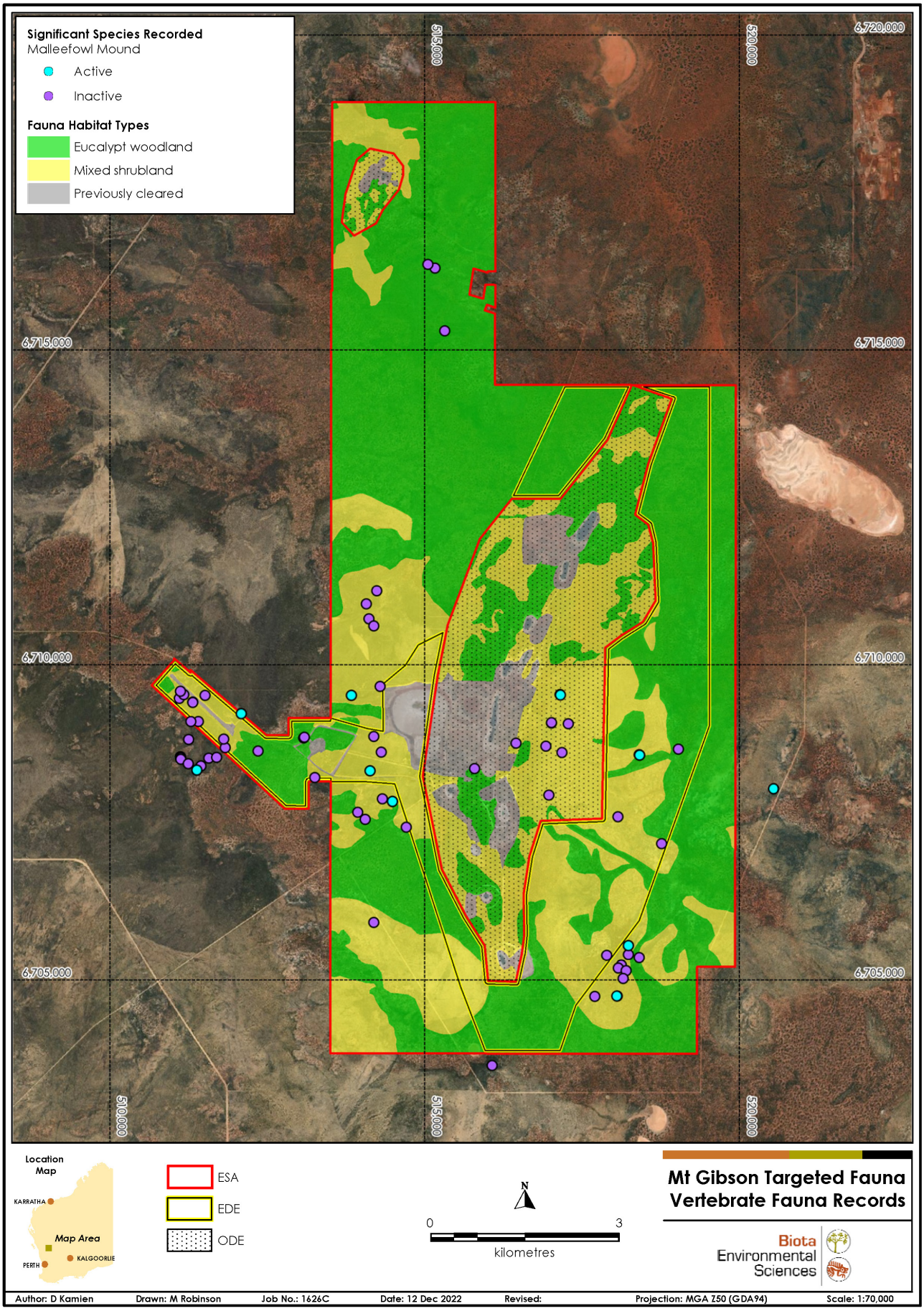

Figure 5.2: Significant vertebrate species records from the survey and provided by Tetris.

5.3 Invertebrate Fauna

Twelve *Idiosoma* sp. burrows were recorded in eucalypt woodland habitat from seven sites within the ESA, both from within and outside the EDE (Table 5.1). Figure 5.3 shows the locations of *Idiosoma* sp. burrows recorded during this survey and records from the initial survey (Biota 2022). An example of the typical burrow entrance morphology is shown in Plate 5.5 and Plate 5.6.

Based on previous records documented in Rix et al (2018), the burrows recorded in the ESA likely represent either the Lake Goorly Shield-backed Trapdoor Spider (*Idiosoma kopejtkaorum*) or the Ornate Shield-backed Trapdoor Spider (*Idiosoma formosum*). However, a recent survey of the ESA (Biota 2022) found only *I. kopejtkaorum* to be present.

Table 5.1: *Idiosoma* sp. burrow records.

Site	Record	Number of burrows	Status	Date	Location	Habitat
MGT01SRE	MGT01SRE_MG-01	1	Adult	21/9/2022	EDE	Eucalypt Woodland
	MGT01SRE_MG-02	4	Juveniles	21/9/2022	EDE	
MGT02SRE	MGT02SRE_MG-01	1	Adult	21/9/2022	EDE	
MGT03SRE	MGT03SRE_MG-01	1	Juvenile	21/9/2022	EDE	
MGT04SRE	MGT04SRE_MG-01	1	Adult	22/9/2022	ESA	
	MGT04SRE_MG-02	1	Adult	22/9/2022	ESA	
	MGT04SRE_MG-03	1	Defunct	22/9/2022	ESA	
	MGT04SRE_MG-04	1	Adult	22/9/2022	ESA	
MGT06SRE	MGT06SRE_MG-01	1	Adult	22/9/2022	ESA	
MGT07SRE	MGT07SRE_MG-01	1	Adult	22/9/2022	ESA	
	MGT07SRE_MG-02	1	Defunct	22/9/2022	EDE	
MGT08SRE	MGT08SRE_MG-01	1	Defunct	22/9/2022	EDE	

Plate 5.5: *Idiosoma* sp. closed burrow.

Plate 5.6: *Idiosoma* sp. open burrow.

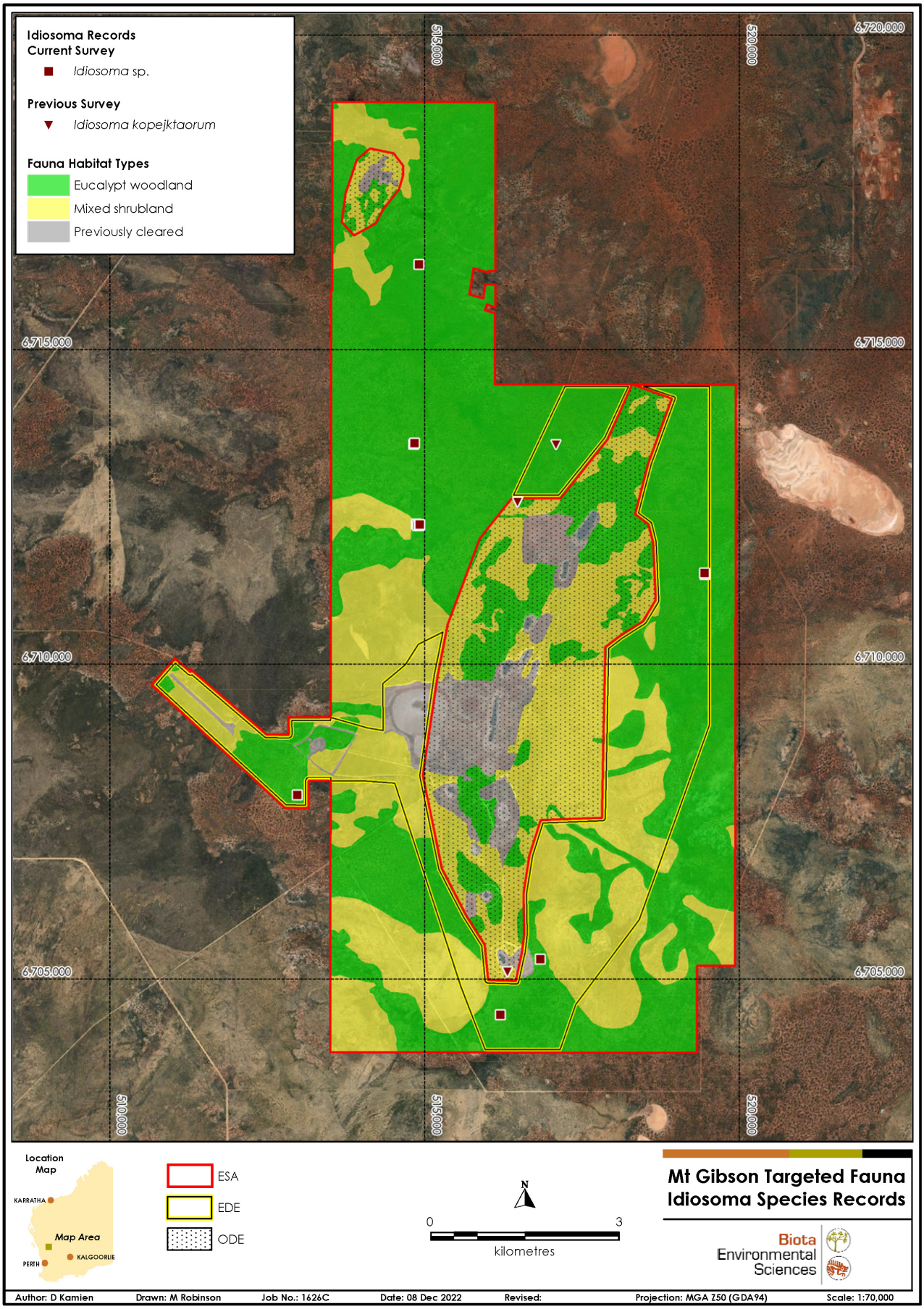

Figure 5.3: ***Idiosoma*** **species records from this survey and the initial survey (Biota 2022).**

5.4 Likelihood of Occurrence in the ESA

Appendix 3 summarises the likelihood of occurrence of the significant species that have potential to occur in the ESA.

Prior to undertaking the field survey, one species had previously been recorded, six species were considered 'likely to occur' and two species 'may occur' (Appendix 3). Six species were considered unlikely to occur, and two species would not occur in the study area (Appendix 3).

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6.0 Discussion and Key Findings

As presented in Biota (2022), both the mixed shrubland and eucalypt woodland habitats present within the ESA and the EDE represent high faunal value, providing core and secondary habitats for significant species that occur or are likely occur within the ESA (Table 6.1).

Table 6.1: Habitat preference for significant species occurring or likely to occur within the ESA.

Species	Core Habitat	Secondary Habitat
Malleefowl	• Mixed shrubland	• Eucalypt woodland
Western Spiny-tailed Skink	• Eucalypt woodland	–
Lake Goorly Shield-Backed Trapdoor Spider	• Eucalypt woodland	• Mixed shrubland • Previously cleared
Ornate Shield-backed Trapdoor Spider	• Eucalypt woodland	• Mixed shrubland • Previously cleared

Based on examination of aerial imagery, soil landscapes mapping and vegetation mapping, these core and secondary habitats are not restricted to the ESA, EDE or ODE and their attributes are typical of habitat types occurring more widely in the region. The only MNES species recorded inside the ESA, EDE and ODE, the Malleefowl, also occurs beyond these extents (Biota 2022).

The above also suggests there is a negligible risk that the distributions of the SRE invertebrate species recorded in Biota (2022), are restricted to the ODE or ESA. The Endangered *Idiosoma* sp. recorded in this study are unlikely to be restricted to the ODE or ESA based on available records data (Rix et al. 2018), and results from Biota (2022) and habitat attributes indicate that there is no overall mechanism limiting dispersal or gene flow within SRE invertebrate groups at the locality scale.

The mixed shrubland and eucalypt woodland habitats identified in the ESA and EDE are the same fauna habitats previously identified in the ODE (Biota 2022), with both habitats extending contiguously between the three areas and beyond (Figure 5.1). Therefore, using habitat as a surrogate for distributional boundaries, it can be inferred that taxa recorded in the ODE (Biota 2022) would also occur in the ESA and beyond.

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8.0 Glossary

Biota	Biota Environmental Sciences.
DBCA	Department of Biodiversity, Conservation and Attractions.
EDE	Extended development envelope
EIA	Environmental Impact Assessment.
EPA	Environmental Protection Authority of Western Australia.
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
ESA	Extended study area
Landform	A geomorphological unit that is largely defined by its surface form and location.
MNES species	Species that are listed as Matters of National Environmental Significance under the EPBC Act.
ODE	Original development envelope
SM Mini Bat	Song Meter Mini acoustic bat call recorder.
sp. (plural: spp.)	Abbreviation of "species".
SRE	short-range endemic.
Taxon (plural: taxa)	A taxonomic entity, typically at species level or below.

Appendix 1

Threatened Fauna Statutory Framework

Commonwealth *EPBC Act 1999*

Fauna species of national environmental significance are listed under the Commonwealth *EPBC Act*, and may be classified as 'critically endangered', 'endangered', 'vulnerable' or 'lower risk', which are consistent with IUCN categories.

Critically Endangered (CR): a taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.

Endangered (EN): a taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

Vulnerable (VU): a taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

Lower Risk (LR): a taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. **Conservation Dependent (CD).** Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation program targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. **Near Threatened (NT).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
3. **Least Concern (LC).** Taxa which do not qualify for Conservation Dependent or Near Threatened.

Migratory species are also protected under the *EPBC Act* as species of national environmental significance. Migratory species are those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations. The list of migratory species consists of those species listed under the following international conventions:

1. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
2. China-Australia Migratory Bird Agreement (CAMBA);
3. Japan-Australia Migratory Bird Agreement (JAMBA); and,
4. Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Western Australian *Biodiversity Conservation Act 2016*

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 has been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the Biodiversity Conservation Act 2016:

Threatened Species

Critically Endangered (CR): Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines.

Endangered (EN): Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".

- **Vulnerable (VU):** Threatened species considered to be "facing a high risk of extinction in the wild in the medium term future, as determined in accordance with criteria set out in the ministerial guidelines".

Extinct Species

Extinct Species (EX): Species where "there is no reasonable doubt that the last member of the species has died"

- **Extinct in the wild (EW):** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form"

Specially Protected Species

- **Migratory (MI):** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth.

  Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the Biodiversity Conservation Act are a subset of migratory animals, that are known to visit Western Australia, protected under the international agreements and treaties, excluding species that are listed as threatened species.

  Species of special conservation interest (conservation dependent fauna) (CD): Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.

- **Other specially protected fauna (OS):** Fauna otherwise in need of special protection to ensure their conservation

Department of Biodiversity, Conservation and Attractions Priority Listing

The DBCA maintains a list of Priority species that have not been assigned statutory protection under the *Biodiversity Conservation Act 2016*. Species on this list are considered to be of conservation priority because there is insufficient information to make an assessment of their conservation status or they are considered to be rare but not threatened and are in need of monitoring. Under this list, species are classified according to four Priority categories:

Priority 1: Poorly known species
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Priority 2: Poorly known species
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Priority 3: Poorly known species
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

Priority 4: Rare, Near Threatened and other species in need of monitoring
(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy. conservation lands.

Appendix 2

Malleefowl Mound Records

Site	Easting (mE)	Northing (mN)	Habitat	Mound Status	Recorder	Area
MGM01	514489	6707849	Mixed shrubland	Active	Biota	ESA only
MGM02	517159	6709539	Mixed shrubland	Active	Biota	ODE
MGM03	511319	6709423	Mixed shrubland	Inactive	Biota	EDE
MGM04	518417	6708587	Mixed shrubland	Active	Biota	EDE
MGM05	518053	6704757	Mixed shrubland	Active	Biota	ESA only
-	514138	6708335	Mixed shrubland	Active	Tetris	EDE
-	513839	6709536	Mixed shrubland	Active	Tetris	ESA only
-	518242	6705563	Mixed shrubland	Active	Tetris	ESA only
-	511387	6708348	Mixed shrubland	Active	Tetris	Outside study area
-	512091	6709246	Mixed shrubland	Active	Tetris	Outside study area
-	520545	6708050	Mixed shrubland	Active	Tetris	Outside study area
-	511106	6709487	Mixed shrubland	Inactive	Tetris	EDE
-	511176	6709548	Mixed shrubland	Inactive	Tetris	EDE
-	511514	6709533	Mixed shrubland	Inactive	Tetris	EDE
-	511405	6709121	Mixed shrubland	Inactive	Tetris	EDE
-	511291	6709117	Mixed shrubland	Inactive	Tetris	EDE
-	511833	6708701	Mixed shrubland	Inactive	Tetris	EDE
-	511809	6708840	Mixed shrubland	Inactive	Tetris	EDE
-	512359	6708651	Mixed shrubland	Inactive	Tetris	EDE
-	517893	6705409	Mixed shrubland	Inactive	Tetris	EDE
-	514197	6710637	Eucalypt woodland	Inactive	Tetris	EDE
-	513080	6708858	Eucalypt woodland	Inactive	Tetris	EDE
-	513094	6708870	Eucalypt woodland	Inactive	Tetris	EDE
-	513258	6708229	Mixed shrubland	Inactive	Tetris	EDE
-	514197	6708881	Mixed shrubland	Inactive	Tetris	EDE
-	514311	6708632	Mixed shrubland	Inactive	Tetris	EDE
-	519034	6708682	Mixed shrubland	Inactive	Tetris	EDE
-	511122	6709602	Mixed shrubland	Inactive	Tetris	EDE
-	518768	6707182	Mixed shrubland	Inactive	Tetris	EDE
-	518071	6707605	Eucalypt woodland	Inactive	Tetris	EDE
-	514294	6709676	Mixed shrubland	Inactive	Tetris	ESA only
-	514194	6705930	Mixed shrubland	Inactive	Tetris	ESA only
-	518241	6705419	Mixed shrubland	Inactive	Tetris	ESA only
-	518410	6705374	Mixed shrubland	Inactive	Tetris	ESA only
-	518129	6705253	Mixed shrubland	Inactive	Tetris	ESA only
-	518077	6705203	Mixed shrubland	Inactive	Tetris	ESA only
-	518205	6705163	Mixed shrubland	Inactive	Tetris	ESA only
-	518154	6705038	Mixed shrubland	Inactive	Tetris	ESA only
-	515319	6715324	Mixed shrubland	Inactive	Tetris	ESA only
-	515167	6716321	Mixed shrubland	Inactive	Tetris	ESA only
-	515057	6716379	Mixed shrubland	Inactive	Tetris	ESA only
-	514243	6711194	Mixed shrubland	Inactive	Tetris	ESA only
-	514076	6710989	Mixed shrubland	Inactive	Tetris	ESA only
-	514116	6710749	Mixed shrubland	Inactive	Tetris	ESA only
-	514333	6707891	Mixed shrubland	Inactive	Tetris	ESA only
-	513940	6707676	Mixed shrubland	Inactive	Tetris	ESA only
-	514060	6707565	Mixed shrubland	Inactive	Tetris	ESA only
-	514709	6707443	Mixed shrubland	Inactive	Tetris	ESA only
-	515798	6708371	Mixed shrubland	Inactive	Tetris	ODE
-	516927	6708730	Mixed shrubland	Inactive	Tetris	ODE
-	517183	6708627	Mixed shrubland	Inactive	Tetris	ODE
-	516978	6707952	Mixed shrubland	Inactive	Tetris	ODE
-	516457	6708777	Mixed shrubland	Inactive	Tetris	ODE
-	517019	6709099	Mixed shrubland	Inactive	Tetris	ODE
-	517284	6709084	Mixed shrubland	Inactive	Tetris	ODE
-	511256	6708833	Mixed shrubland	Inactive	Tetris	Outside study area

Site	Easting (mE)	Northing (mN)	Habitat	Mound Status	Recorder	Area
-	511126	6708563	Mixed shrubland	Inactive	Tetris	Outside study area
-	511132	6708542	Mixed shrubland	Inactive	Tetris	Outside study area
-	511129	6708518	Mixed shrubland	Inactive	Tetris	Outside study area
-	511248	6708449	Mixed shrubland	Inactive	Tetris	Outside study area
-	511448	6708411	Mixed shrubland	Inactive	Tetris	Outside study area
-	511574	6708539	Mixed shrubland	Inactive	Tetris	Outside study area
-	511700	6708549	Mixed shrubland	Inactive	Tetris	Outside study area
-	516075	6703657	Mixed shrubland	Inactive	Tetris	Outside study area
-	517704	6704757	Eucalypt woodland	Inactive	Tetris	Outside study area

Appendix 3

Likelihood of Significant Species Occurrence

Species Name	Common Name	Conservation Status		Preferred Habitat	Habitat Available in Study Area	Occurrence in Locality	Likelihood of Occurrence (Prior to Survey)	Likelihood of Occurrence (Post Survey)
		State	Commonwealth					
Herpetofauna								
Egernia stokesii badia	Western Spiny-tailed Skink	Vulnerable	Endangered	Fallen and hollow log piles, York Gum, Gimlet and Salmon Gum woodlands.	✓	Nearest record located approximately 13 km N of the study area.	Likely to occur	Likely to occur
Cyclodomorphus branchialis	Common Slender Blue-tongue	Vulnerable	–	Mallee or spinifex communities, vegetation clumps, fallen timber and leaf litter.	✓	Nearest record located approximately 32 km NE of the study area.	May occur	May occur
Avifauna								
Calidris ferruginea	Curlew Sandpiper	Critically Endangered,	Critically Endangered,	Beaches and inland mudflats and lakes.	X	Nearest record located approximately 28 km SW of the study area in the vicinity of Jibberding salt lakes.	Unlikely to occur	Unlikely to occur
Pezoporus occidentalis	Night Parrot	Critically Endangered	Endangered	Arid or semi-arid spinifex grasslands with large, established, and unburnt hummocks. Foraging habitat includes areas of samphire, bluebush, and saltbush.	X	No records from the locality.	Would not occur	Would not occur
Rostratula australis	Australian Painted-snipe	Endangered	Endangered	Shallow, brackish, or freshwater terrestrial wetlands.	X	No records from the locality.	Would not occur	Would not occur
Leipoa ocellata	Malleefowl	Vulnerable	Vulnerable	Dry inland scrub and mallee; occasionally in adjacent eucalypt woodland.	✓	Tracks recorded within the study area during the recent survey. Individual recorded ~1.5 km north of the main project area. Closest previous record located approximately 2 km W of the minor project area. Multiple records within the locality, predominantly to the north.	Likely to occur	Recorded
Falco hypoleucos	Grey Falcon	Vulnerable	Vulnerable	Wide range of habitats in the arid zone but appears to be least rare in lightly wooded coastal and riverine plains	✓	No records from the locality.	Unlikely to occur	Unlikely to occur
Falco peregrinus	Peregrine Falcon	Specially Protected	–	Wide range of habitats including forest, woodlands, wetlands, and open country.	✓	Recorded within the minor project area during the survey. Closest other records located approximately 12 km N of the study area.	Likely to occur	Likely to occur
Actitis hypoleucos	Common Sandpiper	Migratory	Migratory	Fresh and salt marshes, lakes, streams, sheltered coasts.	X	Recorded approximately 35 km N and 35 km SW of the study area, at a pastoral homestead and in the vicinity of Jibberding salt lakes, respectively.	Unlikely to occur	Unlikely to occur
Gelochelidon nilotica	Gull-billed Tern	Migratory	Migratory	Coastal seas, tidal flats, shallow lakes, and fields	X	Recorded in 1999, approximately 35 km SW of study area, and in the vicinity of Jibberding salt lakes.	Unlikely to occur	Unlikely to occur
Calidris ruficollis	Red-necked Stint	Migratory	Migratory	Predominantly coastal, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected shores. May also frequent wetlands, including salt flats.	X	Recorded in 1999, approximately 35 km SW of study area, and in the vicinity of Jibberding salt lakes.	Unlikely to occur	Unlikely to occur
Thinornis cucullatus	Hooded Dotterel	Priority 4	–	Ocean beaches and inland salt lakes	X	Recorded on four occasions within 35 km of study area, predominantly in vicinity of salt lakes.	Unlikely to occur	Unlikely to occur
Platycercus icterotis xanthogenys	Western Rosella	Priority 4	–	Open eucalypt forest and timbered areas.	✓	Nearest record located approximately 33 km S of the study area.	May occur	May occur
Mammals								
Nyctophilus major tor	Central Long-eared Bat	Priority 3	–	Eucalypt woodlands, savanna woodland, mallee, spinifex grasslands.	✓	Recorded approximately 22 km SW of study area. Recorded during the survey.	Likely to occur	Likely to occur
Invertebrates								
Idiosoma kopejtkaorum	Lake Goorly Shield-Backed Trapdoor Spider	Endangered	–	Eucalypt woodland.	✓	Recorded within 5 km of the study area. Recorded during the survey.	Recorded	Recorded
Idiosoma formosum	Ornate Shield-backed Trapdoor Spider	Endangered	–	Eucalypt woodland.	✓	Nearest record located approximately 5 km NE of the study area.	Likely to occur	Likely to occur
Aganippe castellum	Tree Stem Trapdoor Spider	Priority 4	–	Flood-prone depressions and flats that support myrtaceous shrub communities	✓	Nearest record located approximately 3 km N of the study area.	Likely to occur	Likely to occur