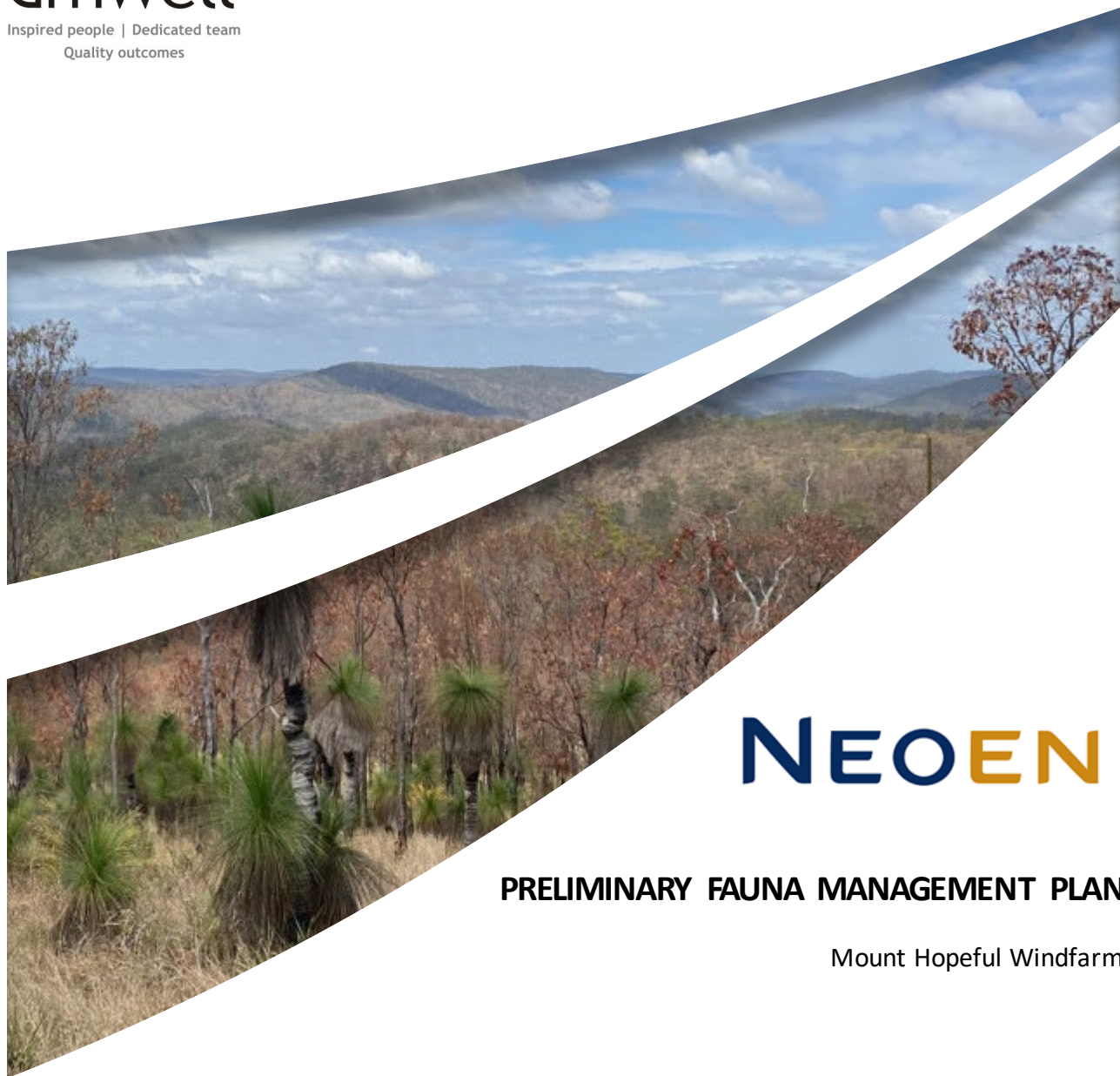


APPENDIX G

Preliminary Fauna Management Plan



NEOEN

PRELIMINARY FAUNA MANAGEMENT PLAN

Mount Hopeful Windfarm

FINAL

May 2023



PRELIMINARY FAUNA MANAGEMENT PLAN

Mount Hopeful Windfarm

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Australia Pty Ltd

Report No. R27
Project Number 7053
Date: May 2023



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Abbreviations

Abbreviations	Description
AEMO	Australian Energy Market Operator
AHD	Australian Height Datum
BBAMP	Bird and Bat Adaptive Management Plan
BESS	battery energy storage systems
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science
DoR	Department of Resources
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
EPMs	Exploration Permits for Minerals
PFMP	Preliminary Fauna Management Plan
ha	hectare
km	kilometres
LGA	Local Government Areas
MCU	Material Change of Use
MNES	Matters of National Environmental Significance
MSES	Matter of State Environmental Significance
MW	megawatts
NC Act	<i>Nature Conservation Act 1992</i> (Qld)
Neoen	Neoen Australia Pty Ltd
PO	Performance Outcome
QREZ	Queensland Renewable Energy Zones
RE	Regional Ecosystem
SIS	State Infrastructure Strategy
TEC	Threatened Ecological Communities
the Project	Mount Hopeful Wind Farm
Umwelt	Umwelt (Australia) Pty Ltd
WoNS	Weeds of National Significance
WTG	wind turbine generator

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1.0 Introduction

Umwelt (Australia) Pty Ltd (Umwelt) is supporting Neoen Australia Pty Ltd (Neoen) in obtaining planning and environmental approvals for the Mount Hopeful Wind Farm (the Project). The Project is located approximately 45 kilometres (km) south of Rockhampton and 65 km west of Gladstone, within the Central Queensland Region.

The Project involves the development of a wind farm containing up to 63 wind turbine generators (WTGs) and ancillary infrastructure including up to ten temporary and ten permanent wind monitoring masts, six substations, battery energy storage system (BESS), temporary construction compound/laydown areas, a concrete batching plant, high voltage (275 kilovolt (kV)) overhead powerlines, as well as underground power and communication cables. The Project is expected to have a maximum generation capacity of approximately 400 megawatts (MW).

The purpose of this Preliminary Fauna Management Plan (PFMP) is to provide an overview of how fauna, including threatened species will be managed for the Project. This PFMP has also been prepared to comply with the conditions of the initial development approval (2109-24892 SDA) dated 17 June 2022 from the State Assessment and Referral Agency (SARA), and has been prepared in consideration of the amended design that is presently being considered by SARA as a Minor Change.

1.1 Ecology Study Boundaries

Information contained within the Mt Hopeful EPBC Act Assessment (Umwelt (Australia) Pty Limited, 2022), has been used to inform and develop this PFMP. Four distinct boundaries are presented that are relevant to the Project and this PFMP including:

- Study Area: refer to **Section 1.1.1**.
- Ground-truthed Mapping Extent: refer to **Section 1.1.2**.
- Development Corridor: refer to **Section 1.1.3**.
- Disturbance Footprint: refer to **Section 1.1.4**.

Figure 1.1 displays the above boundaries.

1.1.1 Study Area

The Study Area refers to the 17 land parcels and local road reserves proposed to host the Project within the Rockhampton Regional Council and Banana Shire Council Local Government Areas (LGA), where development consent is being applied for. The total area of the Study Area is 16,757.5 hectares (ha).

The predominant land use in the Study Area is agriculture, comprising mostly beef cattle grazing. Elevations within the Study Area ranges from approximately 190 metres (m) Australian Height Datum (AHD) to 500 m AHD, characterised by varying landform within the Study Area that comprises of peaks and valleys, with areas of lower, generally flatter topography surrounding the Study Area to the east and west.

Major highways in proximity to the Study Area include the Bruce Highway to the east, Burnett Highway to the west, and the Dawson Highway to the south. These major transport corridors link to the cities of Rockhampton and Gladstone, as well as the Port of Gladstone from which the proposed turbine components will be transported. Access to the Study Area is primarily via local government roads managed by Banana Shire Council including McDonalds Road and Playfields Road to the south-west. Details of all land parcels within the Study Area are provided in **Table 1.1**.

Table 1.1 Study Area Land Parcels

Lot and Plan	Address	Tenure	Local Government Area	Area (ha)
Lot 21 RN1345	Glengowan Road, Ulogie QLD	Freehold	Banana	5,196.6
Lot 24 RN34	Glengowan Road, Ulogie QLD	Freehold	Banana	2,752.5
Lot 23 RN25	Glengowan Road, Ulogie QLD	Freehold	Banana	976.2
Lot 30 RN72	Glengowan Road, Ulogie QLD	Freehold	Banana	1,723.7
Lot 21 RN46	1682A South Ulam Road, Bajool QLD	Freehold	Rockhampton	1,470.6
Lot 25 RN25	1682A South Ulam Road, Bajool QLD	Freehold	Rockhampton	183.5
Lot 2039 RAG4056	1682A South Ulam Road, Bajool QLD	Freehold	Rockhampton	801.0
Lot 1933 RAG4058	1682A South Ulam Road, Bajool QLD	Freehold	Rockhampton	826.3
Lot 2057 RAG4059	1682A South Ulam Road, Bajool QLD	Freehold	Rockhampton	845.9
Lot 15 RN1089	1682A South Ulam Road, Bajool QLD	Freehold	Rockhampton	585.9
Lot 148 DS151	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	235.4
Lot 2420 DT4077	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	64.8
Lot 2345 DT4077	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	105.3
Lot 50 DT40144	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	24.3
Lot 33 DT40123	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	66.5
Lot 38 DT40131	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	71.5
Lot 100 SP28944	1682 South Ulam Road, Bajool QLD	Freehold	Rockhampton	595.0
Local road reserves	Not Applicable	Road reserve	Banana and Rockhampton	232.6
Total Area				16,757.5 ha

1.1.2 Ground-truthed Mapping Extent

The Ground-truthed Mapping Extent covers 12,924.1 ha and represents the limit of the vegetation mapped within the Study Area. Due to the dynamic nature of the Project, some areas surveyed no longer fall within the Study Area boundary, and within the Study Area, not all areas of each land parcel were entirely surveyed.

It should be noted that this boundary does not represent the spatial bounds in which all Project field surveys have been conducted (this area being larger and including areas outside of the Study Area). This area will not be referred to within this report.

1.1.3 Development Corridor

The Development Corridor is a 'buffered' version of the indicative Project layout, covering approximately 1,347.4 ha. This area represents the maximum spatial extent where disturbance may occur within the Study Area and includes areas required for temporary and permanent Project infrastructure, equipment and materials laydown, installation and access.

1.1.4 Disturbance Footprint

The Disturbance Footprint covers approximately 877.5 ha and represents the maximum extent of clearing works and the indicative locations of Project infrastructure.

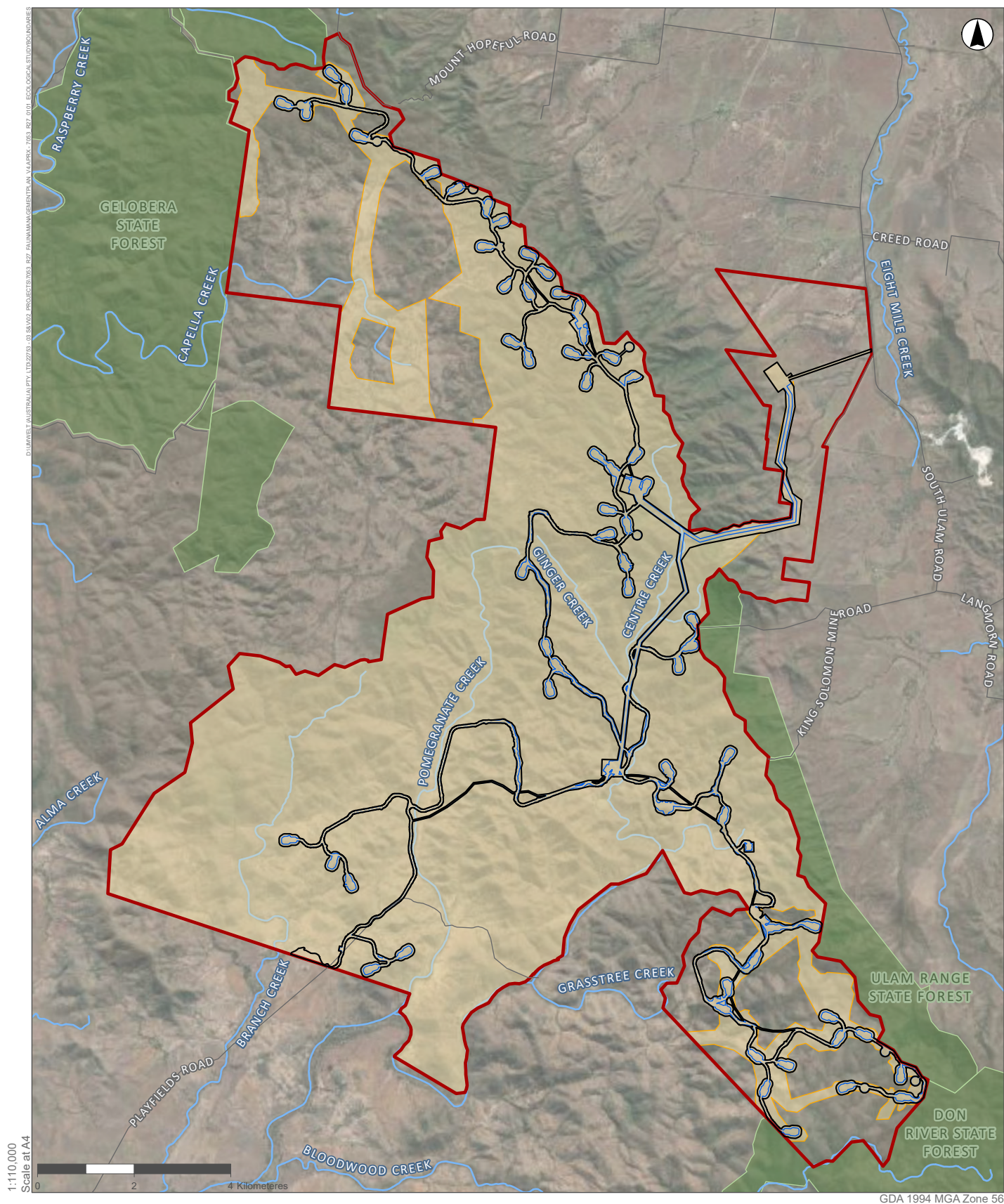


FIGURE 1.1

Ecological Study Boundaries

1.2 Project Description

1.2.1 Project Infrastructure

The Project will utilise existing infrastructure as well as construct new Project infrastructure, refer **Section 1.2.1.1** and **Section 1.2.1.2** below.

1.2.1.1 Existing Infrastructure

Powerlink electricity towers and associated overhead electricity transmission lines adjoin the Study Area to the east. An existing telecommunication tower is located approximately 2 km north of the Study Area. A 120 m guyed lattice meteorological mast was erected over the Study Area in August 2020, as well as a 140 m and 110 m guyed lattice meteorological mast in November 2022.

Other rights and encumbrances of note include:

- An easement (A RP612717) for high voltage electricity transmission line intersecting the eastern portion of the Study Area on Lot 100 SP289441.
- A strata for a Profit à Prendre (030 RN72) over Lot 30 RN72 for a Forest Consent Area to the State of Queensland (represented by the Department of Agriculture and Fisheries).
- Three Exploration Permits for Minerals (EPMs) overlap the Study Area, comprising EPM 15810 held by Mount Morgan Exploration Pty Ltd, EPM 27098 held by GBM Resources Limited, and EMP Application area 27105 held by Prophet Resources Pty Ltd.

1.2.1.2 Proposed Infrastructure

The Project will construct 63 WTGs with the turbine specifications used for the assessment shown in **Table 1.2**. These specifications are an upper limit and are intended to provide flexibility for any innovation in turbine design between now and the time of detailed design and construction.

Table 1.2 Turbine Specifications

Feature	Maximum Specifications
Project generation capacity	Approximately 400 MW
Turbine electrical output	Approximately 6.5 MW
Maximum number of turbines	63
Tip height	Up to 260 m
Blade length	Up to 90 m

The Project will also require the provision of ancillary infrastructure, including the following:

- Up to 10 temporary wind monitoring towers.
- Up to 10 permanent wind monitoring towers.
- Up to six substations, a BESS and ancillary electrical infrastructure.

- Up to 13 km of high voltage (275 kV) overhead powerlines.
- Site operational, maintenance and storage areas containing permanent site offices, workshops, warehouses, mobile offices, lunchroom, amenities and ablutions.
- Overhead and/or underground power and communication cables.
- Up to 175 km of gravel capped roads.
- Two permanent site access points.
- A range of temporary infrastructure to facilitate the construction of the Project, including:
 - One construction compound.
 - A temporary worker's accommodation camp to provide for a peak construction workforce of up to approximately 450 staff and including a water treatment plant, sewage treatment plant and sprayfield.
 - Three concrete batching plants.
 - Two laydown areas.

1.2.2 Anticipated Project Timeline

A summary of the anticipated construction works associated with the Project are provided in **Table 1.3**.

Table 1.3 Anticipated Construction Works

Project Stage/Component	Description
Construction Commencement, Completion and Commissioning of Project	<ul style="list-style-type: none"> • Commencement of construction works: Quarter 4, 2023. • Completion of construction works: Quarter 3, 2025. • Commissioning of the Project: Scheduled in Quarter 4, 2025.
Duration of Construction Works	<ul style="list-style-type: none"> • Between 22 and 28 months.
Planned Construction Activities	<ul style="list-style-type: none"> • Site establishment (temporary site facilities, lay down areas, equipment and materials). • Earthworks for access roads and wind turbine hardstands. • Excavations for the foundations. • Construction of wind turbine foundations. • Installation of electrical and communications cabling and equipment. • Installation of wind turbine transformers, in parallel with electrical reticulation works. • Arrival of wind turbine components to the Project Site. • Installation of wind turbines. • Commissioning of wind turbines. • Reliability testing.

1.3 Aim and Objectives

The aim of this PFMP is to reduce the potential impact on fauna species and their habitat within the Study Area by outlining mitigation and management measures to be implemented throughout the duration of the Project. The specific objectives of the PFMP are to:

- Provide a description of the nature and location of Project activities including approximate timing where possible.
- Provide a description of the occurrence and extent of fauna species and their habitat across the Study Area and Disturbance Footprint, including threatened fauna habitat and known threatened species records.
- Provide a description of the location and extent of works required, including how Project activities have been designed to minimise impacts on fauna and fauna habitat.
- Provide information on the roles, responsibilities, and training requirements in relation to fauna management.
- Outline mitigation and management measure to be implemented throughout the duration of the Project to reduce impacts on fauna and fauna habitat.
- Outline the pre-clearance survey methodology.
- Detail the monitoring and reporting requirements for pre-construction, construction, post-construction, and operation phases of the Project, including:
 - Threatened fauna monitoring.
 - Pest fauna monitoring.
 - Bird and bat monitoring as detailed in the Bird and Bat Adaptive Management Plan (BBAMP).

In addition to this PFMP, a Construction Environmental Management Plan (CEMP) will be developed for the Project to address management of environmental values. This plan will include, but not be limited to, the management of noise and vibration, sediment and erosion control, air quality and weed and pest management.

Potential impacts on fauna and fauna habitat values detailed in this document have been determined based on the Disturbance Footprint, which represents worst-case scenario direct impacts (see **Section 1.1.3** above).

2.0 Legislative Context

The legislation relevant to the PFMP is summarised in **Table 2.1**.

Table 2.1 **Legislation Relevant to the Project**

Relevant Legislation	Governing Agency	Summary	Project Relevance
Commonwealth Legislation			
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	The EPBC Act is Australia's key piece of environmental legislation. It outlines nine Matters of National Environmental Significance (MNES). Actions that adversely affect MNES may be deemed to be a controlled action under the EPBC Act.	The following MNES are relevant to the Project: <ul style="list-style-type: none"> Threatened Species Migratory Species
EPBC Act Environmental Offsets Policy	DCCEEW	The EPBC Act Environmental Offsets Policy outlines the use of environmental offsets under the EPBC Act and are considered during the assessment phase of an environmental impact assessment. Specifically, this policy applies to project assessments and approvals under Parts 8 and 9 of the EPBC Act, in addition to strategic assessments under Part 10.	Pending the outcomes of the EPBC Act referral decision, offsets may be required.
State Legislation			
<i>Planning Act 2016</i> (Planning Act)	Department of State Development, Infrastructure, Local Government and Planning (DSDILGP)	Applications for a Material Change of Use MCU for a new or expanding wind farm and Operational Works for Native Vegetation Clearing must be assessed against the benchmarks included in State Code 23 and State Code 16 of the State Development Assessment Provisions 16. Development that is a Material Change of Use (MCU) for a wind farm should demonstrate compliance with 13 performance outcomes (PO) and associated acceptable outcomes within the code.	State Code 23 requires assessment against PO5 – Flora and Fauna: <i>Development is designed, sited and operated to ensure that flora, fauna and associated ecological processes are protected from adverse impacts.</i> State Code 16 requires assessment against benchmarks relating to offset areas, minimisation of clearing, and clearing associated with wetlands, watercourses and drainage features, connectivity areas, Endangered and Of Concern Regional Ecosystems (REs), and Essential Habitat.

Relevant Legislation	Governing Agency	Summary	Project Relevance
<i>Nature Conservation Act 1992</i> (NC Act)	Department of Environment and Science (DES)	The purpose of the NC Act is to conserve biodiversity by creating and managing protected areas, managing and protecting native wildlife, and managing the spread of non-native wildlife.	<p>Where a proposed development will result in impacts to fauna protected under the NC Act, authorisation from the Director General of the DES is required.</p> <p>The following fauna values under the NC Act are relevant to the Project:</p> <ul style="list-style-type: none"> • Threatened fauna species. • Connectivity.
<i>Biosecurity Act 2014</i>	Department of Agriculture and Fisheries	The <i>Biosecurity Act 2014</i> lists fauna pest species as either a Prohibited or Restricted biosecurity matter.	The <i>Biosecurity Act 2014</i> defines specific requirements for notification and management actions for all listed biosecurity matters, including specific requirements for the disposal of Restricted Matters.
<i>Environmental Offsets Act 2014</i> (EO Act)	DES	An environmental offset condition may be imposed under certain Queensland legislation that applies to development assessment where the activity is a prescribed activity under the EO Act. Activities which have an impact on a Matter of State Environmental Significance (MSES) may require offsetting under the Act.	Consideration of offsetting requirements for the Project will need to be determined once a fixed design for the Project is completed. Requirements will also need to be considered in conjunction with overlapping EPBC Act requirements. Environmental offsets are therefore not discussed as part of this report.

3.0 Fauna Values

Fauna surveys were conducted within representative locations of all fauna habitat types. The adopted methodology followed recommendations outlined in Queensland survey guidelines, *Terrestrial Fauna Survey Guidelines for Queensland, Version 3* (Eyre et al., 2018). Specific methods employed are detailed in **Table 3.1** below.

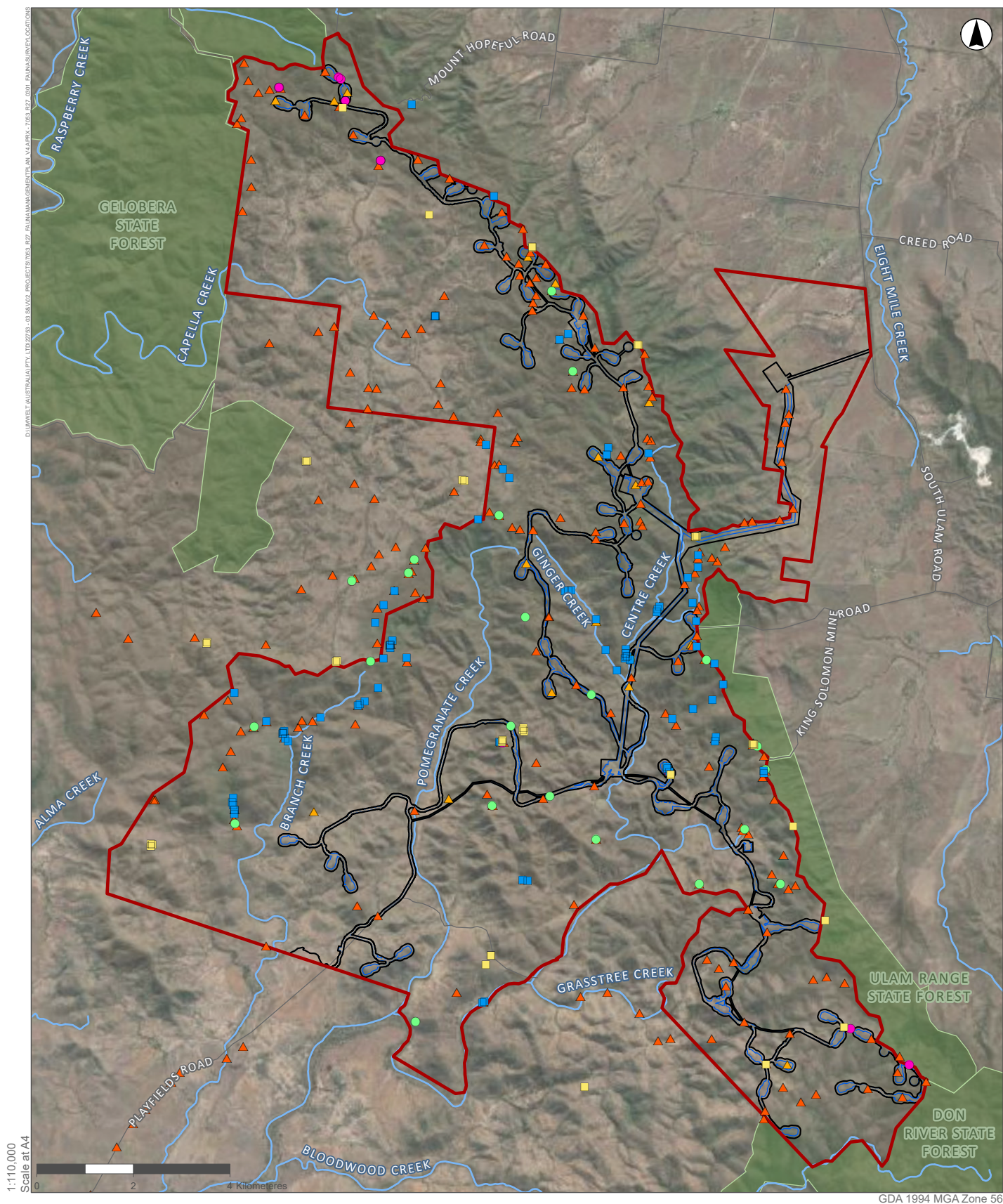
Due to the location of the Study Area, terrain difficulties, ethical requirements and remote access, intensive trapping methodologies were limited to a few locations and remote sampling techniques were instead adopted, including the use of cameras and acoustic monitoring devices.

Survey effort outlined in **Table 3.1** covers the full field survey program which was conducted across an area larger than the Study Area, including areas directly adjacent as well as land parcels to the west. Fauna survey locations are displayed on **Figure 3.1**.

Table 3.1 Fauna Survey Techniques

Technique	Description	Survey Effort
Bird Survey (General)	Roaming/meandering bird surveys using both visual and auditory identification was conducted within all habitat types. Active birding was also completed at farm dams and watercourses where accessible.	99 person-hours
Bird Survey (Vantage Point)	High points within the landscape with clear vantage of proposed turbines and adjacent valleys were surveyed for birds. All birds heard and observed were recorded along with flight heights and behaviours. Vantage point surveys were undertaken to characterise bird assemblages within the Study Area. The presence of threatened and migratory bird species was a key focus, including the white-throated needletail, fork-tailed swift, red goshawk and squatter pigeon (southern).	225 person-hours
Spotlighting and Call Playback	Spotlighting was undertaken on foot targeting grey-headed flying fox, ghost bat, greater and koala habitat, including areas of vine thicket and eucalypt woodland. Spotlighting was also undertaken from the passenger window of a slow-moving vehicle. Call playback surveys were also undertaken targeting nocturnal bird species as well as koala within eucalypt woodland on hills and slopes.	60 person-hours 6 hours
Elliott Trapping	Type A aluminium Elliot traps targeting small mammals and reptiles were placed at approximately 10 m intervals along two transects. Traps were baited with a mixture of rolled oats, peanut butter, honey and vanilla essence, and checked each morning to identify and release captured fauna.	320 trap nights
Pitfall Trapping	Pitfall trapping was undertaken using 20 litre (L) buckets dug into the ground until the top of the bucket was flush with the surface of the ground. Three buckets were used at each site separated by approximately 10 m. A drift fence, approximately 30 cm high, was erected between each bucket to direct small animals towards the pitfall traps.	27 trap nights

Technique	Description	Survey Effort
Active Searches	Active diurnal searches were conducted within all habitat types to identify the present of fauna or signs of fauna activity including scats and scratches. Searches included scanning the trees and ground, searching beneath microhabitat such as rocks, fallen timber and peeling bark, digging through leaf litter and soil at tree bases and flushing birds from areas with a dense or grassy ground cover. Grass tussocks were gently disturbed to potentially flush ground-dwelling birds such as the threatened squatter pigeon (southern). Disturbance to microhabitat features and reptiles was kept to a minimum. Active searches were also completed opportunistically at Habitat Assessment and SAT sites.	58 person-hours
Camera Trapping	Camera traps were deployed in strategic positions including fauna corridors and watering points such as dams and creek lines to record visitation by nocturnal and diurnal animals. Camera traps comprised baited set-ups using honey oat mix and/or sardines as an attractant.	490 trap nights
Acoustic Bat Call Detection	Anabat Swift devices were deployed in representative microbat foraging and dispersal habitat including natural flyways, along watercourses and at BBUS vantage locations to record the presence of microbats. Data recorded on the bat recorders were analysed by a qualified specialist, Greg Ford of Balance! Environmental. The format and content of the analysis summary reports comply with nationally accepted standards for the interpretation and reporting of Anabat data. Anabat Swift devices were used in surveying for ghost bat.	111 nights
Harp Trapping	Single and double-bank harp traps were positioned in natural flyways associated with a creek line in locations of eucalypt woodlands to target microbat species. This method was used to target various microbat species including ghost bat.	14 trap nights
Koala SAT	Targeted searches for koala presence through identification of scats and scratched within all accessible broad habitat types (Phillips and Callaghan, 2011).	20 sites
Fauna Habitat Assessment	<p>Fauna habitat values were characterised using a comprehensive habitat assessment methodology within all accessible broad habitat types capturing variation in condition, vegetation types and disturbances. The presence and abundance of specific habitat resources was also assessed, including but not limited to:</p> <ul style="list-style-type: none"> • Koala food and shelter trees. • Hollow bearing trees and stags. • Fallen logs, woody debris and leaf litter. • Rocky features such as surface rocks, boulders, crevices, overhangs and caves. • Proximity to water. <p>These assessments were used to inform habitat modelling for each of the potentially occurring or known MNES.</p>	224 sites
Incidental Observations	All fauna observed incidentally throughout the Study Area were recorded, including while traveling to and between vantage point sites. For each record the following were noted; species, location of the observation recorded, abundance, flight behaviour, flight height and flight direction.	-



GD A 1994 MGA Zone 56

Legend

Fauna Survey Locations

- Anabat
- Camera
- Harp Trapping
- Koala SAT
- ▲ Fauna Habitat Assessment
- ▲ Fauna Habitat Quality Assessment
- Study Area
- Disturbance Footprint
- Development Corridor
- Roads
- Watercourse

■ State Forest

FIGURE 3.1

FAUNA SURVEY LOCATIONS

3.1 Study Area Characteristics

The Study Area is characterised by a variety of vegetated environments, including cleared agricultural land as well as regrowth and remnant Eucalypt woodlands and vine thicket across an undulating terrain. The dominant vegetation communities across the Study Area are woodlands and forests dominated by narrow-leaved ironbark (*Eucalyptus crebra*), spotted gum (*Corymbia citriodora*) and white mahogany (*Eucalyptus acmenoides*).

The Bouldercombe Gorge Resources Reserve, Gelobera State Forest, Don River State Forest and Ulam Range State Forest are Protected Areas located adjacent to the Study Area, providing connectivity to the broader region.

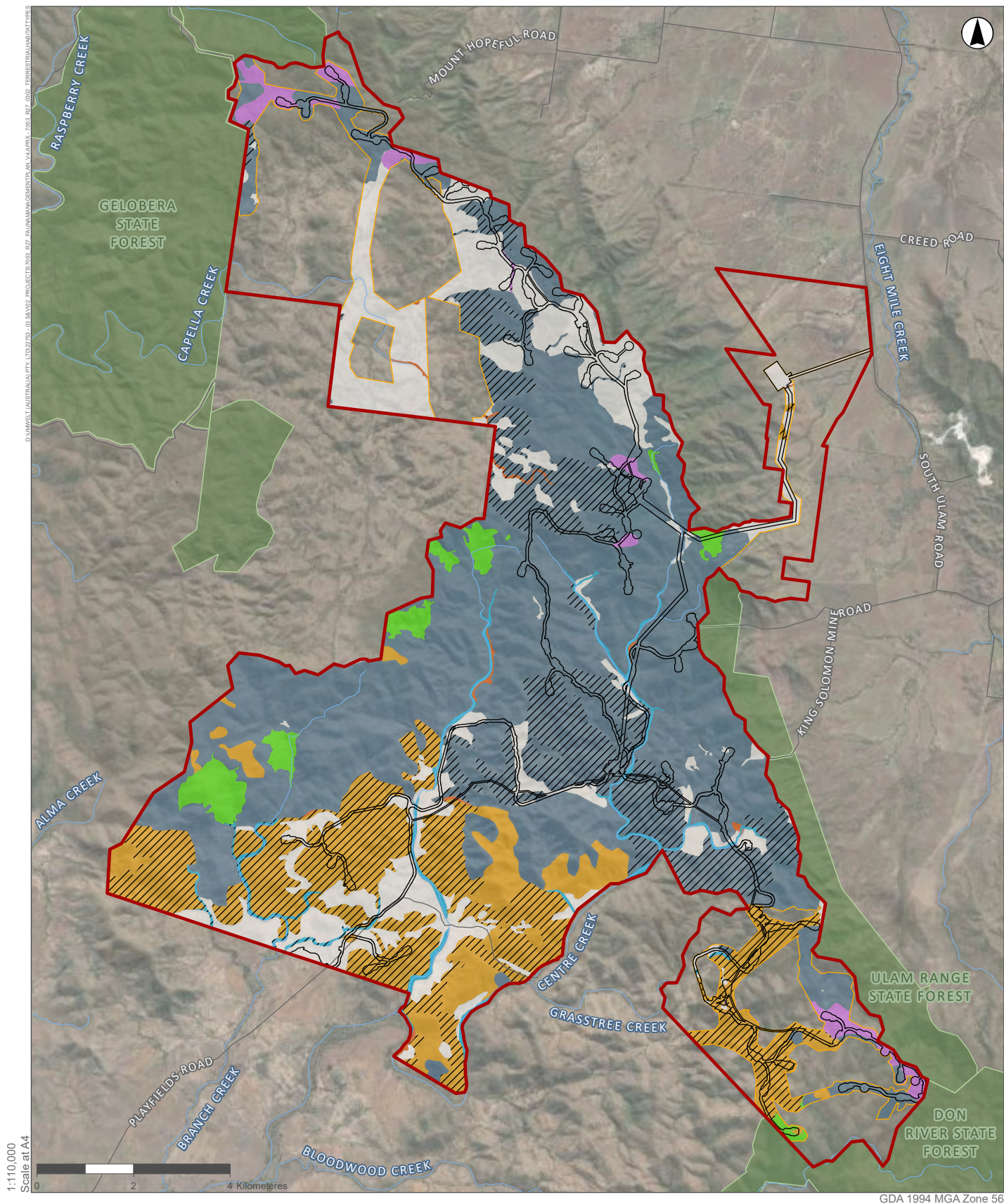
3.2 Terrestrial Habitat Values

Terrestrial habitat assessed during the field survey program can be broadly grouped into seven types, as summarised in **Table 3.2** and shown on **Figure 3.2**.

Table 3.2 Terrestrial Habitat Types within the Ground-truthed Mapping Extent

Habitat Type	Habitat Description	Associated REs	Area (ha) ¹ within Ground-truthed Mapping Extent
Mixed eucalypt woodland on steep slopes	Mixed eucalypt woodland on steep slopes and crests, commonly with <i>Corymbia citriodora</i> and/or <i>Eucalyptus crebra</i> +\- <i>E. acmenoides</i> , <i>E. tereticornis</i>	11.11.3, 11.11.4, 11.11.4a, 11.11.4b, 11.12.6	7,264.3
<i>Eucalyptus crebra</i> woodland	<i>Eucalyptus crebra</i> +\- <i>Corymbia erythrophloia</i> woodland on slopes and crests	11.11.15, 11.12.1	2,575.5
<i>Eucalyptus moluccana</i> woodland	<i>Eucalyptus moluccana</i> woodland on slopes and crests	11.11.3c, 11.11.4c	241.8
Semi-evergreen vine thicket	Vine thicket on upper slopes and gullies with various floristics including <i>Euroschinus falcatus</i> var. <i>falcatus</i> , <i>Brachychiton australis</i> , <i>Flindersia</i> spp., <i>Ficus</i> sp., <i>Jasminum</i> sp., <i>Alyxia</i> sp., etc.	11.11.5a 11.12.4	330.8
Riparian <i>Melaleuca</i> woodland	<i>Melaleuca fluviatilis</i> woodland +\- <i>Eucalyptus tereticornis</i> fringing a watercourse	11.3.25b	240.8
Alluvial eucalypt woodland	<i>Eucalyptus tereticornis</i> +\- <i>Corymbia tessellaris</i> woodland on alluvial soils sometimes with <i>Casuarina cunninghamiana</i> as dominant	11.3.4, 11.3.25	36.9
Non-remnant pasture	Areas containing pasture comprising native and non-native grasses, scattered native trees and various infrastructure including tracks and dams	-	2,234.1

¹: Areas presented are inclusive of regrowth communities where present.



Legend

- Roads
- Watercourse
- ▭ Study Area
- ▭ Disturbance Footprint
- ▭ Ground-truthed Mapping Extent
- ▭ State Forest
- ▨ Regrowth Vegetation

Terrestrial Habitat Types

- ▭ Alluvial eucalypt woodland
- ▭ Eucalyptus crebra woodland
- ▭ Eucalyptus moluccana woodland
- ▭ Mixed eucalypt woodland on steep slopes
- ▭ Riparian Melaleuca woodland
- ▭ Semi-evergreen vine thicket
- ▭ Non-remnant

FIGURE 3.2

TERRESTRIAL
HABITAT TYPES

3.3 Fauna Species Diversity

A total of 211 fauna species from 156 genera were identified during the field survey program, comprising 148 birds, 37 mammals, 19 reptiles and 7 amphibians. Of the species recorded, 6 are introduced, representing 2.8% of the total fauna assemblage recorded. The field surveys also identified 6 introduced species which represents 3.1% of the total fauna species recorded, described further in **Section 3.3.3** below.

3.3.1 Threatened Fauna

Seven threatened fauna species are known from the Study Area, confirmed during the field survey program (**Table 3.3**). Records for threatened species are shown on **Table 3.3**.

The likelihood of occurrence assessment determined that a further two threatened fauna species have a moderate likelihood of occurrence within the Study Area (**Table 3.3**). No species were identified as having a high likelihood of occurrence.

Table 3.3 Likelihood of Occurrence Assessment Results: Threatened Fauna

Common Name	Scientific Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence Outcome
glossy-black cockatoo	<i>Calyptorhynchus lathami</i>	Not Listed	Vulnerable	Known
greater glider (southern and central)	<i>Petauroides volans</i>	Vulnerable	Vulnerable	Known
yellow-bellied glider (south-eastern)	<i>Petaurus australis australis</i>	Vulnerable	Vulnerable	Known
northern quoll	<i>Dasyurus hallucatus</i>	Endangered	Least Concern	Known
squatter pigeon (southern)	<i>Geophaps scripta scripta</i>	Vulnerable	Vulnerable	Known
white-throated needletail	<i>Hirundapus caudacutus</i>	Vulnerable, Migratory	Vulnerable	Known
short-beaked echidna	<i>Tachyglossus aculeatus</i>	-	Special Least Concern	Known
collared delma	<i>Delma torquata</i>	Vulnerable	Vulnerable	Moderate
koala	<i>Phascolarctos cinereus</i>	Vulnerable	Vulnerable	Moderate

In addition to the species outlined in **Table 3.3** three species have been considered relevant to the Project due to the potential presence of habitat within the Study Area. These species, their listing status and justification for assessment has been outlined below in **Table 3.4**.

Table 3.4 Additional Threatened Fauna Considered Relevant to the Project

Common Name	Scientific Name	EPBC Act Status	NC Act Status	Justification for Assessment
red goshawk	Erythrotriorchis radiatus	Vulnerable	Endangered	Habitat within the Study Area may be marginally suitable for foraging and dispersal.
ghost bat	Macroderma gigas	Vulnerable	Endangered	Habitat within the Study Area may be suitable for foraging and dispersal.
grey-headed flying-fox	Pteropus poliocephalus	Vulnerable	Least Concern	Foraging habitat has been identified in the Study Area and includes any vegetation community (remnant or regrowth) which contains important winter/spring flowering species within 40 km of known camps within the Study Area.

Profiles of known and potentially occurring threatened species listed under the NC Act or EPBC Act with the potential to be impacted by Project activities are described in **Table 3.7** and modelled habitat within the Ground-truthed Mapping Extent is shown on **Figure 3.4** to **Figure 3.15**.

3.3.2 Migratory Fauna

Excluding the white-throated needletail (*Hirundapus caudacutus*) which is also listed threatened, two migratory fauna species are known from the Study Area, confirmed during field surveys. Records for these species are shown on **Figure 3.3**. The likelihood of occurrence assessment determined that one species has a high likelihood of occurrence, and three species have a moderate likelihood of occurrence (**Table 3.5**).

Table 3.5 Likelihood of Occurrence Assessment Results: Migratory Fauna

Common Name	Scientific Name	EPBC Act Status	NC Act Status	Likelihood of Occurrence Outcome
rufous fantail	Rhipidura rufifrons	Migratory	Special Least Concern	Known
spectacled monarch	Symposiarchus trivirgatus	Migratory	Special Least Concern	Known
fork-tailed swift	Apus pacificus	Migratory	Special Least Concern	High
black-faced monarch	Monarcha melanopsis	Migratory	Special Least Concern	Moderate
oriental cuckoo	Cuculus optatus	Migratory	Special Least Concern	Moderate
satin flycatcher	Myiagra cyanoleuca	Migratory	Special Least Concern	Moderate

Profiles of known and potentially occurring migratory species listed under the NC Act or EPBC Act with the potential to be impacted by Project activities are described in **Table 3.8** and Ground-truthed Mapping Extent in **Figure 3.16** to **Figure 3.21**.

3.3.3 Introduced Fauna

Field surveys identified six introduced fauna species, four of which are listed as Restricted Invasive biosecurity matters under the *Biosecurity Act 2014*. A breakdown of these species is provided in **Table 3.6**.

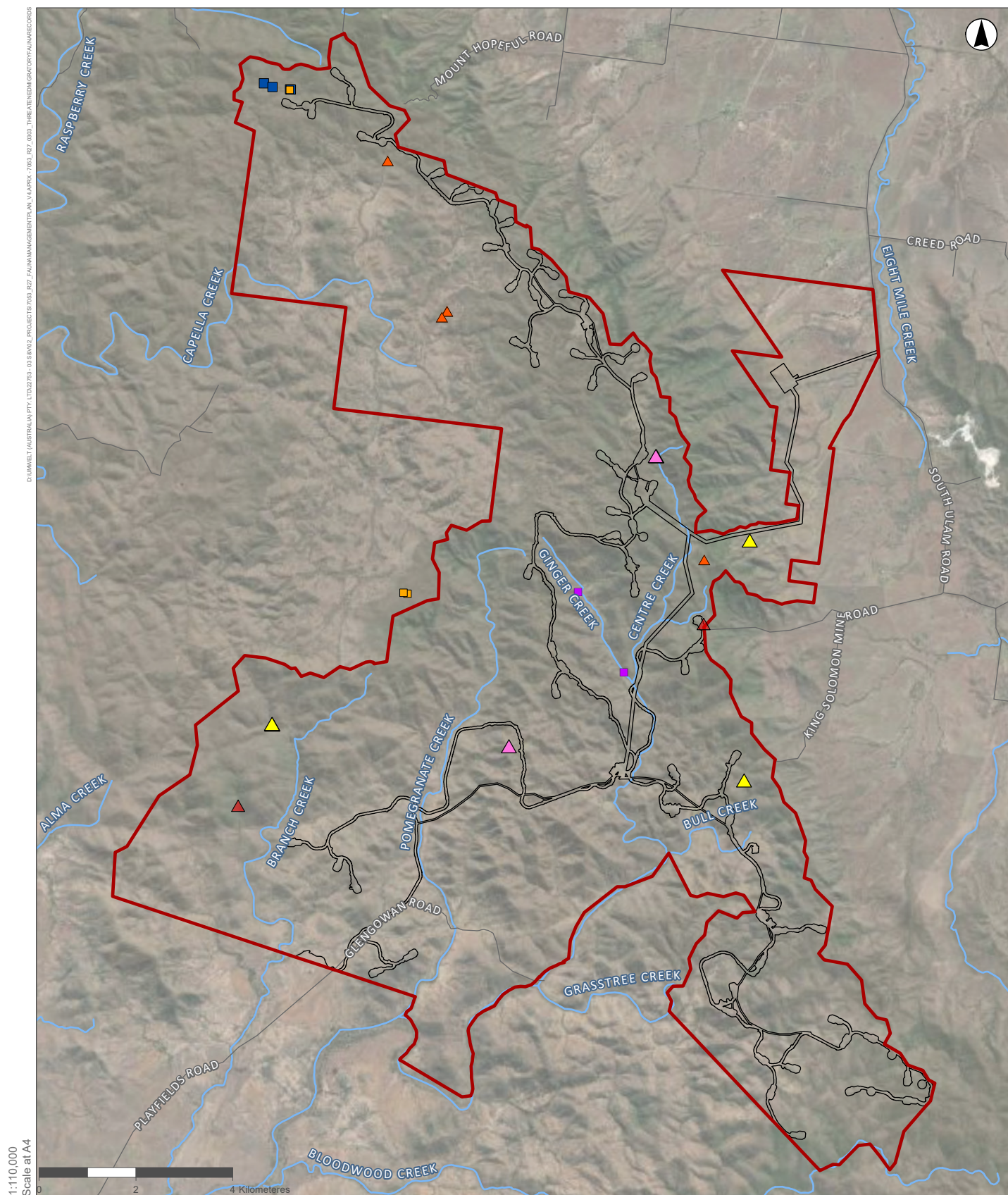
Table 3.6 Introduced Species Recorded within the Study Area

Common Name	Scientific Name	Biosecurity Act 2014 Status
cane toad	<i>Rhinella marina</i>	Invasive
horse	<i>Equus caballus</i>	Invasive
feral cat	<i>Felis catus</i>	Restricted Invasive
feral pig	<i>Sus scrofa</i>	Restricted Invasive
black rat	<i>Rattus rattus</i>	Restricted Invasive
brown hare	<i>Lepus capensis</i>	Restricted Invasive

EPBC Act 'key threatening processes' are processes which threaten the survival, abundance or evolutionary development of a native species or ecological community (Department of Climate Change Energy the Environment and Water, 2022a). Key threatening processes are linked to three of the above introduced species and include:

- The biological effects, including lethal toxic ingestion, caused by cane toads (*Rhinella marina*).
- Predation by feral cats.
- Predation, habitat degradation, competition and disease transmission by feral pigs.

These species are herein referred to as 'pest fauna'.



GDA 1994 MGA Zone 56

Legend

Threatened Fauna Records (Umwelt)

- Northern quoll (*Dasyurus hallucatus*)
- Greater glider (*Petauroides volans*)
- Yellow-bellied glider (*Petaurus australis australis*)


Migratory Fauna Records (Umwelt)


- ▲ Glossy black-cockatoo (*Calyptorhynchus lathami*)
- ▲ Squatter pigeon (southern) (*Geophaps scripta scripta*)
- ▲ White-throated needletail (*Hirundapus caudacutus*)
- ▲ Spectacled monarch (*Symposiachrus trivirgatus*)
- ▲ Rufous fantail (*Rhipidura rufifrons*)
- ▲ short-beaked echidna (*Tachyglossus aculeatus*)

- ▭ Study Area
- ▭ Disturbance Footprint
- Roads
- Watercourse


FIGURE 3.3
THREATENED AND
MIGRATORY FAUNA RECORD
LOCATIONS


Table 3.7 Threatened Fauna Species Profiles

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Glossy black-Cockatoo (<i>Petauroides volans</i>) – Vulnerable under the NC Act			
	<p>The glossy black-cockatoo prefers woodland areas dominated by she-oak (<i>Allocasuarina</i>), or open sclerophyll forests (i.e. <i>Eucalyptus</i>, <i>Corymbia</i> or <i>Angophora</i>) and woodlands with a stratum of <i>Allocasuarina</i> beneath.</p> <p>Glossy black-cockatoos were recorded during the field survey program on three occasions. One observation was made during the bird utilisation survey, where a flock of 22 individuals were observed transiting south from the eastern ridge of the Study Area between 60–90 m above ground level (AGL). The remaining two observations were of small flocks (three individuals), with one group foraging within a stand of forest she-oak (<i>Allocasuarina torulosa</i>), and the other group transiting north at 40 m AGL. The location of these records are shown on Figure 3.3.</p>	<p>Within the Study Area, glossy black-cockatoos may be found foraging in remnant of regrowth eucalypt woodlands associated with regional ecosystem supporting foraging tree species including those from the genera <i>Casuarina</i> and <i>Allocasuarina</i> (11.3.25, 11.3.25b, 11.11.3, 11.11.4). The predicted habitat areas are considered an over-representation of potential foraging habitat within the Study Area, with the primary food source, <i>Allocasuarina torulosa</i>, distributed unevenly throughout. Potential breeding habitat within the Study Area is uncommon, limited to a single vegetation community (RE 11.11.4c). This community was the only that was found during the field survey program to regularly support rare to occasional large, hollow bearing trees. However, breeding habitat is considered to be marginal, given the lack of large trunk hollows preferred by the species. It should be noted that no evidence of nesting glossy black-cockatoos was recorded during the field survey program.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 23.8 ha of marginal breeding habitat and 242.5 ha of foraging habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Loss of trees with nesting hollows. • Competition for hollows. • Loss of food resources. • Predation. • Inappropriate fire regimes. • Climate change. <p>No recovery plan exists for this species.</p>


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Greater glider (southern and central) (<i>Petauroides volans</i>) – Endangered under the EPBC Act and NC Act			
	<p>At least two species of greater glider are recognised to occur within Queensland: <i>Petauroides volans</i> (southern and central) and <i>Petauroides minor</i> (northern). As suggested by the common name, <i>Petauroides minor</i> is restricted to a relatively small area of northern Queensland from Townsville to the Windsor Tablelands and has a highly disjunct distribution. Relative to the northern species, the southern and central species (<i>Petauroides volans</i>) has a broad and mostly continuous distribution from Proserpine in Queensland, south through NSW and the ACT, to Wombat State Forest in central Victoria.</p> <p>Greater gliders (southern and central) are typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. During the day, this species spends most of its time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. Hollows are therefore an important and limiting habitat resource. As described in the species' Conservation Advice (DAWE, 2022d), the species' probability of occurrence is positively correlated with the availability of tree hollows.</p>	<p>The greater glider (southern and central) is known to occur within the Study Area, recorded three times during spotlighting surveys. In June 2020, one individual was recorded in a grey box (<i>Eucalyptus moluccana</i>) tree 18 m above ground level (AGL) within RE 11.3.26 in an area directly adjacent to the Study Area. In November 2020, another individual was recorded near the June 2020 record within the same patch of <i>Eucalyptus moluccana</i> woodland. Targeted nocturnal surveys undertaken in October 2021 resulted in the identification of one further individual within <i>Eucalyptus moluccana</i> woodland (RE 11.11.3c) in the north-western portion of the Study Area. The location of these records are provided in Figure 3.3.</p> <p>Eucalypt woodlands and forests dominate the Ground-truthed Mapping Extent and comprise 11 REs identified as 'habitat' or 'potential habitat' consistent with DES.</p> <p>The extent of habitat for greater glider (central and southern) has been mapped in Figure 3.5.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 206.9 ha of breeding and denning habitat and 331.5 ha of foraging and dispersal habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Habitat loss. • Fragmentation and modification. • Barbed wire fencing. • Climate change. • Hyper-predation by owls. • Predation by introduced species. <p>No recovery plan exists for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>Greater gliders (southern and central) are primarily folivorous, with a diet mostly comprising the leaves and flowers of Myrtaceae (e.g. eucalypt) trees. It favours forests with a diversity of eucalypt species due to seasonal variation in its preferred tree species. Home ranges of this species are typically relatively small (1–4 ha) but are larger in lower productivity forests and more open woodlands (up to 16 ha) (DAWE, 2022d). They are larger for males than for females, with male home ranges being largely non-overlapping. The species can cover distances up to 100 m however they usually glider approximately 30 m and have a steeper trajectory than other species of glider.</p>		


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Yellow-bellied glider (<i>Petaurus australis australis</i>) – Vulnerable under the EPBC Act and NC Act			
	<p>In Queensland, the sub-species is distributed along the coast and eastern seaboard, from the north of Mackay extending southward through the NSW-QLD border. There are also some isolated smaller populations found inland within the Carnarvon Ranges and Blackdown in central Queensland.</p> <p>The yellow-bellied glider (south-eastern) shows preference for large patches of mature old growth forest, particularly with winter-flowering and smooth-barked eucalypt, that provide suitable foraging habitat and shelter (DAWE 2022e). The sub-species relies on hollows for shelter and denning purposes during the day; suitable hollows are generally found in large living trees usually >1 m in diameter. They live in family groups of two to six individuals within exclusive home ranges of approximately 50–65 ha. Because the trees used for foraging and shelter are dispersed and use may vary over time and space, large home ranges are needed (DAWE 2022e).</p> <p>As detailed in the subspecies' Conservation Advice, yellow-bellied gliders (south-eastern) also require some level of floristic diversity to provide a year-round food supply, and they are unlikely to persist in forests dominated by only one or two tree species. Sap feed trees are a critical habitat feature and form an important component of the diet of the yellow-bellied glider (south-eastern), especially when alternative food sources are limited (DAWE 2022e).</p>	<p>The yellow-bellied glider (south-eastern) is known to the Study Area, having been recorded on four occasions, during nocturnal surveys in Autumn, 2021. One record was confirmed via vocalisation, during a call playback survey in October 2021, while the remaining individuals were observed visually during spotlight searches. All records occur in the far-northern extent of the Study Area where the sub-species was recorded utilising <i>Eucalyptus moluccana</i> woodland, ground-truthed as RE 11.11.3c. The location of these records are provided in Figure 3.3.</p> <p>The extent of habitat for yellow-bellied glider (south-eastern) has been mapped in Figure 3.6. Clearing within the Disturbance Footprint will result in the loss of 170.6 ha of breeding and denning habitat and 181.1 ha of foraging and dispersal habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Habitat loss and degradation. • Fragmentation. • Fire disturbance. • Invasive species predation. • Barbed wire fencing. <p>No recovery plan exists for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	Smooth-barked eucalypts are important due to the range of foraging substrates (and therefore food resources) they provide, as loose bark hanging in strips from these trees provides shelter for insect prey. A study from 2005 identified 13 sap tree species in southern Queensland including <i>Corymbia citriodora</i> , <i>Eucalyptus biturbinata</i> , <i>E. longirostrata</i> , <i>E. major</i> , <i>E. melliodora</i> , <i>E. moluccana</i> , <i>E. tereticornis</i> , <i>E. racemosa</i> , <i>E. resinifera</i> , <i>E. laevopinea</i> , <i>E. sphaerocarpa</i> , <i>C. intermedia</i> and <i>Angophora leiocarpa</i> .		
northern quoll (<i>Dasyurus hallucatus</i>) – Endangered under the EPBC Act and Least Concern under the NC Act			
	<p>The distribution of the northern quoll is discontinuous across northern Australia with core populations in rocky and/or high rainfall areas (Hill and Ward, 2010). In Queensland, the species is known to occur as far south as Brisbane and Toowoomba in the south, as far north as Cape York and extends as far west into central Queensland to the Carnarvon Range National Park. The species' distribution is highly fragmented in Queensland and surveys indicate severe reductions from the species' former distribution.</p>	<p>The northern quoll was detected on camera traps on two occasions. Records were made within fringing riparian <i>Casuarina cunninghamiana</i> and <i>Melaleuca</i> spp. woodland (RE 11.3.25b) with a rocky stream bed, and in an adjacent rocky gully with large boulders fringed by <i>Corymbia citriodora</i> and <i>Eucalyptus crebra</i> woodland (RE 11.12.6). The location of these records are provided in Figure 3.3. Vegetation, particularly the shrub layer, was structurally complex in these locations. These areas provided denning opportunities, as did similar habitats with rocky relief, predominantly on drainage lines in steep gullies.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Introduction of invasive species leading to increased competition, direct predation and habitat degradation. • Direct mortality as a result of vegetation clearing and traffic. • Pastoralism, leading to altered fuel loads and fire regimes. • Disease e.g. toxoplasmosis.


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>The northern quoll occupies a diversity of habitats including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes. A study of northern quolls in Queensland found that the species is “more likely to be present in high relief areas that have shallower soils, greater cover of boulders, less fire impact and were closer to permanent water”.</p> <p>The <i>EPBC Act referral guidelines for the northern quoll</i> states that, “on current knowledge, foraging or dispersal habitat is recognised to be any land comprising predominantly native vegetation in the immediate area (i.e. within 1 km) of shelter habitat, quoll records or land comprising predominately native vegetation that is connected to shelter habitat within the range of the species”.</p> <p>Northern quolls are opportunistic omnivores, which consume a wide range of pretty items including invertebrates, carrion, fruit nectar, mammals, birds, reptiles and frogs. Cane toads are a food item of particular concern because ingestion of their toxins is a major cause of decline in northern quoll populations.</p>	<p>Extensive foraging and dispersal habitat occurs throughout the Ground-truthed Mapping Extent and likely wider Study Area, generally represented by large, continuous tracts of open eucalypt woodland within 1 km of breeding and refuge habitat. Areas of potential habitat generally contain prey microhabitat including fallen logs, ground timber and small- to medium-sized rocks in varying abundance.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 22.1 ha of denning habitat and 551.4 ha of foraging and dispersal habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined and micrositeing is employed to reduce impact to microhabitat features.</p>	<p>The <i>National Recovery Plan for the Northern Quoll (Dasyurus hallucatus)</i> aims to reduce the rate of decline for the species within Australia ensuring viable populations persist across the major regions of the species’ distribution.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
squatter pigeon (southern) (<i>Geophaps scripta scripta</i>) – Vulnerable under the EPBC Act and NC Act			
	<p>The squatter pigeon (southern) occurs on the inland slopes of the Great Dividing Range, from the Burdekin-Lynd Divide in central Queensland, south to West Wyalong in northern NSW. As per the species SPRAT, the known distribution is estimated to occur within the latitudes, 17° to 30° S, and the longitudes, 141° to 153° 30' E. As per the distribution map on SPRAT, the Study Area occurs in the central part of the sub-species range, in the 'likely to occur' extent.</p> <p>North of the Carnarvon Ranges in Central Queensland and possibly in the area between Injune and the Carnarvon Ranges, the species is relatively common and likely to comprise a single, continuous sub-population. Populations in the southern parts of the subspecies' distribution however (i.e. south of Injune and Tin Can Bay, Queensland and NSW) are largely fragmented and isolated; in these areas there have also been noticeable disappearances. The southern boundary of the known distribution of the squatter pigeon (southern) is contracting northwards.</p> <p>The subspecies is known to access suitable waterbodies to drink on a daily basis, including permanent or seasonal rivers, creeks, lakes, ponds and waterholes, and artificial dams. The subspecies prefers to drink where there is gently sloping, bare ground on which to approach and stand at the water's edge.</p>	<p>The squatter pigeon (southern) is known to occur within the Study Area, recorded on 78 occasions throughout the field survey program, although this is likely to include multiple observations of the same individuals. It was commonly recorded along access tracks in non-remnant areas of the Study Area. The location of these records are provided in Figure 3.3.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 3.6 ha of breeding habitat, 1.5 ha of foraging and 324.2 ha of dispersal habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Loss and fragmentation of habitat. • Degradation of habitat by overgrazing by domesticated herbivores. • Habitat degradation by invasive weeds such as buffel grass. • Predation by invasive fauna. <p>No recovery plan exists for this species.</p>


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>The requirements for breeding and foraging habitat are well defined. Breeding habitat comprises remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Acacia</i> or <i>Callitris</i> species, on sandy or gravelly soils (predominantly areas mapped as Queensland land zones 3, 5 or 7) within 1 km of a suitable waterbody. Foraging habitat is almost identical, however occurring within 3 km of a suitable waterbody. As described on SPRAT, the ground layer vegetation in foraging and breeding habitat is typically considerably patchy consisting of native, perennial tussock grasses or a mix of perennial tussock grasses and low shrubs or forbs. This patchy, ground layer of vegetation rarely exceeds 33% of the ground area. The remaining ground surface consisting of bare patches of gravelly or dusty soil and areas lightly covered in leaf litter and coarse, woody debris (e.g. fallen trees, logs and smaller debris).</p> <p>Although breeding can occur throughout the year if conditions are good, breeding generally coincides with the dry season (April to October) when their primary food source (grass seed) is most abundant. The nest is a depression scraped into the ground beneath a tussock of grass, bush, fallen tree or log and is sparsely lined with grass.</p>		


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	Squatter pigeon (southern) dispersal habitat is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Such patches facilitate the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or droughts.		
white-throated needletail (<i>Hirundapus caudacutus</i>) – Vulnerable under the EPBC Act and NC Act			
	<p>The white-throated needletail is a large species of swift which is a non-breeding migrant to Australia typically arriving in September and October. They most commonly migrate to Australia via the Torres Strait and disperse in a southerly direction along the eastern and western sides of the Great Divide in Queensland and New South Wales. By November the species reaches the southern extent of its range in Australia dispersing throughout parts of Victoria, south-eastern South Australia and Tasmania. In the Northern Territory and Western Australia, they occur as vagrants. Estimates place the white-throated needletail's range in Australia at 126,200 km².</p> <p>White-throated needletails are an almost exclusively aerial, large-bodied swift that are insectivorous feeding on a variety of insect prey items during their migration in Australia across a range of habitat types and landscapes. Whilst in Australia the species is gregarious observed flying in flocks of hundreds and even thousands of birds.</p>	<p>White-throated needletail was recorded on 30 occasions flying over a diversity of habitat types, both incidentally and during the Bird and Bat Utilisation Surveys (BBUS). Six hundred and ninety-eight individuals have been recorded during surveys with a total of 320 individuals recorded at vantage points during BBUS and a total of 378 individuals recorded incidentally across all survey events. The location of these records are provided in Figure 3.3.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 267.9 ha of roosting and foraging habitat and 365.9 ha of foraging and dispersal habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species within Australia are:</p> <ul style="list-style-type: none"> • Wind turbine collision, overhead wires, windows and lighthouses. • Declines due to a reduction of prey abundance or secondary poisoning. • The loss of roosting habitat and invertebrate prey due to clearing of woodland and forest ecosystems. <p>No recovery plan exists for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>They are occasionally observed individually or in smaller groups and can sometimes be found in mixed flocks with other insectivorous aerial species such as fork-tailed swift (<i>Apus pacificus</i>) and fairy martins (<i>Hirundo ariel</i>).</p> <p>They are regularly recorded above wooded areas including open forest and rainforest, though may also fly below the canopy between trees or in clearings. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks. According to the <i>Referral guideline for 14 birds listed as migratory species under the EPBC Act</i> (Department of the Environment, 2015a) trees with dense canopy foliage and tree hollows are considered to provide roosting habitat for white-throated needletail, although the degree to which the species roosts in trees in potentially over-emphasised. A radiotracking study on white-throated needletails was able to track an individual to a roosting site in open sclerophyll forest. Although the study was unable to detect the exact roosting tree the dominant tree species included <i>Eucalyptus crebra</i>, <i>Eucalyptus muelleriana</i>, <i>Eucalyptus gummifera</i> and <i>Lophostemon confertus</i>. It is thought the species will return to roost sites over consecutive nights (Tarburton, 1993). Home ranges and territories are not maintained while the birds are in Australia.</p>		

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>During non-breeding migrations to Australia the white-throated needletail feeds on a variety of insects including beetles, cicadas, flying ants, bees, wasps, flies, termites, moths, locusts and grasshoppers. The species feeds up to the height of clouds over a variety of foraging habitats including heavily treed forests. Open foraging habitats include farmland, heathland or mudflats, although the species has been observed feeding at lower altitudes closer to the ground as low as 15 cm at a coastal saltworks. They occasionally forage above recently disturbed habitats, such as recently burned or cleared forest, or above paddocks being ploughed or cut. The species is also known to hunt in updraught locations like ridges, cliffs, or sand dunes. Low pressure systems both lift food sources and provide assistance with flight and needletails often forage at the edge of these systems (Boehm, 1939).</p>		
collared delma (<i>Delma torquata</i>) – Vulnerable under the EPBC Act and the NC Act			
	<p>The collared delma is endemic to Queensland and inhabits open-forest and woodlands that are typically adjacent to rocky terrain. The species distribution extends from the western edges of Brisbane in southeast Queensland, northwest to the Blackdown Tablelands and west to the Roma region of inland Queensland (Steve K Wilson, 2015).</p>	<p>The collared delma was not recorded during the field survey program</p> <p>Of the three land zones collared delma habitat is associated with, only land zone 3 occurs within the Ground-truthed Mapping Extent. Recorded micro-habitat features relevant to collared delma include:</p> <ul style="list-style-type: none"> • Coarse woody debris and ground timber. • fine and coarse litter. 	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Habitat loss through clearing for agriculture. • Habitat degradation by overgrazing of stock.


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>The population is heavily fragmented with records occurring at the Bunya Mountains, Blackdown Tablelands National Park (NP), Bullyard Conservation Park, D'Aguilar Range NP Expedition NP, Naumgna and Lockyer Forest Reserves, Western Creek near Millmerran and the Toowoomba Range.</p> <p>As per the <i>Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles</i>, suitable habitat includes: open-forest, woodlands and adjacent exposed rocky areas in Queensland RE Land Zones 3, 9 and 10. Known important habitat is described as suitable habitat within the known or likely to occur distribution mapping for collared delma. DCCEEW's RFI to referral EPBC 2021/9137 provides further detail on specific habitat requirements for collared delma as: 'Eucalypt dominated woodland to open forest where it is associated with suitable micro-habitats (exposed rocky outcrops) where ground cover is predominantly native grasses, such as <i>Themeda triandra</i>, <i>Cymbopogon refractus</i>, <i>Aristida</i> sp. and <i>Lomandra</i> sp.'. The species is also known from two locations featuring woodlands of <i>Eucalyptus tereticornis</i> or <i>Acacia harpophylla</i> where significant rock components were absent (Steve K Wilson, 2015).</p> <p>As per SPRAT, the presence of rocks, logs, bark and other coarse woody debris, and mats of leaf litter (typically 30–100 mm thick) appears to be an essential characteristic of the microhabitat and is always present where the species occurs.</p>	<ul style="list-style-type: none"> • native grasses including <i>Aristida</i> sp. and <i>Lomandra</i> sp. • Stones <20 cm in diameter adjacent to rocky outcrops consisting of boulders. <p>Potential habitat across the Ground-truthed Mapping Extent was generally found to have low levels of required microhabitat. Eucalypt woodlands associated with RE 11.3.25b and 11.3.4 generally occur adjacent to steep hillslopes with exposed rocky boulders and other microhabitat features. In select patches of these communities, ground timber and woody debris was recorded as being common to abundant across a range of sizes from less than 10 cm to greater than 30 cm. Leaf litter was also abundant in places but generally comprised a single thin layer and did not form 'mats'. Outcrops of stones consisted of sizes that were generally less than 20 cm in diameter. Rocky outcrop areas were typically associated with ephemeral creek lines and banks. Native grass cover was largely absent in these areas. Whilst some habitat features may provide micro habitat for collared delma, the absence of key ground cover species limits the suitability of the habitat overall.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 5.0 ha of breeding and foraging habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<ul style="list-style-type: none"> • Removal of rocks, coarse woody debris and ground litter. • Use of agricultural chemicals. • Predation by feral cats and foxes. • Weed invasion (particularly <i>Lantana montevidensis</i>*). <p>No recovery plan exists for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Koala (<i>Phascolarctos cinereus</i>) – Vulnerable under the EPBC Act and NC Act			
	<p>Koalas are reported to be widespread across Queensland, occurring in patchy and often low-density populations across the different bioregions (Department of Agriculture Water and the Environment, 2022a). As per the modelled species distribution in the Conservation Advice, koala is 'known or likely' to occur in the wider Rockhampton region.</p> <p>Koalas occur in coastal and inland locations and inhabit eucalypt forests and woodlands. The koala's diet is defined by the availability and palatability of a limited variety of <i>Eucalyptus</i>, <i>Corymbia</i> and <i>Angophora</i> species (Department of Agriculture Water and the Environment, 2022a). They are nocturnal and spend significant periods of time moving across the ground between food and shelter trees. Movement increases in the breeding season (typically September to February). Home ranges across the species' distribution are highly variable; in Queensland and New South Wales individual home ranges are reported to vary between 3 and 500 ha (Department of Agriculture Water and the Environment, 2022a).</p> <p>As described in the <i>National Recovery Plan for the Koala</i> (Department of Agriculture Water and the Environment, 2022b), the species uses shelter trees to thermoregulate, especially during hot days and to avoid predators. Koalas appear to prefer larger and more shady trees and use a wide range of tree species for shelter.</p> <p>Based on known use, recorded shelter tree species</p>	<p>No evidence of koala was recorded across the field survey program. A range of recommended field survey methods were employed to increase the chances of detecting the species.</p> <p>The koala is considered to have a moderate likelihood of occurrence based on the presence of suitable eucalypt woodland and forest habitat and scattered desktop records from the wider region. The closest desktop records are both from 1940 and occur east of the Study Area within 14 km. Undated desktop records also occur west (approximately 28 km away) near Wowan, and south (approximately 21 km away) near Round Mountain.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 721.1 ha of breeding, foraging and dispersal habitat and 5.3 ha of climate refugia habitat for the species.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Clearing and degradation of habitat. • Vehicle strike. • Disease. • Predation by dogs. <p>Koala populations across parts of Queensland and NSW were significantly impacted by the 2019–2020 bushfires. Drought and extreme heat are also known to cause very significant mortality, and population recovery post-event may be substantially impaired by the range of other threatening factors.</p>


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	in Queensland include rainforest trees, <i>Callitris columellaris</i> , <i>Acacia harpophylla</i> and <i>Melaleuca bracteata</i> .		
Red Goshawk (<i>Phascolarctos cinereus</i>) – Vulnerable under the EPBC Act and Endangered under the NC Act			
	<p>The red goshawk is found in coastal and subcoastal, tall, open forest and woodlands and tropical savannas traversed by rivers lined with timber, and along the edges of rainforest (Threatened Species Scientific Committee, 2015). Forests of intermediate density are favoured, or ecotones between habitats of differing densities. The species is sparsely distributed across 15 % of coastal and near coastal Australia, from the Kimberley in Western Australia to north-eastern New South Wales. It occurs at low densities across eastern Queensland, to the western slopes of the Great Dividing Range (Czechura et al., 2011). Historically (1970–1975), the species was recorded rarely (11–50 records) in the Rockhampton region, and as of 2020 it is considered to be regionally extinct (Noske and Briggs, 2021).</p> <p>Red goshawks are currently known to breed from the Kimberley east to Cape York Peninsula and on the Tiwi Islands. They may still breed at very low densities in the Wet Tropics and Einasleigh Uplands, though record data are scarce. It is suggested that since European settlement, development and habitat alteration have rendered about 20% of the species' predicted range, especially in coastal Queensland, unsuitable for breeding. Given the species wide ranging habits,</p>	<p>Despite extensive survey effort through bird utilisation surveys (BUS) over four seasons and diurnal bird survey throughout the field survey program, the red goshawk was not recorded. The species is considered to be extinct in the Rockhampton region (Noske and Briggs, 2021), and therefore has a low likelihood of occurrence. No potential breeding habitat was identified in the Ground-truthed Mapping Extent. The majority of woodlands and forests within the Ground-truthed Mapping Extent contain trees that are <20 m in height. However, some patches of woodland were noted as containing trees 20–25 m in height that may be suitable for nesting, including:</p> <ul style="list-style-type: none"> • Trees up to 24 m tall in <i>Eucalyptus moluccana</i> woodland (RE 11.11.3c) in the northernmost section of the Study Area. • Trees 20–25 m tall in sections of riparian woodland containing <i>Casuarina cunninghamiana</i>, <i>Melaleuca</i> spp. and <i>Corymbia tessellaris</i> (RE 11.3.25). • Trees approximately 20 m tall in eucalypt woodland along the eastern boundary of the Study Area (REs 11.11.3, 11.11.4, 11.11.4b). <p>Despite some areas of tall trees being present,</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Extensive habitat loss, degradation and fragmentation. • Inappropriate fire regimes. • Draining of wetlands. • Rural and residential development. • Domestic livestock grazing. • Climate change. <p>The Draft Conservation Advice and Listing Assessment – <i>Erythrorhynchus radiatus</i> (Department of Agriculture Water and the Environment, 2022c) also identifies Psittacine Beak and Feather Disease as a potential threat to the species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>inconspicuous nature, and difficulties with reliable field identification, its status in many regions outside northern Australia can be considered uncertain.</p> <p>Red goshawks are probably monogamous and may occupy the same breeding territories year after year (Threatened Species Scientific Committee, 2015). Red goshawks typically breed in trees >20 m tall (range 18.5–40.5 m) with an open limb and canopy structure, though there is anecdotal evidence of birds using trees 14 m in height. Nests are located above 20 m in tall trees (>30 m) that are usually within groups of the tallest trees (>25 m) in a given region of sub-coastal woodlands (Department of Environment and Resource Management, 2012). Further inland, trees tall enough for nesting are restricted to alongside</p>	<p>there are no large or perennial watercourses within proximity to the Study Area. The closest major perennial watercourses are the Don River (5 km south of the Study Area), Calliope River (7 km southeast) and Dee River (15 km west). The closest major watercourse is Centre Creek (stream order 4, non-perennial), which meanders along the southern boundary of the Study Area before flowing into the Don River 12 km south of the Study Area. Reflecting their highly ephemeral nature, watercourses within the Study Area were generally observed during the field survey program to be dry or containing rare pools of water.</p> <p>Suitable foraging and dispersal habitat may occur within the Ground-truthed Mapping Extent and wider Study Area, comprising open woodlands and ecotones between habitats including woodlands and vine forests. However, the absence of nearby permanent water greatly limits the overall suitability of potential habitat, given the presence of permanent freshwater is an essential habitat component.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 578.3 ha of foraging and dispersal habitat.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>major rivers' banks. All identified nest trees having been within 1 km of permanent water, often adjacent to rivers or clearings, and usually the tallest and largest trees (Department of Environment and Resource Management, 2012).</p> <p>When foraging, the red goshawk shows a preference for intact, extensive woodlands and forests with a mosaic of vegetation types that are open enough for fast maneuvering flight (Department of Environment and Resource Management, 2012). These favoured areas contain permanent water, are relatively fertile and biologically rich with large populations of birds. The species generally avoids very densely vegetated or very open habitats but will hunt along ecotones between such habitats and woodlands or forests. In northern Queensland, the species is mainly associated with extensive, uncleared, mosaics of native vegetation, especially riparian vegetation, open forest and woodland that contain a mix of eucalypt, ironbark and bloodwood species (Department of Environment and Resource Management, 2012). The species have large home ranges, estimated at 120 km² for females and 200 km² for males.</p>		


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Ghost Bat (<i>Macroderma gigas</i>) – Vulnerable under the EPBC Act and Endangered under the NC Act			
	<p>The ghost bat is endemic to northern Australia. It has a disjunct distribution, comprising isolated populations extant in the semi-desert Pilbara region of Western Australia, the mesic Kimberley and Top End of the Northern Territory, north-western Queensland south of the Gulf of Carpentaria, Cape York peninsular, wet and dry tropics and the central Queensland coastal and hinterland regions. As per SPRAT, within Queensland their estimated range extends from Cape York to the Queensland – New South Wales border. The Rockhampton region falls within the species 'likely' distribution, with known breeding sites occurring at Mount Etna and the surrounding area. The Study Area is situated approximately 64 km south of Mount Etna.</p> <p>The species occupies a wide range of habitats from rainforest, monsoon and vine scrub to open woodlands in arid areas. Recent studies have also indicated the use of cleared agricultural land (Bat Call WA Pty Ltd, 2022). These habitats are used for foraging, while roost habitat is more specific. Ghost bats move between a number of roosts seasonally or as dictated by weather conditions and/or foraging opportunities, as such they require a range of roost sites (Van Dyck and Strahan, 2008). Roost sites can include caves, rock crevices and disused mine adits.</p>	<p>The ghost bat is considered a low likelihood of occurrence within the Study Area. Although the species is known from Mount Etna also located within the Rockhampton region, this site occurs >60 km north of the Study Area. Desktop records of the species in the wider local area are scarce and generally pre-1990; the nearest is located at Stanwell approximately 34 km north-west and has a 20 km spatial uncertainty.</p> <p>No evidence of the species was recorded despite extensive field survey effort, which included several recommended ghost bat survey methods including roost searches and characterisation, habitat assessments, spotlighting and use of passive call detectors (Anabat Swifts). Harp trapping has also been completed in natural flyways.</p> <p>No potential roost sites including caves, rock overhangs or crevices were recorded during the field survey program. A total of five mineral occurrences (gold) are mapped within the Study Area by the Queensland DoR and three of these sites are associated with abandoned mines including the King Solomon mine, Queen of Sheba mine and an unnamed mine (ID 569551). Based on the information associated with these sites including dimensions, work extent and general location (i.e. gully), only one of the three mines (Queen of Sheba) was determined to potentially contain a mine adit.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Habitat loss and degradation due to mining activities. • The species' slow reproductive rate, and the lack of suitable habitat which restricts its movement, renders it vulnerable to threats and localised extinctions. • Habitat loss (destruction of, or disturbance to, roost sites and nearby areas) due to mining. • Disturbance of (human visitation at) breeding sites. • Loss and modification to foraging habitat. • Collision with fences, especially those with barbed wire. • Collapse or reworking of old mine adits.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>Based on recently published species-specific guidance on the species, roost habitat can be categorised based on utilisation (maternity/diurnal roost or nocturnal roost) and occupancy rates (permanent, regular, occasional or opportunistic) (Bat Call WA Pty Ltd, 2022). Diurnal roost sites are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C and a moderate to high relative humidity of 50–100 percent. Most breeding sites appear to require multiple entranced or chambered caves. In contrast, shallow caves, shelters and deep overhangs are likely to be used opportunistically by transient individuals as nocturnal roosts (Bat Call WA Pty Ltd, 2022).</p> <p>The nightly foraging range is 10 to 15 km (Bat Call WA Pty Ltd, 2022). In the cooler months (non-breeding season) individuals may disperse up to 150 km from their permanent roost locations in small groups or pairs (Hoyle et al., 2001).</p>	<p>The Queen of Sheba historical mine was investigated by an ecologist in November 2022 and found to comprise an open cut excavation with a narrow vertical shaft, likely similar to what is reported at the nearby sites. Based on this finding and the known information about historical workings in the wider area, no abandoned mines within or directly adjacent to the Study Area were considered potentially suitable for the roosting of ghost bat.</p> <p>Due to the absence of potential roost sites within the Study Area and the known nightly foraging distances up to 15 km, no foraging habitat is considered present. While a known maternity roost occurs at Mount Etna, as described above this site occurs a significant distance from the Study Area (>60 km) and is not within foraging range. As the species disperses up to 150 km during the non-breeding season, potential habitat within the Ground-truthed Mapping Extent is restricted to seasonal foraging and dispersal habitat.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 877.3 ha of seasonal foraging and dispersal habitat.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<ul style="list-style-type: none"> Contamination by mining residue at roost sites. Disease. Poisoning by cane toads. Competition for prey with foxes and feral cats. <p>As per Bat Call WA (2022), other indirect sources potentially causing impacts to colonies include:</p> <ul style="list-style-type: none"> Sound, vibration, airborne dust and pollutants. Increased light. Changed fire regimes.

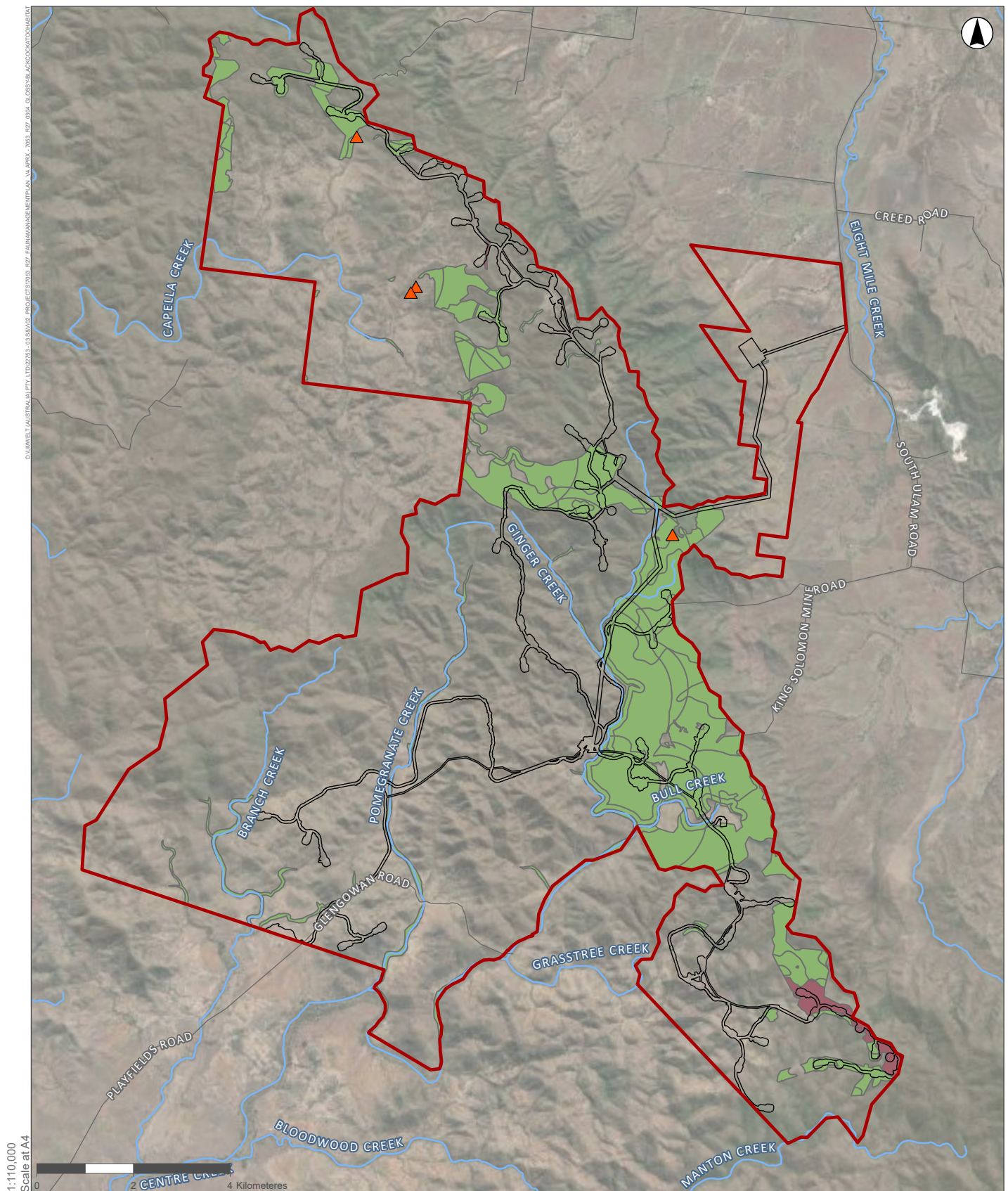
Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) – Vulnerable under the EPBC Act and Least Concern under the NC Act			
	<p>The grey-headed flying-fox is endemic to Australia and occurs from Ingham in Queensland to Adelaide in South Australia. They are usually found on the coastal lowlands and slopes of eastern Australia below altitudes of 200 m (Department of Environment and Water, 2021). The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. The grey-headed flying-fox is highly mobile and considered ‘highly adaptable’ given its proclivity to occupy urbanised environments.</p> <p>The grey-headed flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, <i>Melaleuca</i> swamps and <i>Banksia</i> woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary food source is blossom from <i>Eucalyptus</i> and related genera but in some areas it also utilises a wide range of rainforest fruits. None of the vegetation communities used by the grey-headed flying-fox produce continuous foraging resources throughout the year. As a result, the species has adopted complex migration traits in response to ephemeral and patchy food resources and only a small proportion of its’ wide range is used at any one time.</p>	<p>No records of the species were observed during the field survey program which included 60 person hours of spotlighting. Database records indicate that several historical records occur surrounding Rockhampton, the most recent of which (1995) occurs approximately 42 km from the northern boundary of the Study Area. Other records in the wider local area include a number of observations surrounding Gladstone (including records from 2002, 2007 and 2019), approximately 60 km east of the Study Area. Although potential habitat is identified within the Ground-truthed Mapping Extent (as described further below), the species was determined to have a low likelihood of occurrence within the Study Area due to the lack of nearby records.</p> <p>Based on the quarterly data from the National Flying-fox Monitoring Program (contained within the National Flying-fox Monitoring Viewer), the nearest regularly occupied camps are in Bundaberg, approximately 200 km southeast of the Study Area. However, grey-headed flying-fox have been observed roosting in Wowan (approximately 29 km west of the Study Area), Kabra, near Rockhampton (approximately 32 km northeast of the Study Area) and Keppel Sands (approximately 49 km northeast of the Study Area).</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Habitat loss via clearing of winter foraging resources and loss of roosting habitat. • Camp disturbance via conflict with humans. • Mortality in commercial fruit crops – animals being killed from crop management practices. • Heat stress. • Entanglement in netting and barbed wire fencing – animals can become entangled in netting over fruit trees and thousands of animals die or face permanent injury from entanglement in barbed wire.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>The grey-headed flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of <i>Melaleuca</i>, mangroves and riparian vegetation.</p> <p>Grey-headed flying-foxes commute daily to foraging areas, usually within 15 km of the day roost site. They are capable of nightly flights of up to 50 km from their roost to different feeding areas as food resources change. At most times of the year there is a complete exodus from the colony site at dusk.</p>	<p>The most recent observations of grey-headed flying-foxes roosting in these camps are from 2019 in Keppel Sands (1–499 individuals – camp #367) and Wowan (1–499 individuals – camp #755) and 2017 in Kabra (1–499 individuals – camp #362). Individuals have been identified in all camps on only one occasion since the beginning of the National Flying-fox Monitoring Program. None of these camps constitute ‘Nationally important camps’ (Department of Environment and Water, 2021) as they have not contained $\geq 10,000$ individuals in more than one year in the last 10 years, or have been occupied by more than 2,500 grey-headed flying-foxes permanently or seasonally every year for the last 10 years.</p> <p>The locations of flying-fox camps are generally stable through time, although patterns of camp occupation vary. Given the paucity of grey-headed flying-fox camps within proximity to the Study Area, and no camps being observed during field surveys despite extensive effort, it is considered that roosting habitat is absent from the Study Area.</p>	<ul style="list-style-type: none"> • Climate change – has the potential to affect food availability and heat-related mortality. • Bushfires – resulting in the loss of foraging habitat and resources leading to mortalities. • Electrocution on powerlines. • Zoonotic diseases.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
		<p>The Study Area falls outside of the typical nightly foraging commute (20 km) for the species and is outside of the indicative extent of foraging habitat as per Map 1 of the <i>National Recovery Plan for the Grey-headed Flying-fox</i> (Department of Environment and Water, 2021). However, two camps (Wowan and Kabra) do occur within the maximum distance grey-headed flying-foxes have been known to fly to forage (40 km). Although movements of these distances are rare, it is considered possible that the species could sporadically forage in <i>Eucalyptus</i> woodlands in the Study Area which contain known important foraging species (RE 11.12.1, 11.12.6, 11.11.3, 11.11.3c, 11.11.4, 11.11.4a, 11.11.4b, 11.11.4c, 11.3.4, 11.3.25 and 11.3.25b). Known important foraging species in these vegetation communities include <i>Eucalyptus crebra</i>, <i>Eucalyptus tereticornis</i> and <i>Corymbia citriodora</i>. If used by grey-headed flying-fox, it is likely to be infrequent, given the distance from known camps and the sporadic occupation of these camps.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 243.7 ha of foraging habitat. It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
Short-beaked Echidna (<i>Tachyglossus aculeatus</i>) – Special Least Concern under the NC Act			
	<p>The short-beaked echidna is found in almost all terrestrial habitats in Australia. This species relies on a substrate of leaf litter and coarse woody debris for foraging. It shelters in fallen logs, rock crevices, dense leaf litter and abandoned burrows.</p>	<p>The short-beaked echidna was recorded twice on camera traps within the Study Area, one from vine forest in the southwest corner and the other from eucalypt woodland in the central-east portion. The location of these records are provided in Figure 3.3.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 877.3 ha of foraging, breeding and dispersal habitat.</p> <p>It should be noted that the disturbance areas are a maximum and subject to potential reduction as the Disturbance Footprint is refined.</p>	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> • Predation by native and introduced predators. <p>No recovery plan exists for this species.</p>

¹ Species descriptions including key threats, distribution, habitat and ecology have been derived from information within DES Species Profiles (Department of Environment and Science, 2023) and within the Species Profile and Threats Database (Department of Climate Change Energy the Environment and Water, 2022b) or publicly available google images (2022).



1:110,000
Scale at A4

GDA 1994 MGA Zone 56

Legend

- ▲ Glossy black-cockatoo (*Calyptorhynchus lathami*)
- Roads
- Watercourse
- Study Area
- Disturbance Footprint
- Glossy-black Cockatoo Habitat
- Foraging and Dispersal
- Breeding and Denning

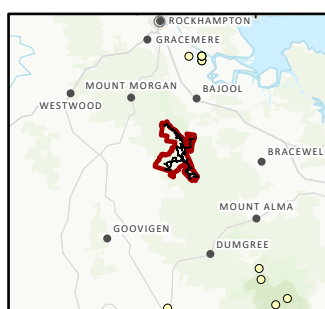
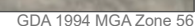


FIGURE 3.4

**GLOSSY BLACK-COCKATOO
HABITAT**



- Towns
- Greater Glider (Southern and Central) Record (ALA)
- ▲ Greater Glider (Southern and Central) Record (Umwelt)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area

Greater Glider (Southern and Central) Habitat

- Foraging and Dispersal
- Breeding and Denning

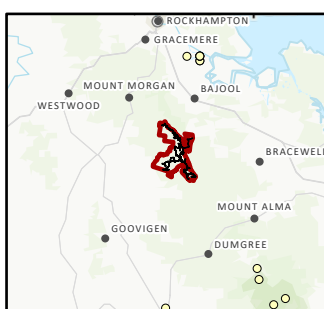
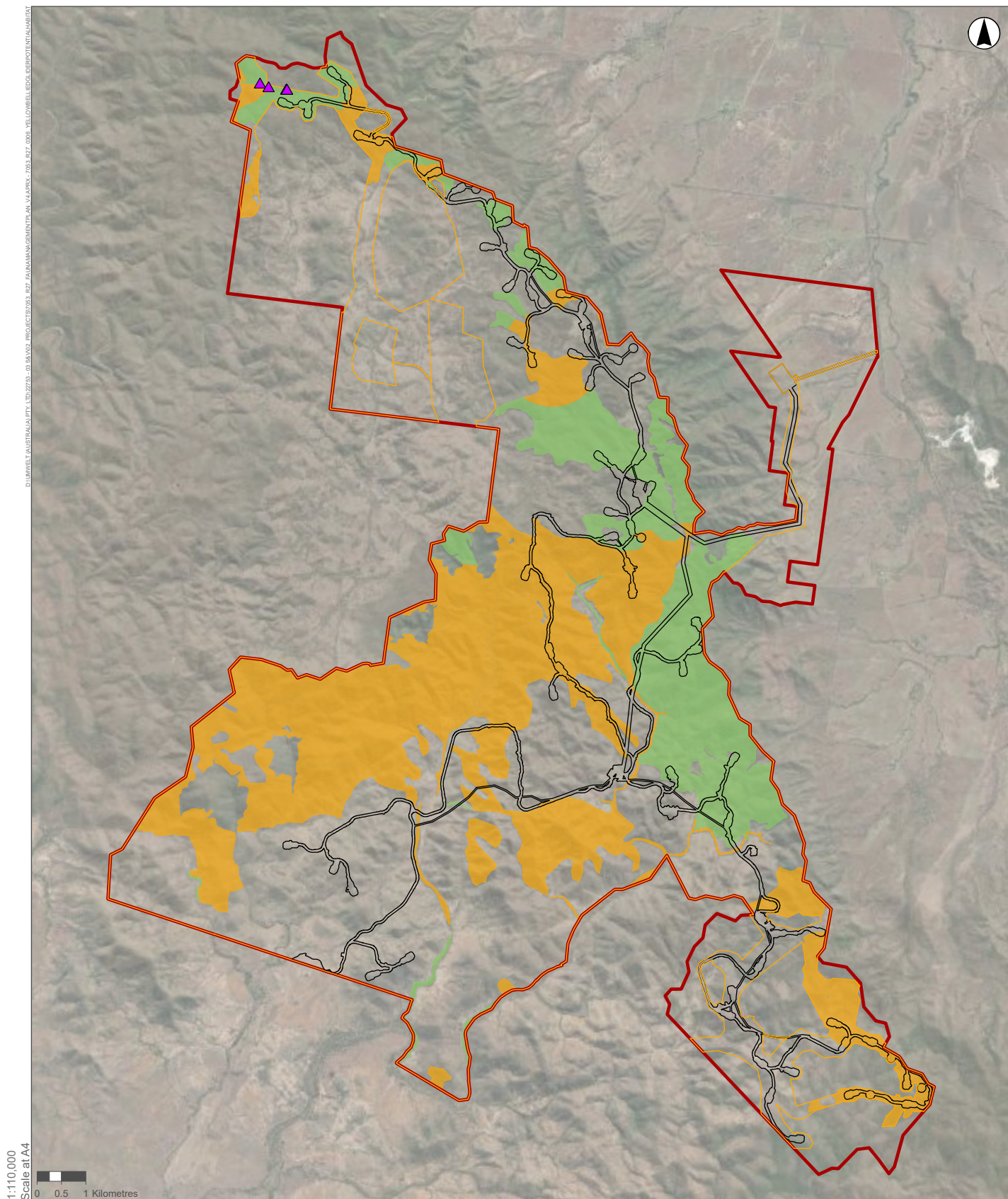


FIGURE 3.5
GREATER GLIDER (CENTRAL AND SOUTHERN) HABITAT



GDA 1994 MGA Zone 56

Legend

- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- ▲ Yellow-bellied Glider (south-eastern)

Yellow-bellied Glider (south-eastern) Potential Habitat

- Breeding and Denning
- Foraging and Dispersal

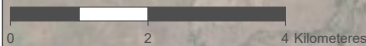
FIGURE 3.6

**YELLOW-BELLIED GLIDER
(SOUTH-EASTERN) POTENTIAL
HABITAT**



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Scale at A4



GDA 1994 MGA Zone 56

Legend

- Towns
- ▲ Northern Quoll Records (Umwelt)
- Northern Quoll Record (ALA)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Foraging and Dispersal
- Breeding and Shelter

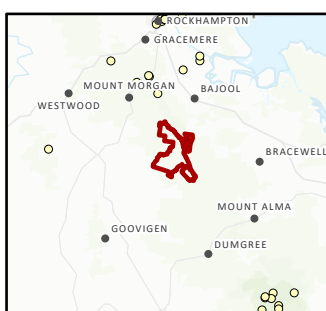
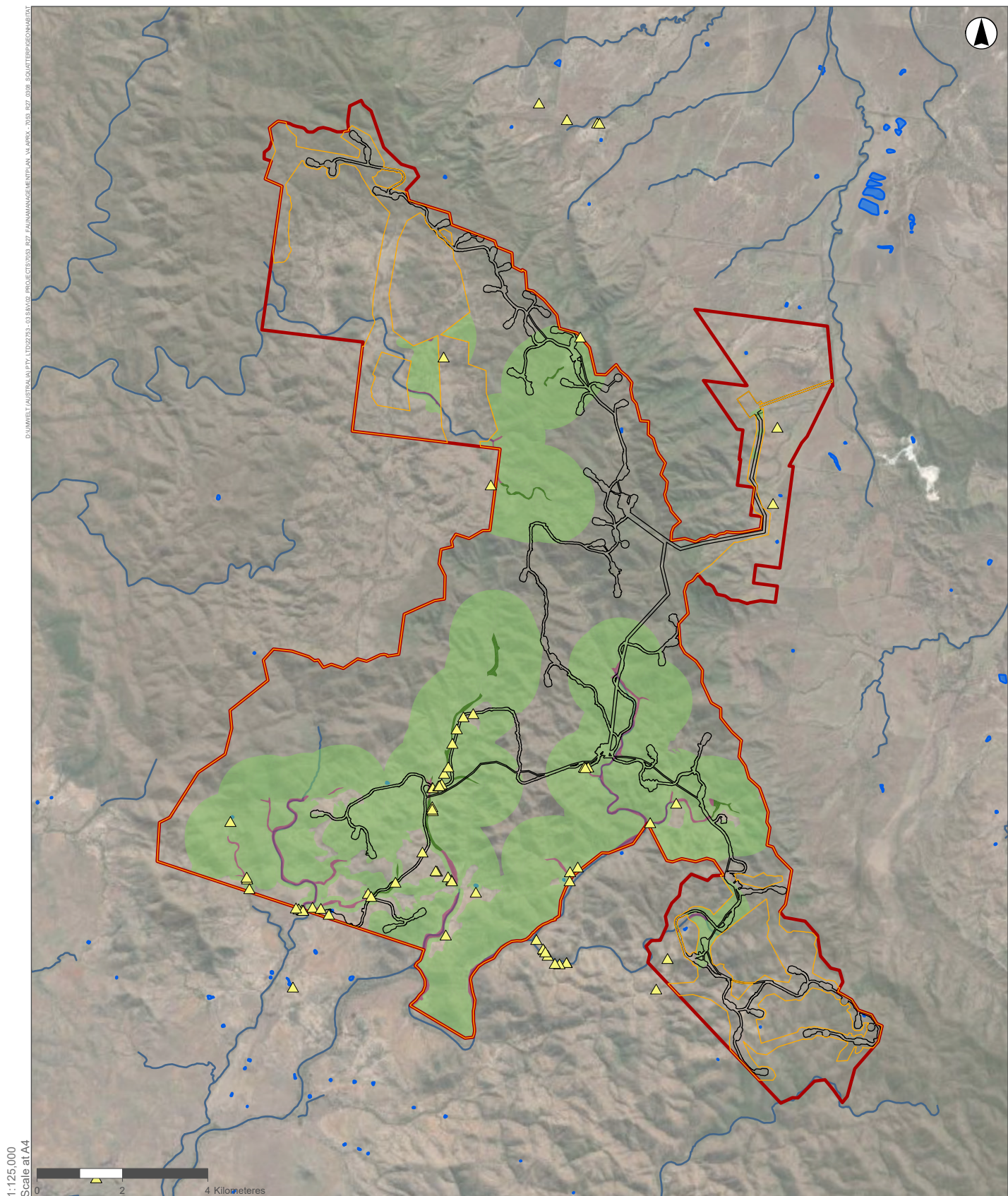


FIGURE 3.7
NORTHERN QUOLL HABITAT



Legend

- Squatter Pigeon (Southern) Record (ALA)
 - △ Squatter Pigeon (Southern) Record (Umwelt)
 - Suitable Watercourses
 - Ground-truthed Mapping Extent
 - Disturbance Footprint
 - Study Area
 - Reservoirs (DoR)
- Squatter Pigeon (Southern) Habitat**
- Breeding
 - Dispersal
 - Foraging

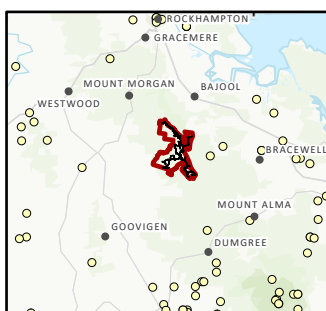
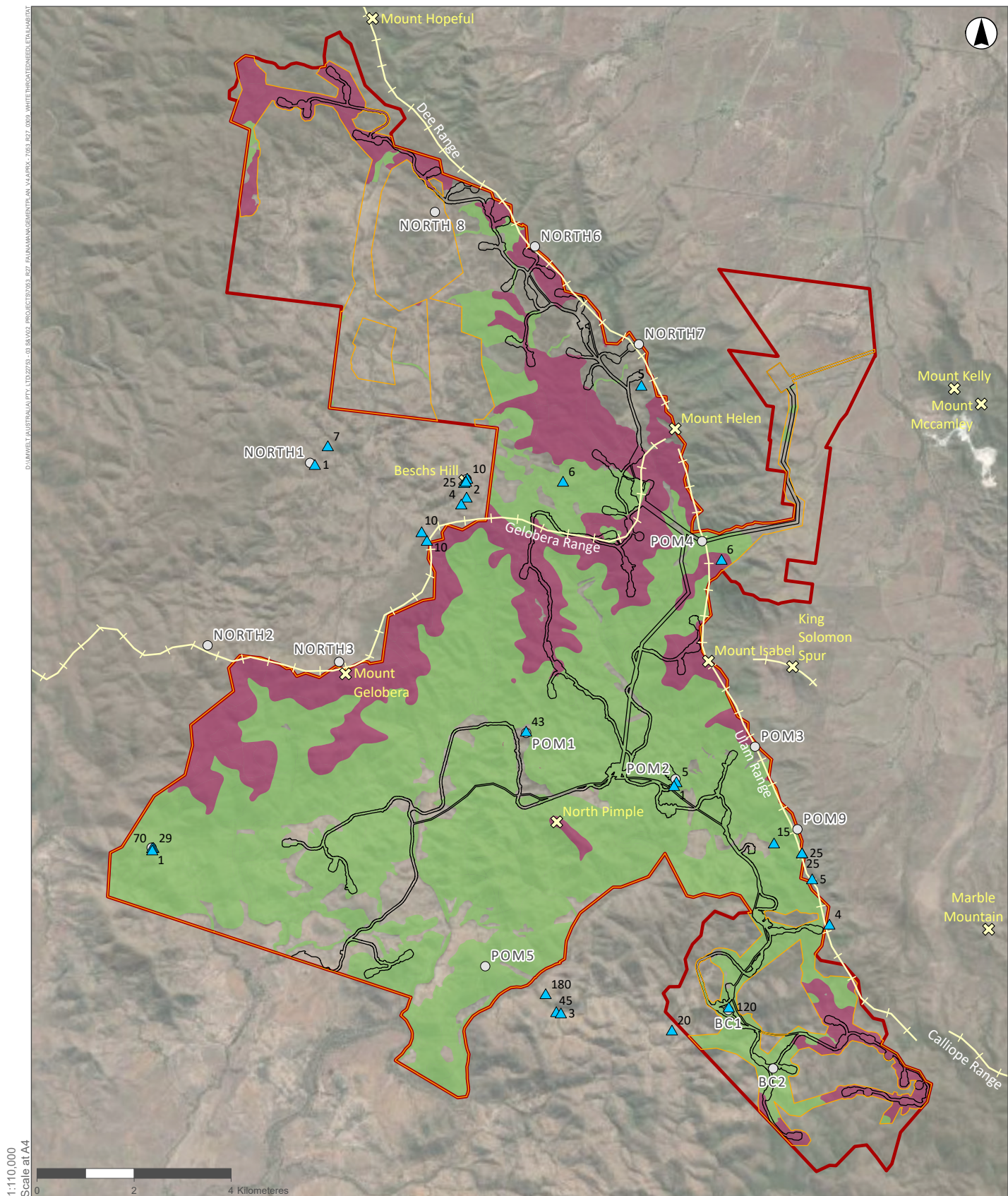


FIGURE 3.8

**SQUATTER PIGEON (SOUTHERN)
HABITAT**



1:110,000
Scale at A4

GDA 1994 MGA Zone 56

Legend

- Towns
- White-throated Needletail Record (ALA)
- ▲ White-throated Needletail Record (Umwelt)
- ✕ Mountains, Peaks and Capes (DoR)
- Vantage Point Sites
- Mountain Range (DoR)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- White-throated Needletail Habitat
 - Foraging and dispersal
 - Roosting and foraging

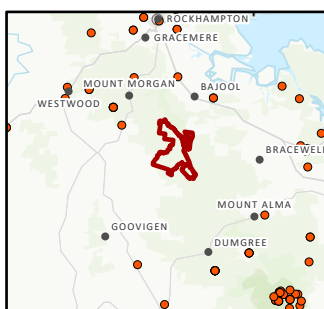
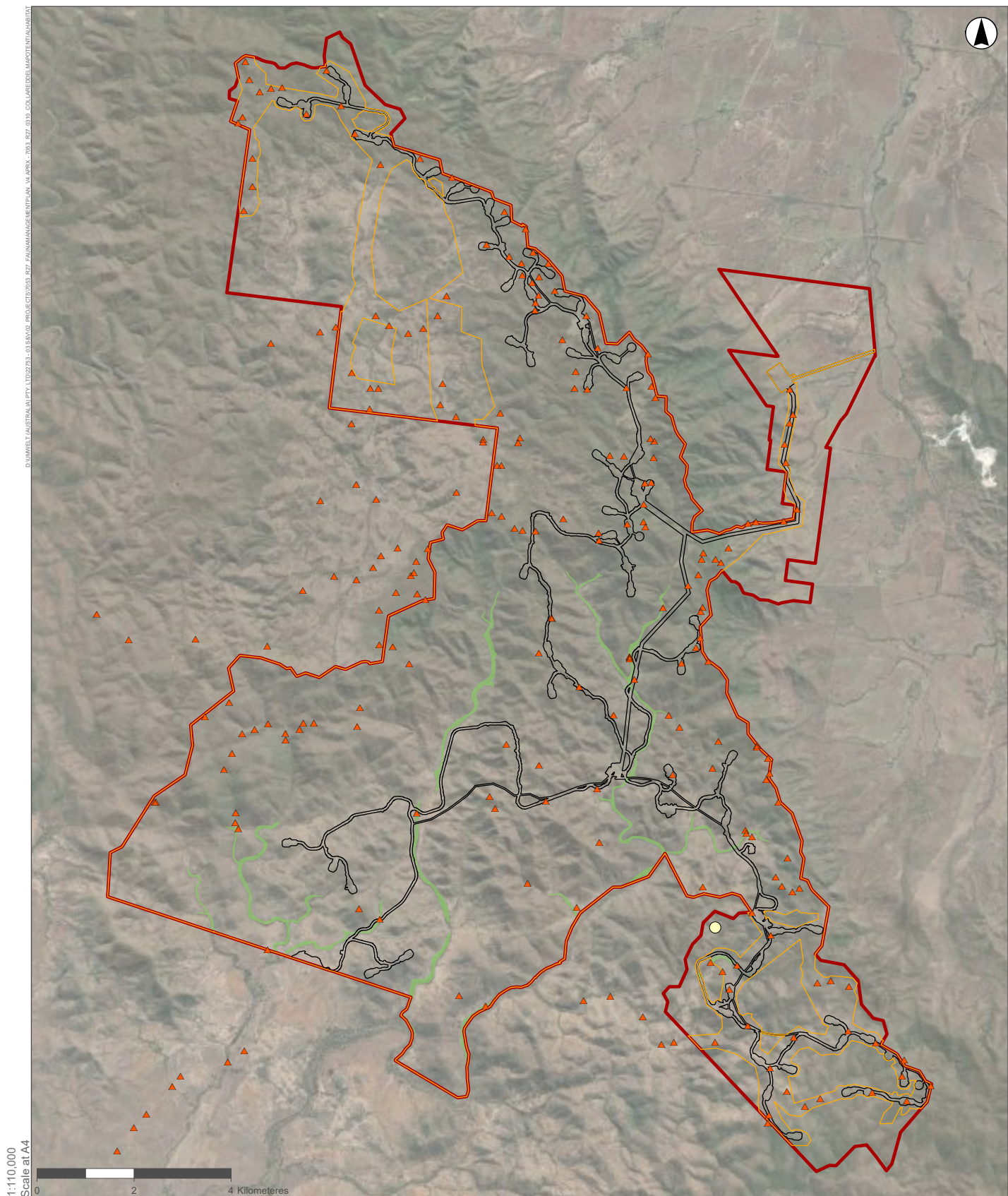


FIGURE 3.9

WHITE-THROATED NEEDLETAIL
HABITAT

Image Source: ESRI Basemap (2022) Data source: Department of Resources (2022)



Legend

- ▲ Active Diurnal Search Sites
- Collared Delma Record (ALA)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Collared Delma Habitat**
 - Breeding and Foraging

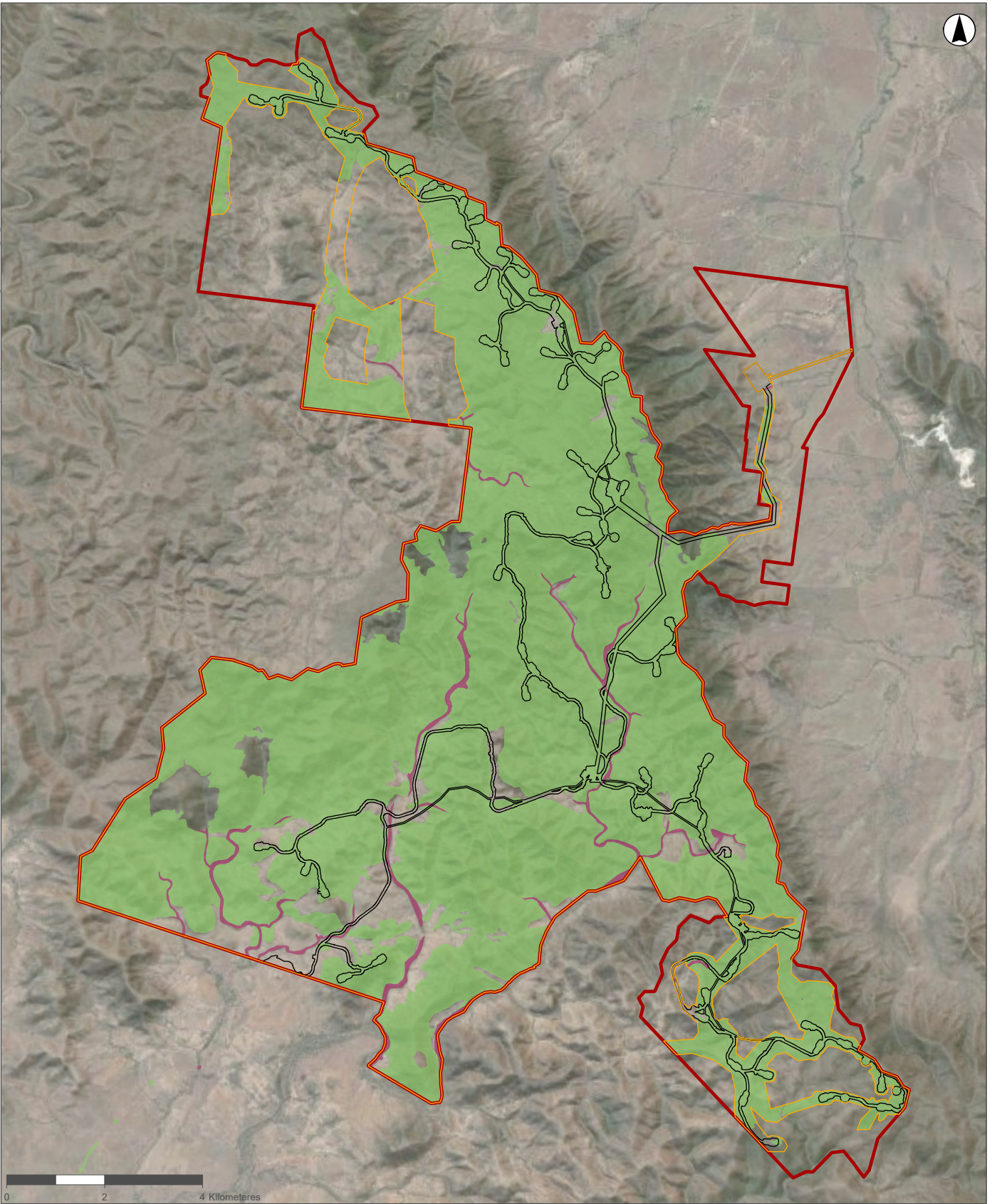
FIGURE 3.10

COLLARED DELMA POTENTIAL HABITAT



D:\UMWELT\AUSTRALIA\CTY_1202270_1_01_SAVO2_PROJEKT\2023_027_RANAMANGA\CENTRAL\AN_VAARPK_7053_R27_011_KOAL_POTENTIAL_HABITAT

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Scale at A4



GDA 1994 MGA Zone 56

Legend

- Towns
- Koala Record (ALA)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Koala Habitat
- Breeding, Foraging and Dispersal
- Climate Refugia

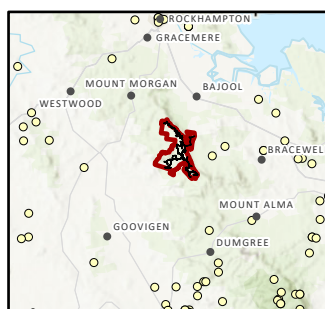
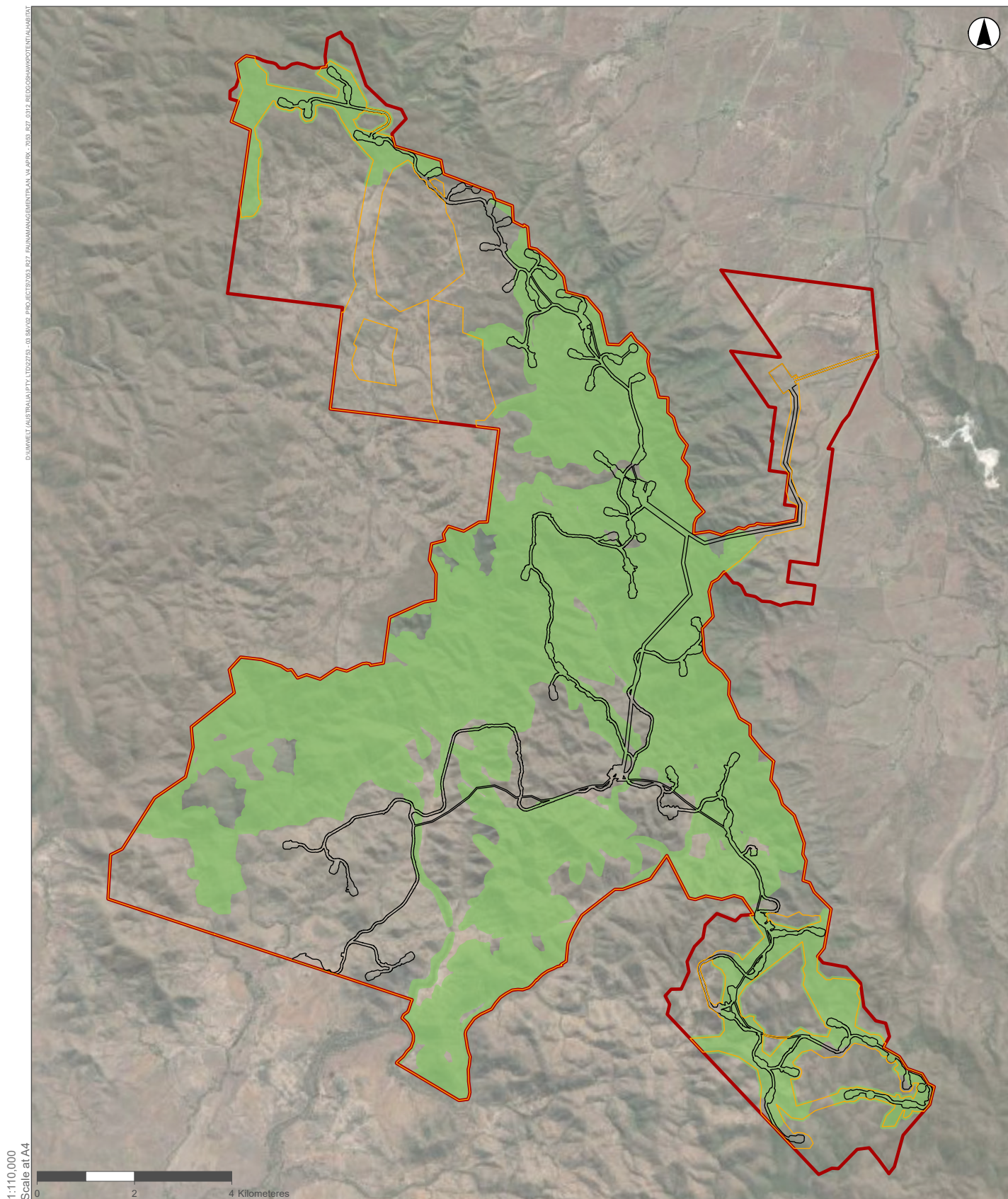


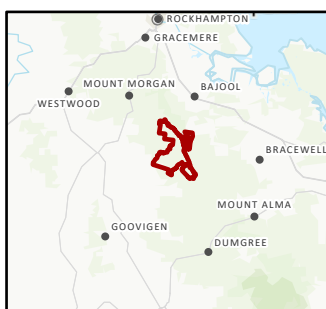
FIGURE 3.11

KOALA POTENTIAL HABITAT



Legend

- Red Goshawk Record (ALA)
- Towns
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Red Goshawk Habitat**
- Marginal Foraging and Dispersal



GDA 1994 MGA Zone 56

FIGURE 3.12

RED GOSHAWK POTENTIAL HABITAT



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Scale at A4

0 2 4 Kilometers

Legend

- Ghost Bat Record (ALA)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Ghost Bat Habitat**
- Seasonal Foraging and Dispersal



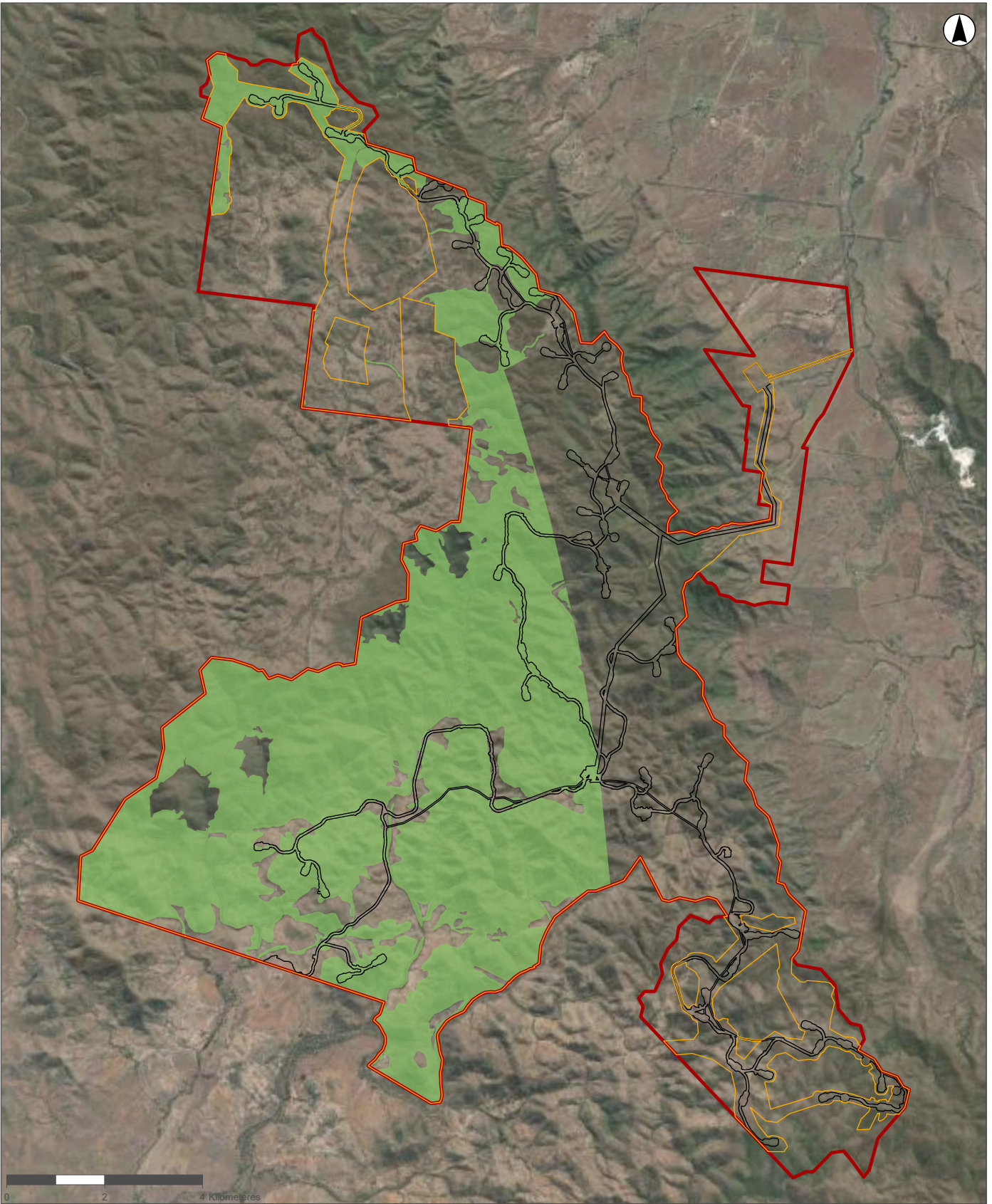
GDA 1994 MGA Zone 56

FIGURE 3.13
GHOST BAT POTENTIAL HABITAT



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Scale at A4



GDA 1994 MGA Zone 56

Legend

- Grey-headed Flying-fox Record (ALA)
- ▲ Roost (National Flying-fox Monitoring Program)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Grey-headed Flying-fox Habitat**
- Foraging and Dispersal

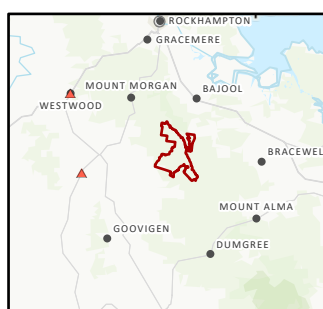


FIGURE 3.14

**GREY-HEADED FLYING-FOX
POTENTIAL HABITAT**



D:\UMWELT\AUSTRALIA\RTV\1222731-13\58V09 PROJ\CT07003 827 FAUNANOMGE\MENTPLAN_M.ABSK - 2010 827 0315 ECHIDNAHABITAT

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Scale at A4

0 2 4 Kilometers

GDA 1994 MGA Zone 56

Legend

- ▲ short-beaked echidna (*Tachyglossus aculeatus*)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Echidna Habitat

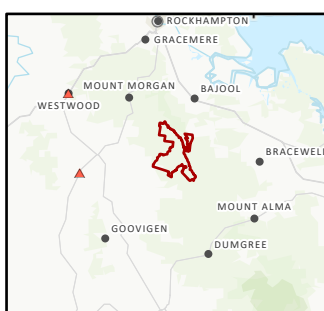






FIGURE 3.15
ECHIDNA HABITAT

Table 3.8 Migratory Fauna Species Profiles


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
rufous fantail (<i>Rhipidura rufifrons</i>) – Migratory under the EPBC Act and Special Least Concern under the NC Act			
	<p>In east and south-east Australia, the rufous fantail mainly inhabits wet sclerophyll forests, usually with a dense shrubby understorey often including ferns. They are found in rainforest, dense wet eucalypt and monsoon forest, paperbark and mangrove swamp and riparian vegetation (Morcombe, 2004). When on passage, a wider range of habitats are used including dry eucalypt forests and woodlands and brigalow shrublands. Breeding habitat occurs in dense wet forests – rainforests, mangroves, the wet fern gullies in eucalypt forests and other dense vegetation (Morcombe, 2004).</p> <p>This species occurs as solitary birds or in pairs or small parties. The rufous fantail is found in northern and eastern coastal Australia, being more common in the north. This species migrates to south-east Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range (Department of the Environment, 2015b).</p>	<p>The rufous fantail was recorded within the Study Area on four occasions:</p> <ul style="list-style-type: none"> • One individual observed actively foraging within a narrow gully, comprising a structurally complex lower tree and shrub layer. The gully was situated adjacent to steep sloping Eucalypt woodland. • One individual observed within vine thicket vegetation, comprising structurally complex shrub layer over ground microhabitat of fallen logs and coarse litter. • Two individuals were recorded on separate occasions on steep slopes, dispersing through eucalypt woodland in close proximity to vine thicket vegetation and in areas invaded by <i>Lantana camara</i>. <p>The location of these records are provided in Figure 3.3.</p> <p>On all occasions, the rufous fantail was using lower portions of habitat, occupying the ground and mid-stratum vegetation layers.</p>	<p>The likely threats identified for the species are:</p> <ul style="list-style-type: none"> • Introduction of invasive species including black rat (<i>Rattus rattus</i>) and incursion of invasive vine species in riparian habitat. • Loss and fragmentation of core moist forest breeding habitat resulting from land clearing and urbanization, particularly where remnant and corridor habitat occurs along the species' migration routes. <p>No recovery plan exists for this species.</p>


Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
		<p>Semi-evergreen vine-thicket and eucalypt woodlands throughout the Study Area may be utilised for foraging and dispersal when on passage to breeding habitat in south-eastern Australia. It is unlikely that the species breeds in the area due to the geographical location and the lack of wet forest and rainforest.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 372.0 ha of foraging and dispersal habitat for the species. The Disturbance Footprint is outside of the species' breeding range.</p> <p>It should be noted that these areas are subject to change as the Disturbance Footprint is refined.</p>	
spectacled monarch (<i>Symposiachrus trivirgatus</i>) – Migratory under the EPBC Act and Special Least Concern under the NC Act			
	<p>The spectacled monarch is found in dense vegetation, mainly in rainforest but also in moist forest or wet sclerophyll and occasionally in other dense vegetation such as mangroves, drier forest and woodlands. These habitats are considered important habitats (Department of the Environment, 2015a).</p> <p>The spectacled monarch is distributed across eastern Australia along the coastal regions where it is a resident in the north of its distribution and a summer breeding migrant to coastal south-eastern Australia. This species begins its southern</p>	<p>The spectacled monarch was recorded within the Study Area twice in June 2020, once in the central portion and once in the north-eastern portion. Numerous records, including recent records, exist for this species in the surrounding region (Atlas of Living Australia, 2022).</p> <p>Habitat suitable for foraging and dispersal was present within the Study Area and included the following:</p> <ul style="list-style-type: none"> • Semi-evergreen vine thicket. • Gullies in eucalypt woodlands where dense vegetation occurs. 	<p>The primary threat identified for the species is:</p> <ul style="list-style-type: none"> • Introduction of invasive species including black rat (<i>Rattus rattus</i>) and incursion of invasive vine species in riparian habitat. <p>No recovery plan exists for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>migration in September and returns north in March. Spectacled monarch also occupies coastal islands from Cape York in Queensland to Port Stephens in New South Wales (BirdLife Australia, 2022a). This species is also thought to migrate to Papua New Guinea, the Moluccas and Timor during the autumn and winter months (BirdLife Australia, 2022a; Museum Australian, 2022).</p> <p>The spectacled monarch is insectivorous, foraging primarily in the foliage beneath the canopy and on tree trunks or vines. The spectacled monarch constructs a tiny cup nest of fine bark, plant fibres, moss, and spider web 1 m to 6 m above the ground, frequently close to water, in a tree fork or in hanging vines (BirdLife Australia, 2022a).</p>	<p>The location of these records are provided in Figure 3.3.</p> <p>The species utilises this region on its' migration and does not reside or breed in the region. As such habitat within the Study Area has been identified as foraging and dispersal only.</p> <p>Clearing within the Disturbance Footprint will result in the loss of 17.5 ha of foraging and dispersal habitat for the species. The Disturbance Footprint is outside of the species' breeding range.</p> <p>It should be noted that these areas are subject to change as the Disturbance Footprint is refined.</p>	
fork-tailed swift (<i>Apus pacificus</i>) – Migratory under the EPBC Act and Special Least Concern under the NC Act			
	<p>The fork-tailed swift is found across a range of habitats in Australia, from inland open plains to wooded areas, where it is exclusively aerial (Department of the Environment, 2015b). It spends most of the year at high altitudes, feeding on invertebrates carried aloft in the air column known as aerial plankton. The fork-tailed swift comes down, near to the ground during bad weather.</p>	<p>Despite the high likelihood of occurrence rating for this species, the fork-tailed swift was not identified during the field survey program. The air space above remnant and regrowth woodlands, open pasture grassland and non-remnant vegetation communities all have the potential to be used by this species for foraging and dispersal within the Study Area.</p>	<p>No significant threats to this species in Australia.</p> <p>The potential threats identified for this species are:</p> <ul style="list-style-type: none"> • Habitat destruction. • Predation by introduced species. <p>No recovery plan exists for this species.</p>

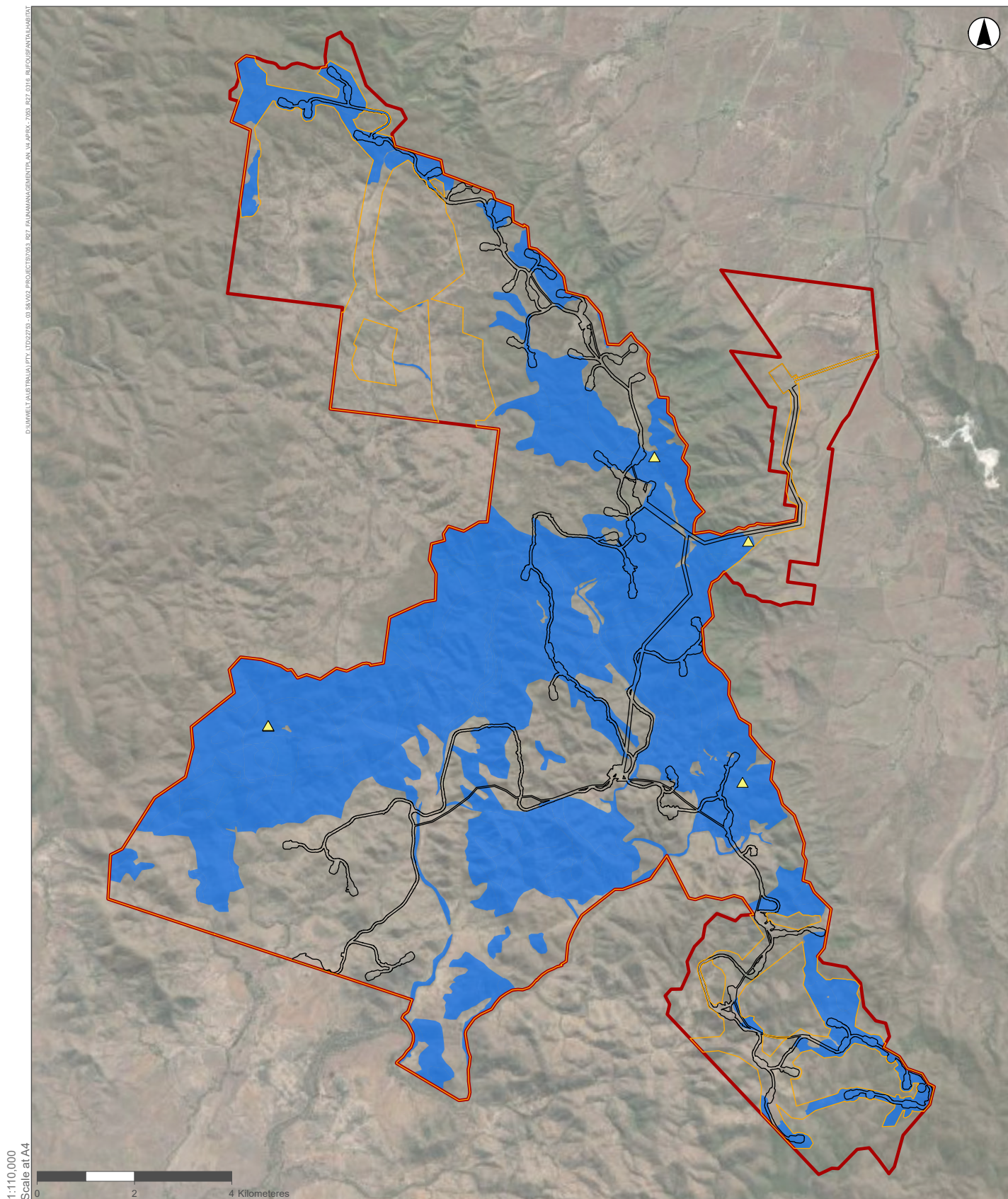
Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	The species migrates to Australia during the warmer months of the year from breeding habitat in South-east Asia, where it nests in colonies on cliffs. No breeding habitat is known in Australia.	Desktop records occur in scattered locations in the wider area. The nearest record is from 2019 and is located approximately 20 km north of the Study Area near the Bouldercombe Forge Conservation Park. Clearing within the Disturbance Footprint will result in the loss of 877.3 ha of foraging and dispersal habitat for the species. The Disturbance Footprint is outside of the species' breeding range. It should be noted that these areas are subject to change as the Disturbance Footprint is refined.	
black-faced monarch (<i>Monarcha melanopsis</i>) – Migratory under the EPBC Act and Special Least Concern under the NC Act			
	The black-faced monarch inhabits humid gullies, coastal scrub, eucalyptus woodlands, and rainforests. When migrating, it can occur in more open forest across its range (BirdLife Australia, 2022b). This species is mainly associated with wet forests, primarily wet sclerophyll forests and rainforests, particularly in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs (Department of the Environment, 2015a).	Black-faced monarch was not observed within the Study Area during the field survey program. It is conservatively considered to have a moderate likelihood of occurrence due to the presence of suitable habitat and scattered desktop records in the wider local area. The nearest desktop record is located approximately 21 km north near Bouldercombe Gorge Conservation Park and is undated.	The primary threats identified for the species are: <ul style="list-style-type: none"> • Introduction of invasive species including black rat (<i>Rattus rattus</i>) and incursion of invasive vine species in riparian habitat. No recovery plan exists for this species.

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>The black-faced monarch is distributed across eastern Australia along the coastal regions becoming less common towards the southern extent of its range. This species flies between their breeding grounds in eastern Australia and their wintering habitats in southern New Guinea across the Torres Strait. Individual birds can occur outside of their typical range with vagrants being observed in Western Australia and New Zealand. Individuals have also been recorded in northern and western Victoria and in southern South Australia (BirdLife Australia, 2022b).</p> <p>The black-faced monarch feeds on insects foraging amongst foliage catching prey on the wing. Their nest consists of a deep cup that is typically made from casuarina needles, bark, roots, moss and spider web and placed in the fork of a tree between 3 and 6 m above the ground. Females build the nest and both sexes incubate the eggs (BirdLife Australia, 2022b).</p>	<p>The Project is located within an area mapped as core breeding range for the species however, given that no rainforest or wet sclerophyll habitat types exist within the Study Area suitable habitat is predominantly limited to foraging and dispersal habitat. Semi-evergreen vine thicket associated with gullies and slopes may represent marginal breeding habitat and has been conservatively included.</p> <p>Habitat suitable for foraging and dispersal was present within three habitat types for the species including:</p> <ul style="list-style-type: none"> • Semi-evergreen vine thicket. • Remnant alluvial eucalypt woodland. • Eucalypt woodland with open understory and grassy ground layer. <p>The species utilises the region on its' migration and breeds in select parts of Queensland. As such, habitat within the Study Area may provide foraging, dispersal and marginal breeding opportunities. Sheltered gullies with dense vegetation and semi-evergreen vine thicket communities may be suitable for foraging and potentially breeding constituting an important habitat.</p>	

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
		<p>Clearing within the Disturbance Footprint will result in the loss of 17.5 h of foraging and marginal breeding habitat and 354.6 ha of foraging and dispersal habitat for the species.</p> <p>It should be noted that these areas are subject to change as the Disturbance Footprint is refined.</p>	
oriental cuckoo (<i>Cuculus optatus</i>) – Migratory under the EPBC Act and Special Least Concern under the NC Act			
	<p>Oriental cuckoo is found in a range of vegetation types including rainforest, vine-thicket and wet sclerophyll forests. It also inhabits open communities such as <i>Casuarina</i>, <i>Acacia</i> and <i>Eucalyptus</i> woodland, favouring edges or ecotones between forest types. While on passage, this species has been recorded occupying plantations, cleared areas and gardens, typically at lower.</p> <p>A non-breeding migrant to Australia, oriental cuckoo transits to northern and eastern Australia in summer reaching as far south on the east coast as Bega, NSW.</p>	<p>Oriental cuckoo was not recorded within the Study Area during the field survey program despite the extensive targeted fauna and bird utilisation surveys. This species was conservatively assessed as having a moderate likelihood of occurring within the Study Area due to the presence of scattered records in the wider local area and suitable habitat. The nearest desktop record is located approximately 20 km north of the Study Area near the Bouldercombe Forge Conservation Park and is undated with 9000 m spatial uncertainty.</p> <p>While no breeding habitat occurs within the Australia, large tracts of eucalypts woodlands and vine-thickets throughout the Study Area may be suitable for foraging and dispersal purposes. Habitat suitable for foraging and dispersal was identified as:</p> <ul style="list-style-type: none"> • Semi-evergreen vine thicket. • Remnant alluvial eucalypt woodland. 	<p>Threats to this species are not known.</p> <p>No recovery plan exists for this species.</p>

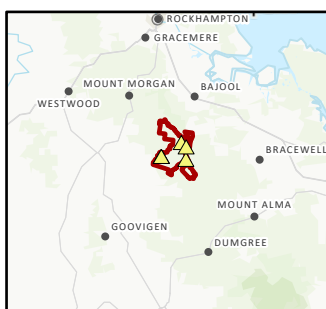
Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
		<ul style="list-style-type: none"> Eucalypt woodland with open understory and grassy ground layer. <p>Clearing within the Disturbance Footprint will result in the loss of 372.0 ha of foraging and dispersal habitat for the species. The Disturbance Footprint is outside of the species' breeding range.</p> <p>It should be noted that these areas are subject to change as the Disturbance Footprint is refined.</p>	
satin flycatcher (<i>Myiagra cyanoleuca</i>) – Migratory under the EPBC Act and Special Least Concern under the NC Act			
	<p>The satin flycatcher inhabits heavily vegetated gullies in eucalypt forests and taller woodlands, often near wetlands or watercourses. They are mostly recorded in wet sclerophyll forests, however they also occur in eucalypt woodlands with open understorey and grassy ground cover (Department of the Environment, 2019).</p> <p>This species migrates to northern Australia and Papua New Guinea in autumn and returns to south-eastern Australia in spring however their movements are described as erratic. Their migration route appears to follow the Great Dividing Range but reported sightings have occurred in coastal NSW.</p>	<p>The satin flycatcher was not observed within the Study Area during the field survey program. It is conservatively considered to have a moderate likelihood of occurrence due to the presence of suitable habitat and scattered desktop records in the wider local area. The nearest desktop record is from 1994 and is located approximately 12 km north near Bouldercombe Gorge Conservation Park although has a 20 km spatial uncertainty.</p> <p>Habitat suitable for foraging and dispersal was present within two habitat types for the species:</p> <ul style="list-style-type: none"> Remnant alluvial eucalypt woodland. Eucalypt woodland with open understory and grassy ground layer. 	<p>The primary threats identified for the species are:</p> <ul style="list-style-type: none"> Introduction of invasive species including black rat (<i>Rattus rattus</i>) and incursion of invasive vine species in riparian habitat. Clearing and logging of mature forest in south-eastern Australia. <p>No recovery plan exists for this species.</p>

Species	Distribution, Habitat and Ecology ¹	Study Area Values	Threats to the species ¹
	<p>Departure times vary dependent on location, but it is generally between February and early May. Timing for returning to south-eastern Australia to breed also varies dependent on location but ranges between August to November.</p> <p>The satin flycatcher is primarily insectivorous, preying on arthropods, mostly insects, although very occasionally they will also eat seeds. They are arboreal foragers, feeding high in the canopy and subcanopy of trees, usually sallying for prey in the air or picking prey from foliage and branches of trees, flitting from one perch to another (Department of the Environment, 2019).</p>	<ul style="list-style-type: none"> The species utilises this region on its' migration and does not reside or breed in the area. As such habitat within the Study Area has been identified as suitable for foraging and dispersal only. <p>Clearing within the Disturbance Footprint will result in the loss of 363.7 ha of foraging and dispersal habitat for the species. The Disturbance Footprint is outside of the species' breeding range.</p> <p>It should be noted that these areas are subject to change as the Disturbance Footprint is refined.</p>	



Legend

- Rufous Fantail Record (ALA)
- Towns
- ▲ Rufous Fantail Record (Umwelt)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Rufous Fantail Habitat
- Foraging and Dispersal (Important Habitat)



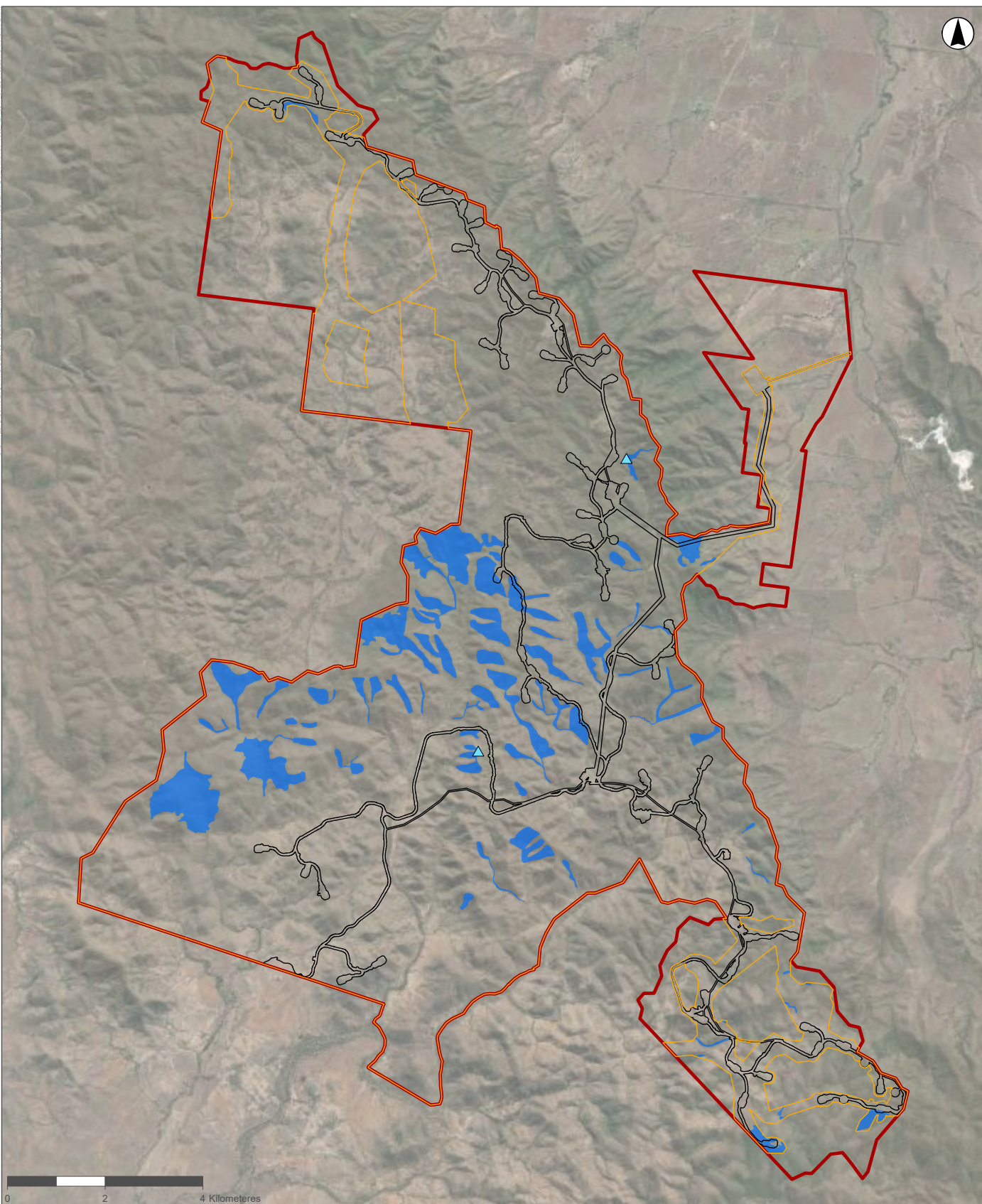
GDA 1994 MGA Zone 56

FIGURE 3.16
RUFIOUS FANTAIL HABITAT



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1:110,000
Scale at A4



GDA 1994 MGA Zone 56

Legend

- Spectacled monarch Record (ALA)
 - ▲ Spectacled monarch Record (Umwelt)
 - Ground-truthed Mapping Extent
 - Disturbance Footprint
 - Study Area
 - Foraging and Dispersal (Important Habitat)
- Spectacled Monarch Habitat**

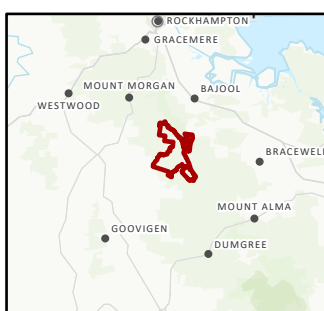


FIGURE 3.17

SPECTACLED MONARCH HABITAT



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1:110,000
Scale at A4

0 2 4 Kilometers

GDA 1994 MGA Zone 56

Legend

- Fork-tailed Swift Record (ALA)
- Towns
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Fork-tailed Swift Habitat**
- Foraging and dispersal (exclusively aerial species) (Important Habitat)

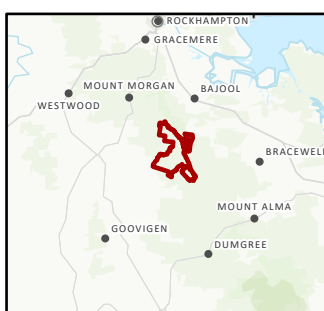


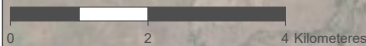
FIGURE 3.18

FORK-TAILED SWIFT POTENTIAL HABITAT



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1:110,000
Scale at A4



GDA 1994 MGA Zone 56

Legend

- Towns
- Black-faced Monarch Record (ALA)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- ▭ Study Area
- Potential Black-faced Monarch Habitat**
 - Foraging and Dispersal
 - Foraging and Marginal Breeding

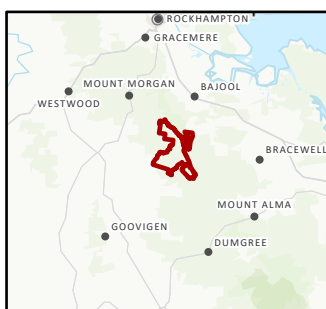


FIGURE 3.19

**BLACK-FACED MONARCH
POTENTIAL HABITAT**



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1:110,000
Scale at A4

0 2 4 Kilometres

GDA 1994 MGA Zone 56

Legend

- Oriental Cuckoo Record (ALA)
- Towns
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Oriental Cuckoo Habitat**
- Foraging and dispersal (Important Habitat)

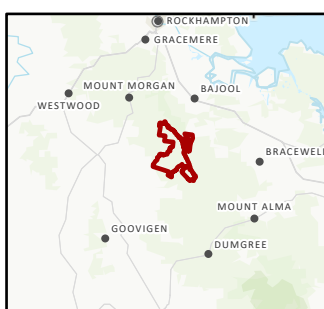


FIGURE 3.20

ORIENTAL CUCKOO POTENTIAL HABITAT



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1:110,000
Scale at A4

0 2 4 Kilometers

GDA 1994 MGA Zone 56

Legend

- Towns
- Satin Flycatcher Record (ALA)
- Ground-truthed Mapping Extent
- Disturbance Footprint
- Study Area
- Potential Satin Flycatcher Habitat**
- Foraging and Dispersal (Important Habitat)

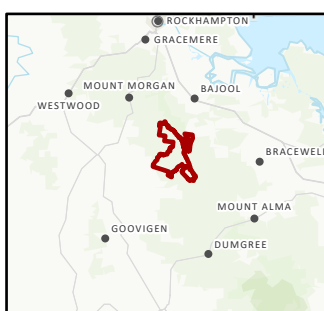


FIGURE 3.21

SATIN FLYCATCHER POTENTIAL HABITAT

4.0 Potential Impacts

4.1 Overview

The Project has the potential to impact on fauna and fauna habitat values within the Study Area during the construction, operation and maintenance and decommissioning and rehabilitation phases of the Project. The key potential impacts associated with the different Project phases have been summarised below in **Table 4.1**.

The greatest potential impact on ecological values will be from direct impacts associated with the clearing of vegetation during the construction phase of the Project. Within the Study Area, a maximum area of approximately 877.5 ha will be directly impacted as determined by the Disturbance Footprint (**Figure 1.1**). Approximate impacts on fauna habitat have been provided below in **Table 4.2**.

Mitigation and management measures to reduce Project impacts are discussed in **Section 5.0**.

Table 4.1 Project Activities, Risks and Potential Impacts

Project Phase	Project Activity	Risk/ Threat	Potential Impacts
Construction	Site establishment, vegetation and habitat clearing	Habitat loss, fragmentation, and degradation	<ul style="list-style-type: none"> • Increase or the introduction of edge effects. • Removal of habitat features necessary to support threatened and migratory fauna species. • Reduction in the extent and condition of suitable habitat. • Reduction in population size and number of individuals within a community.
		Introduction and exacerbation of weeds and pest fauna species	
	Construction activities including vehicular movement	Dust generation	
		Soil erosion and sedimentation	
Operation and Maintenance	Project activities	Introduction and exacerbation of weeds and pest fauna species	
Decommissioning	Project conclusion and rehabilitation works	Dust generation	
		Introduction and exacerbation of weeds and pest fauna species	

4.2 Potential Impacts to Fauna Habitat

The Project will result in the removal of up to 372.0 ha of remnant vegetation, 261.8 ha of regrowth vegetation and 241.2 ha of non-remnant cleared vegetation within the Disturbance Footprint (**Figure 1.1**). **Table 4.2** below provides a breakdown of direct impacts to threatened and migratory fauna species and details the mapped extent of each habitat type within the Development Corridor and within the Disturbance Footprint.

Table 4.2 Impacts to Threatened and Migratory Fauna Habitat/Potential Habitat the Development Corridor and Disturbance Footprint

Common Name	Scientific Name	EPBC Act Status	NC Act Status	Habitat Type	Area (ha) within the Development Corridor	Area (ha) within Disturbance Footprint
Threatened Fauna Habitat/Potential Habitat						
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	Vulnerable	Vulnerable	Marginal breeding	38.6	23.8
				Foraging	372.7	242.5
greater glider (southern and central)	<i>Petauroides volans</i>	Endangered	Endangered	Breeding and denning	330.4	206.9
				Foraging and dispersal	500.4	331.5
yellow-bellied glider (south-eastern)	<i>Petaurus australis australis</i>	Vulnerable	Vulnerable	Breeding and denning	275.4	170.6
				Foraging and dispersal	280.7	181.1
northern quoll	<i>Dasyurus hallucatus</i>	Endangered	Least Concern	Denning and refuge	49.1	22.1
				Foraging and dispersal	834.0	551.4
squatter pigeon (southern)	<i>Geophaps scripta scripta</i>	Vulnerable	Vulnerable	Breeding	4.4	3.6
				Foraging	2.2	1.5
				Dispersal	470.0	324.2
white-throated needletail	<i>Hirundapus caudacutus</i>	Vulnerable, Migratory	Vulnerable	Roosting and foraging	427.9	267.9
				Foraging and dispersal	554.2	365.9
collared delma	<i>Delma torquata</i>	Vulnerable	Vulnerable	Breeding and foraging	6.1	5.0
koala	<i>Phascolarctos cinereus</i>	Vulnerable	Vulnerable	Breeding, foraging and dispersal	1,111.3	721.1
				Climate refugia	7.1	5.3
red goshawk	<i>Erythrorhynchus radiatus</i>	Vulnerable	Endangered	Foraging and dispersal	883.9	578.3
ghost bat	<i>Macroderma gigas</i>	Vulnerable	Endangered	Seasonal foraging and dispersal	1,346.5	877.3

Common Name	Scientific Name	EPBC Act Status	NC Act Status	Habitat Type	Area (ha) within the Development Corridor	Area (ha) within Disturbance Footprint
grey-headed flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	Least Concern	Foraging and dispersal	374.6	243.7
short-beaked echidna	<i>Tachyglossus aculeatus</i>	-	Special Least Concern	Foraging, breeding and dispersal	1,346.5	877.3
Migratory Fauna Habitat/Potential Habitat						
rufous fantail	<i>Rhipidura rufifrons</i>	Migratory	Special Least Concern	Foraging and dispersal	594.0	372.0
spectacled monarch	<i>Symposiarchus trivirgatus</i>	Migratory	Special Least Concern	Foraging and dispersal	40.0	17.5
fork-tailed swift	<i>Apus pacificus</i>	Migratory	Special Least Concern	Foraging and dispersal	1,346.5	877.3
black-faced monarch	<i>Monarcha melanopsis</i>	Migratory	Special Least Concern	Foraging and marginal breeding	40.0	17.5
				Foraging and dispersal	554.5	354.6
oriental cuckoo	<i>Cuculus optatus</i>	Migratory	Special Least Concern	Foraging and dispersal	594.0	372.0
satin flycatcher	<i>Myiagra cyanoleuca</i>	Migratory	Special Least Concern	Foraging and dispersal	573.1	363.7

4.2.1 Threatened Fauna

The Project will result in the removal of suitable habitat for both known and potentially occurring threatened and migratory fauna species, as outlined in **Section 3.3.1** and **Section 3.3.2**. Several threatened and migratory species or species habitat with a likelihood of occurrence of Known, High or Moderate (**Section 3.3.1** and **Section 3.3.2**) may also require offsetting under the EPBC Act or EO Act.

Significant impact assessments were undertaken in accordance with the MNES Guidelines (Department of the Environment, 2013) for the species outlined in **Table 3.5** within the Assessment of Matters of National Environmental Significance (Attachment B of the Preliminary Documentation), as these species have a listing status recognised under the EPBC Act (refer **Section 2.0**). In summary, this assessment identified that after avoidance and mitigation measures were considered, the Project is likely to have a significant impact on the following species:

- Greater glider (southern and central).
- Yellow-bellied glider (south-eastern).
- Northern quoll.
- Koala.

An assessment against the Significant Residual Impact Guideline: For Matters Of State Environmental Significance and prescribed activities under the Sustainable Planning Act 2009 (Department of State Development Infrastructure and Planning, 2014) was also undertaken to determine whether the Project is likely to have a Significant Residual Impact on a MSES (refer **Section 2.0**). As per the Significant Residual Impact assessments detailed in Appendix F – Terrestrial Fauna Assessment (Umwelt (Australia) Pty Limited, 2023), related impacts on greater glider, may result in a Significant Residual Impact and require offsetting under the EO Act (Queensland). It should be noted the Study Area does not contain any essential habitat areas for listed fauna species, as shown on the DoR (of Natural Resources and Mines, 2016) Vegetation Management essential habitat map (version 11.05).

5.0 Mitigation and Management

5.1 Objectives

To reduce impacts to fauna habitat and threatened fauna species due to vegetation clearance, the management and mitigation measures outlined in the following sections have been developed with the aim to achieve the following objectives:

- Persistence and maintenance of known threatened fauna populations within the Study Area.
- Approved clearing limits will not be exceeded, as outlined in the Project's Development Approval and/or EPBC Act approval (if obtained).
- Management of pest fauna and weeds, to ensure there are no new introductions of pest fauna species and weeds within the Disturbance Footprint and that existing pest species are not exacerbated by Project activities.
- Retention of important habitat features and facilitation of fauna movement during vegetation removal.
- Bank stability and water quality to be maintained during disturbance of watercourses and drainage features.
- Implementation of erosion and sediment control measures to avoid degradation of fauna habitat.
- Micro-siting does not result in additional disturbance to threatened fauna or fauna habitat above the approved limits.

5.2 Mitigation and Management Measures

The mitigation and management measures presented in this PFMP have been developed with the aim to achieve the objectives outlined in **Section 5.1**. Mitigation and management measures are based on information within the following supporting documents:

- *Mitigating Biodiversity Impacts Associated with Solar and Wind Energy Development* (Bennun et al., 2021).
- Rockhampton Region Planning Scheme (Rockhampton Regional Council, 2015).
- Banana Shire Planning Scheme 2021 (Banana Shire Council, 2021).
- *Environmental Management Plan Guidelines* (Department of Environment, 2014).
- Information contained within Conservation Advice and Recovery plans for relevant species (Department of Climate Change Energy the Environment and Water, 2022b).

5.2.1 General Mitigation Measures

Table 5.1 contains the general mitigation and management measures that relate to fauna and fauna habitat identified within and adjacent to the Disturbance Footprint. Measures have been provided for the following key risks:

- Vegetation clearing, habitat loss, fragmentation and degradation.
- Soil erosion and sedimentation.
- Introduction and exacerbation of introduced weed and pest fauna species.

Table 5.1 Management and Mitigation Measures for the Avoidance of Impacts to Fauna and Fauna Habitat

Risk / Threat	Objective	Mitigation Measures and Management Action(s)	Timing
Vegetation clearing, habitat loss, fragmentation and degradation	Approved clearing limits will not be exceeded, as outlined in the Project's Development Approval and/or EPBC Act approval (if obtained)	<ul style="list-style-type: none"> All Project activities including site access, laydown of plant and equipment and construction activities must be within the finalised Disturbance Footprint. To ensure all Project activities are within the finalised Disturbance Footprint the following measures will be implemented: <ul style="list-style-type: none"> Final clearing extents within the Disturbance Footprint will be demarcated with flagging tape and where relevant, fencing. Spatial files (shapefile format) will be provided detailing the Disturbance Footprint and clearing extents. The Environment Officer will inspect this area on a weekly basis to ensure work is being undertaken within the final clearing extents within the Disturbance Footprint, and that the fencing/ flagging tape is still within the correct location. Where possible, locate access tracks and electrical connections adjacent to existing access or farm tracks to minimise clearing. Where possible, reduce clearing to the minimum extent required to facilitate construction activities within the Disturbance Footprint in areas surrounding creek lines and watercourses. Stockpile locations to be identified within previously cleared areas and utilised to retain topsoil and cleared vegetation material. These areas are to be identified during pre-clearance surveys and demarcated with appropriate signage and flagging tape. 	Prior to commencement of site disturbance and any construction activities
	Micro-siting does not result in additional disturbance to threatened fauna or fauna habitat above the approved limits	<p>Pre-clearance habitat surveys will be undertaken by a suitably qualified person within suitable habitat in the Disturbance Footprint for the threatened species which are known or likely to occur. (inclusive of a 5 m buffer). These surveys will identify important microhabitat features (i.e. hollow bearing trees; boulder piles) to inform the micro-siting process.</p> <p>Where possible, optimise the placement of infrastructure within the Disturbance Footprint to further minimise impacts to:</p> <ul style="list-style-type: none"> Potential threatened or migratory fauna species habitat features. Potentially active breeding places. Known locations of threatened or migratory fauna species. <p>Refer to Section 5.2.3 for details pertaining to pre-clearance survey.</p>	Within 3 months prior to commencement of site disturbance and any construction activities.

Risk / Threat	Objective	Mitigation Measures and Management Action(s)	Timing
	Persistence and maintenance of known threatened fauna populations within the Study Area	<ul style="list-style-type: none"> Personnel will be informed of the sensitive areas¹ within the Disturbance Footprint as well as the procedures for minimising ecological impacts through site inductions, training, and toolbox talks. Exclusion zones will be established around active and potentially active breeding places, such as nests, burrows, dens etc., identified during pre-clearance surveys. Where there is the potential an active breeding place will be tampered with, this will only be done in accordance with an approved and appropriate (low or high risk) DES Species Management Program (SMP) as per the Nature Conservation (Animals) Regulation 2020. Pre-clearance surveys within the Disturbance Footprint will include opportunistic searches for threatened and migratory species (Refer to Section 3.3.1 and Section 3.3.2). If any individuals, populations or high-value microhabitat features are located during the targeted surveys, these will be recorded as per Section 5.3. In the event collared delma is detected during the pre-clearance survey the constraint identification protocol will be followed (Section 5.3.1). A fauna spotter catcher will be present to conduct pre-clearance inspections prior to vegetation clearing activities and monitoring for the presence of fauna during vegetation clearing. In the event collared delma is detected during the clearing process it is the fauna spotter catcher's responsibility to enact Step 1 of the constraint identification protocol (Section 5.3.1). 	Prior to personnel entering and working on the Project site
	Persistence and maintenance of known threatened fauna populations within the Study Area	<ul style="list-style-type: none"> Daily toolbox talks to identify vegetation clearing boundary and presence of high-value microhabitat for threatened fauna identified during pre-clearance survey with vegetation clearing contractor and fauna spotter catcher. Inspection to be undertaken by a fauna spotter catcher prior to the commencement of any vegetation clearing activities to identify and communicate the presence of potential fauna habitat. 	During vegetation clearing activities

Risk / Threat	Objective	Mitigation Measures and Management Action(s)	Timing
		<ul style="list-style-type: none"> • A fauna spotter catcher will be present at all times during clearing activities. The fauna spotter catcher will inspect habitat features (including but not limited to: hollowing-bearing trees and stags, caves and rocky boulder piles) for threatened and migratory fauna prior to felling, using work platforms, inspection cameras or other methods deemed safe and suitable. Fauna spotters will also be present during earthworks where exposed trenches and holes will be left for periods greater than 24 hours. • A fauna spotter catcher will be present during all vegetation clearing and mulching activities to ensure harm to threatened, migratory and least concern fauna is reduced. Under no circumstances is vegetation clearing or mulching to occur without a fauna spotter catcher present. • Fauna handling avoided in the first instance and limited to a fauna spotter catcher where fauna species are required to be relocated outside of the Disturbance Footprint. Release of fauna to occur in nearest adjacent retained vegetation in areas that provide suitable dispersal capacity for the species. Release of fauna must consider the behaviors of the animals (i.e. nocturnal animals are not to be released prior to dusk and diurnal animals not be released later than 2 hours prior to sunset to ensure they have time to seek refuge). 	
	Retention of important habitat features and facilitation of fauna movement during vegetation removal	<ul style="list-style-type: none"> • Habitat features such as fallen logs, ground timber and large rocks to be salvaged prior to vegetation clearing and relocated to vegetation that will be retained outside of the Disturbance Footprint or reinstated as part of rehabilitation works. Movement of this microhabitat must be completed in such a way as not to disturb the recipient habitat. • Where fauna habitat trees occur at the edge of the Disturbance Footprint, they should be avoided in the first instance and pruned back where avoidance is not possible. • Glider poles are proposed to be installed at 13 locations within the Disturbance Footprint to provide movement opportunities between areas of suitable habitat in the landscape. The proposed glider pole locations represent areas important for dispersal and where ongoing connectivity is required to avoid isolation of patches and retention of possible high use areas (i.e. riparian corridors). Glider pole locations will be finalised during the detailed design phase of the Project. • Five 'pinch points' are proposed within the Disturbance Footprint to maintain movement opportunities and minimise fragmentation impacts. Pinch points describe locations of the Disturbance Footprint which are reduced in width. Although pinch points will be designed to facilitate movement of greater gliders and yellow-bellied gliders, they will also limit the dispersal distance required for other fauna to cross cleared areas. Pinch points locations will be finalised during the detailed design phase of the Project. 	During vegetation clearing activities

Risk / Threat	Objective	Mitigation Measures and Management Action(s)	Timing
		<ul style="list-style-type: none"> Vegetation clearing undertaken in a staged approach clearing directionally towards retained vegetation outside of the Disturbance Footprint to avoid isolation of displaced fauna and maintain connectivity with retained vegetation. Where clearing of habitat trees cannot be avoided, understory clearing is to be undertaken around individual trees and left for 24 hours to allow fauna to disperse on their own accord. Nearby large trees to be retained for the 24 hour period to maintain dispersal capacity of arboreal mammals. 	
Soil erosion and sedimentation	Bank stability and water quality to be maintained during disturbance of watercourses and drainage features	<ul style="list-style-type: none"> Vegetation clearing within a watercourse, drainage feature or riparian vegetation to be kept to the minimum extent practical. Installation of appropriate stabilisation and sediment control measure where vegetation clearing occurs at a watercourse or drainage feature including rock checks, pipes or culverts. The potential impacts of erosion and sedimentation will be mitigated and managed through the development and implementation of an Erosion and Sediment Control Plan (ESCP) to ensure water quality is maintained during construction activities. 	Prior to commencement of site disturbance and any construction activities
	Implementation of erosion and sediment control measures to avoid degradation of fauna habitat	<ul style="list-style-type: none"> The potential impacts of erosion and sedimentation will be mitigated and managed through the Project's Preliminary Erosion and Sediment Control Plan (to be finalised and approved prior to construction). This will include the establishment of temporary erosion and sediment control until construction is complete or exposed areas have been rehabilitated to prevent the sedimentation of waterways within the Disturbance Footprint. 	Prior to commencement of site disturbance and any construction activities.
Introduction and exacerbation of introduced weed and pest fauna species	Management of pest fauna and weeds, to ensure there are no new introductions of pest fauna species and weeds within the Disturbance Footprint and that existing pest species are not	<p>Pre-construction</p> <ul style="list-style-type: none"> Baseline pest fauna conditions will need to be established prior to construction such that impacts from the Project can be monitored throughout the Project lifecycle. A baseline pest fauna survey will be conducted prior to construction of the Project. Pre-construction management and mitigation of weeds will be undertaken in accordance with the Project's Vegetation Management Plan. <p>Construction, Operation and Maintenance, Decommissioning and Rehabilitation</p> <ul style="list-style-type: none"> Mitigation and management of weed species during the construction and post-construction phases of the Project will be undertaken in accordance with the Project's Vegetation Management Plan. 	Pre-construction: 0–6 months prior to commencement of site disturbance and any construction activities.

Risk / Threat	Objective	Mitigation Measures and Management Action(s)	Timing
	exacerbated by Project activities	<ul style="list-style-type: none"> Ongoing monitoring of pest species within the Project footprint to establish a trend in pest species occurrence. A weed and pest monitoring report will be prepared 2 years after construction has ceased to compare baseline weed and pest fauna abundance and site usage. Implement a species-specific control program for pest fauna in consultation with landowner(s). This is only to be implemented if incidence of any feral fauna species has increased during construction or operation as reasonably attributable to the Project. The species-specific control program will be detailed in the Weed and Pest Management Plan. Avoid inclusion of any water retaining voids or pits in the design where these are not otherwise required for the control of stormwater run-off erosion and sediment control measures or dams required to supply water for construction activities. Where pits and voids are required, include appropriate cover to prevent extended water retention and subsequent breeding opportunities for cane toads. For pits and voids where long-term presence of retained water is reasonably anticipated and covering is not practicable, fencing to exclude access by cane toads will be incorporated in the design. Sediment fencing, free standing or attached to the base of other fencing material has proven to be effective. Wash down and laydown areas will be designed to include cane toad traps where exclusion from areas of potential water retention is not practicable and where cane toad activity is locally detected. No refuse left exposed, which will specifically assist breeding opportunities for cane toad, red fox, feral cat, dog, house mouse or rat on site. To reduce the presence of pest fauna on site, all food waste must be placed into designated waste bins, and their lids securely closed. Train workforce in the identification of pest fauna species present in the area. 	<p>Construction, Operation and Maintenance, Decommissioning and Rehabilitation:</p> <p>At all times throughout the life of the Project.</p>

¹ Sensitive areas are defined as locations outside the Disturbance Footprint which contain threatened species records or habitat.

5.2.2 Species Specific Mitigation Measures

Mitigation and management measures specific to the known and potentially occurring threatened fauna species within the Study Area are detailed in **Table 5.2** below. Greater consideration has been given to threatened species that may be particularly sensitive to potential Project impacts including the greater glider (southern and central) (*Petauroides volans*), yellow-bellied glider (south-eastern) (*Petaurus australis australis*) and northern quoll (*Dasyurus hallucatus*).

Sections 5.2.3 provides detail regarding the BBAMP, which largely includes measures relevant to potential operational impacts on threatened birds and bats, as well as migratory birds.

Table 5.2 Threatened Species Specific Management Measures

Fauna Species	Measures
glossy black-cockatoo (<i>Calyptorhynchus lathami</i>)	<ul style="list-style-type: none"> Any active breeding places will be managed under an approved DES High Risk SMP. As detailed in the BBAMP, a single glossy black-cockatoo (<i>Calyptorhynchus lathami</i>) death will be a reportable incident to DES and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revised. Other operational measures relevant to glossy black-cockatoo (<i>Calyptorhynchus lathami</i>) are detailed in the BBAMP.
greater glider (<i>Petauroides volans</i>) and yellow-bellied glider (<i>Petaurus australis australis</i>)	<ul style="list-style-type: none"> Where clearing is proposed for areas of greater glider (southern and central) and/or yellow-bellied glider (south-eastern) breeding and denning habitat, pre-clearance surveys must include canopy searches and inspections of suitably sized hollows (>8 cm diameter). Where inspection of hollows cannot be safely undertaken prior to felling, the hollow-bearing tree will be slow felled to minimise the chances of injury or death and will be inspected by a qualified fauna spotter to confirm presence or absence of either glider species. If an individual is found to be present, it will be inspected for injury and if healthy, relocated to an adjacent area of mapped breeding and denning habitat after dusk. If the individual is injured it will be transported to a local wildlife carer and rehabilitated prior to releasing in a suitable area adjacent to the location in which it was found. Every effort will be made to retain suitable hollow bearing trees (those containing hollows >8 cm diameter) within areas identified as breeding and denning habitat including <i>Eucalyptus moluccana</i> woodlands. The retention of trees >30 cm DBH on patch edges will be prioritised next in areas of potential greater glider (southern and central) and yellow-bellied glider (south-eastern) habitat. Trees to be retained within the Disturbance Footprint must be clearly demarcated and avoided. If deemed necessary, a TPZ may be established. Glider poles are proposed to be installed at 13 locations within the Disturbance Footprint to provide movement opportunities between areas of suitable habitat in the landscape. The proposed glider pole locations represent areas important for dispersal and where ongoing connectivity is required to avoid isolation of patches and retention of possible high use areas (i.e. riparian corridors). Glider pole locations will be finalised during the detailed design phase of the Project. Five 'pinch points' are proposed within the Disturbance Footprint associated with areas of greater glider (southern and central) and/or yellow-bellied glider (south-eastern) modelled habitat to maintain movement opportunities and minimise fragmentation impacts on the species. Pinch points describe locations of the Disturbance Footprint which are reduced in width to the extent that individuals can easily disperse across (i.e. based on usual volplane distances, the clearing will have a width no greater than 1.2 times the average canopy height at that location). Pinch points locations will be finalised during the detailed design phase of the Project. In areas of habitat where greater gliders (southern and central) and/or yellow-bellied gliders (south-eastern) are known to occur (i.e. the far northern Study Area), cleared suitable hollows (>8 cm diameter) will be replaced at a 1:2 ratio with a suitable nest box, to be installed in adjacent suitable habitat (i.e. two nest boxes for every hollow removed). A nest box is considered suitable if it is a design known to be used by the greater glider/yellow-bellied glider.

Fauna Species	Measures
	<ul style="list-style-type: none"> Nest boxes will be checked annually for two years following installation to determine success. Nest box inspections should continue every 5 years after, and be maintained or replaced as required. In the unlikely event that a greater glider (southern and central) or yellow-bellied glider (south-eastern) is killed as a result of Project activities, DCCEEW/DES will be notified within a maximum period of 2 business days.
grey-headed flying-fox (<i>Pteropus poliocephalus</i>)	<ul style="list-style-type: none"> In the event that a flying-fox congregation is identified within the Disturbance Footprint, an exclusion zone will be established. A suitably qualified person will refer to the <i>Interim Policy for Determining When a Flying-fox Congregation is Regarding as flying-fox Roost under Section 88C of the Nature Conservation Act 1992</i> (DES, 2021) to determine if the congregation could be considered a roost. If determined that the congregation constitutes a roost, impacts to the flying-fox congregation will be managed in accordance with the <i>Code of practice – Ecologically Sustainable Management of Flying-fox Roosts</i> (DES, 2020). As detailed in the BBAMP, a single grey-headed flying-fox death will be a reportable incident to DCCEEW and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revised. Other operational measures relevant to the grey-headed flying-fox are detailed in the BBAMP.
ghost bat (<i>Macroderma gigas</i>)	<ul style="list-style-type: none"> Where pits, voids or trenches are required, include appropriate cover to prevent extended water retention in these spaces and/or subsequent breeding opportunities for cane toads. As detailed in the BBAMP, a single ghost bat death will be a reportable incident to DCCEEW and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revised. Other operational measures relevant to the ghost bat are detailed in the BBAMP.
northern quoll (<i>Dasyurus hallucatus</i>)	<ul style="list-style-type: none"> Micro-siting of Project infrastructure will aim to retain potential denning habitat features including large hollow logs and large boulders piles. Habitat features that can be avoided will be demarcated. Where they cannot be retained in situ, features will be relocated to adjacent areas of suitable habitat if safe and practical (i.e. the relocation of habitat features must not cause unnecessary disturbance). Vegetation clearing required within or directly adjacent to areas of breeding and denning habitat should be completed outside of the northern quoll breeding season (late July to late August). Where this cannot be committed to, a trapping and relocation program for northern quoll in these areas must be undertaken prior to vegetation clearing commencing. Potential denning sites in areas to be cleared will have entrances closed to avoid use by northern quoll prior to and during clearing. Following the completion of the trapping program, should an active den be found within the Disturbance Footprint, measures outlined in a pre-approved high-risk SMP will be implemented to ensure no impacts occur to an active breeding place. This may include blocking access to dens once vacated to ensure they are not re-utilised during construction.

Fauna Species	Measures
	<ul style="list-style-type: none"> Where pits, voids or trenches are required, include appropriate cover to prevent extended water retention in these spaces and/or subsequent breeding opportunities for cane toads. Carcass surveys will be conducted by a suitably qualified ecologist to detect and remove carrion in operational areas that may attract northern quolls. The BBAMP will include a carcass survey protocol and include details such as survey frequency and timing. Construction areas that may inadvertently provide potential denning opportunities through stockpiling of materials will have fauna exclusion fencing installed around the perimeter. In the unlikely event that a northern quoll is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
Squatter pigeon (southern) <i>(Geophaps scripta scripta)</i>	<ul style="list-style-type: none"> Where clearing is proposed for areas of squatter pigeon (southern) breeding, foraging or dispersal habitat, pre-clearance surveys must include flushing to encourage the movement of individuals out of the clearing area. As squatter pigeon (southern) nests on the ground and is at high risk of direct mortality, nests should be identified and clearly demarcated by a spotter-catcher during pre-clearance surveys. If the spotter-catcher determines a nest to be active, it will be managed in accordance with an approved High-risk SMP. To reduce vehicle or plant collision or crushing of nests, all vehicles and pedestrians will remain within designated access tracks in squatter pigeon breeding habitat. To minimise the chances of a collision, in known squatter pigeon (southern) occurrence areas speed limits (in private areas) will be reduced to 40 km/hr or less and signage will be installed that indicates subspecies' presence. Signage will also be installed within the public road corridor. The construction contractor will not conduct water extraction activities at any location that provide suitable resources for squatter pigeon (southern) (i.e. suitable watercourses and reservoirs mapped on Figure 3.8). As outlined in the Preliminary BBAMP, a single squatter pigeon (southern) death resulting from potential wind turbine collision will be a reportable incident to DCCEEW and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revised. Other operational measures relevant to squatter pigeon (southern) are detailed in the Preliminary BBAMP.

Fauna Species	Measures
red goshawk <i>(Erythrotriorchis radiatus)</i>	<ul style="list-style-type: none"> Pre-clearance nest surveys will be undertaken for red goshawk within the Disturbance Footprint. Searches will be undertaken during fauna spotter catcher pre-clearance surveys whereby suitably qualified fauna spotter catchers will actively search for red goshawk nests. Where a potential nest is identified, clearance activities within the area will cease and a suitably qualified ecologist will undertake an investigation to determine the species that the nest belongs to. If the nest does not belong to a red goshawk, or any other threatened or migratory fauna species, clearance activities will continue as planned in accordance with the Project management plans. In the event that a red goshawk nest is identified within the Study Area DES/DCCEEW will be notified within 10 business days. A review of the current mitigation measures outlined in the BBAMP and recommendation of additional actions will be made where necessary. As detailed in the Preliminary BBAMP, a single red goshawk death will be a reportable incident to DES/DCCEEW and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revise. Other operational measures relevant to red goshawk are detailed in the Preliminary BBAMP.
white-throated needletail <i>(Hirundapus caudacutus)</i>	<ul style="list-style-type: none"> As detailed in the BBAMP the single death of a white-throated needletail will be a reportable incident to DCCEEW and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revised. Other operational measures relevant to this species are detailed in the BBAMP.
collared delma <i>(Delma torquata)</i>	<ul style="list-style-type: none"> Micro-siting of Project infrastructure will aim to retain terrestrial habitat features including large stones, boulders and coarse woody debris. Habitat features that can be avoided will be demarcated. Where they cannot be retained in situ, features will be relocated to adjacent areas of suitable habitat if safe and practical (i.e. the relocation of habitat features must not cause unnecessary disturbance). Where clearing is proposed for areas of potential collared delma habitat, pre-clearance surveys must include active searches targeting areas with common surface rocks. Should an individual or eggs of the species be located, the pre-clearance survey constraints protocol (see Section 5.3) will be enacted to ensure any potential impacts on the species are avoided or managed appropriately. In the unlikely event that a collared delma is killed as a result of Project activities, DES/DCCEEW will be notified within a maximum period of 2 business days.
koala (<i>Phascolarctos cinereus</i>)	<ul style="list-style-type: none"> Pre-clearance surveys will include canopy searches for koalas. If a koala is located during pre-clearance surveys or during clearing activities: <ul style="list-style-type: none"> the individual must not be forcibly relocated any tree which houses a koala as well as any tree with a crown that overlaps that tree will not be cleared until the koala vacates the tree on its own volition allow a clearing buffer surrounding the tree, equal to the height of the tree or deemed suitable by the fauna spotter-catcher any injured koala (and fauna in general) should be transported to a vet or recognised wildlife carer

Fauna Species	Measures
	<ul style="list-style-type: none"> ○ requirements for koalas subject to handling to be examined and if suspected of Chlamydia infection will be taken to a predesignated veterinarian/wildlife care facility for treatment prior to release. • Clearing must be carried out in a way that ensures any koala present have time to move out of the clearing site without human intervention. • In the unlikely event that a koala is killed as a result of Project activities, DES/DCCEEW will be notified within a maximum period of 2 business days.
short-beaked echidna (<i>Tachyglossus aculeatus</i>)	<ul style="list-style-type: none"> • Pre-clearance surveys will include on-ground searches for short-beaked echidna. If an echidna is located during pre-clearance surveys or during clearing activities: <ul style="list-style-type: none"> ○ the individual will be relocated to a nearby area of suitable habitat ○ any injured echidna should be transported to a vet or recognised wildlife carer.
Migratory birds	<ul style="list-style-type: none"> • As detailed in the BBAMP, the single death of a white-throated needletail, fork-tailed swift, oriental cuckoo, black-faced monarch, satin flycatcher, rufous fantail or spectacled monarch will be a reportable incident to DCCEEW and trigger further investigation with regard to causation. Dependent on the outcome of the investigation, the overall collision risk determination for the species may be revised. • Other operational measures relevant to migratory birds are detailed in the BBAMP.

5.2.3 Bird and Bat Adaptive Management Plan

Monitoring and management actions relating to threatened birds and bats will be undertaken in accordance with a pre-approved BBAMP. The strategy of the BBAMP is to monitor and mitigate the potential impacts of turbine strike on birds and bats via trigger based, adaptive management. The implementation of a trigger will be the primary mechanism for monitoring and managing impacts on the white-throated needletail.

Pre- and post-commissioning monitoring of bird and bat activity (including flight behaviours) is a key requirement of the plan. The monitoring will inform a risk profile for each turbine. This strategy leads to direct and tailored management actions, applied at the appropriate locations and times.

5.2.4 Injured Fauna Procedure

Fauna may be susceptible to injury from Project activities during all phases, with elevated risk of injury associated with construction activities (including vegetation clearance and increased vehicle activity). Fauna spotter catchers will be onsite during all clearing activities and will respond to fauna injury events if they arise. If an injury occurs and a fauna spotter catcher is not present, site personnel may conduct the rescue if they are suitably trained in fauna handling procedures. Site personnel must not handle injured bat species.

- Injured animals encountered during clearing activities will be thoroughly checked by fauna spotter catchers and the assessment made will inform whether the animal will be sent to an experienced wildlife carer or vet. If an injury is considered too severe to support rehabilitation, the animal will be euthanised using blunt force trauma in accordance with the Animal Care guidelines (DES 2013).
- A suitably vaccinated ecologist or fauna spotter catcher will undertake all handling of injured bats using relevant personal protective equipment (PPE) and must have the appropriate vaccinations.
- Transport and care of an injured animal will be undertaken in accordance with the Care of Sick, Injured or Orphaned Protected Animals in Queensland Code of Practice (Department of Environment and Science, 2020).
- Relevant wildlife first aid may be administered by the fauna spotter catcher if they are experienced in providing basic care to injured animals. This may include providing food or water to the animal, maintaining relevant body temperature, treating minor wounds or providing basic pain medication.
- The location of the capture will be recorded and provided to the vet or wildlife carer upon delivery of the injured animal.
- Injured animals will be handled such that additional injury or stress will be minimised, this includes:
- Using towels or soft blankets to support the animal.
- Maintaining a firm, supportive grip.
- Keeping the animal in a quiet location, at the correct temperature.
- Suitable carry enclosures will be used specific to the injured animal such as cloth bags for mammals and reptiles, large, secure cages for medium sized mammals and plastic containers for amphibians.

- Transportation will occur in an air-conditioned vehicle with the animal suitably restrained to avoid escape during transport.
- Release of rehabilitated fauna will take place at least 50 m from the Disturbance Footprint, in the same area as where it was captured and in suitable habitat for the species. Release must be undertaken in consideration of the species behavioural characteristics (i.e. nocturnal fauna must be released after dusk; diurnal fauna must be released a minimum of two hours prior to sunset to ensure animals can seek suitable refuge).

Veterinary services and wildlife carer details for the Rockhampton region are provided in **Table 5.3**.

Table 5.3 Wildlife Carer and Veterinary Services of the Rockhampton Region

Vet / Wildlife Carer	Phone Number	Address
RSPCA Rockhampton	1300 264 625	391 Yaamba Rd, North Rockhampton QLD 4701
Hope Animal Sanctuary and Rescue Inc	0427 028 704	n/a
Alma Street Veterinary Hospital	(07) 4922 8138	67 Alma St, Rockhampton QLD 4700
Wildlife Rockhampton	0429 469 453	PO Box 2066 Wandal QLD 4700

5.3 Pre-clearance Survey Methodology

Pre-clearance surveys are ecological surveys that will be undertaken no later than three months prior to clearing works and the permanent removal of vegetation. The following will be conducted prior to and during the pre-clearance surveys within the Disturbance Footprint:

- Field surveys will be led by suitably qualified ecologists² and will include:
 - Identify and mark high-value fauna microhabitat features (i.e. hollow bearing trees; hollow logs; boulder piles) and potential or active breeding places (which are to be managed under an appropriate DES SMP) to be avoided or managed during clearing.
 - Opportunistic threatened and migratory fauna identification. Any individuals observed will be recorded including number of individuals, behaviour at the time of observation (i.e. foraging, roosting, dispersing) and GPS location.
 - All pest fauna species encountered during opportunistic pre-clearance surveys will be recorded including number of individuals, behaviour at the time of observation and GPS location.

² A suitably qualified ecologist is a person who possessed a degree in environmental planning, environmental science, environmental management or similar from a recognised tertiary institution, and has at least five years of relevant experience in environmental assessment.

5.3.1 Pre-clearance Surveys Constraints Protocol – Collared Delma

To mitigate impacts for collared delma, the Project has committed to a constraints protocol in the event of an unexpected find during construction. This commitment relates to approval applications made under the EPBC Act, given the cryptic nature of the species.

The trigger to undertake the pre-clearance surveys constraints protocol is the observation of one or more individual of a collared delma within the Disturbance Footprint during future surveys or construction. If the species is found, the constraints protocol below will then be followed.

- **STEP 1:** Halt construction/clearing activities in the area (i.e. adjacent areas within the Disturbance Footprint where suitable habitat is present – to be determined by a suitably qualified ecologist).
- **STEP 2:** Undertake investigation into potential impacts on the species. This should include:
 - Updating of habitat mapping.
 - Updating of Significant Residual Impact Assessment.
 - Determination of avoidance and mitigation strategies.
- **STEP 3:** Communicate outcomes with DES/DCCEEW and determine next steps as required.

6.0 Compliance Management

6.1 Training Requirements

Training will be undertaken to ensure site personnel are familiar with the content and requirements of this PFMP. The site manager will be responsible for ensuring individuals are aware of their responsibilities and reporting requirements. The following training requirements will be provided, at a minimum, to all site personnel:

- Environmental induction.
- Environmental awareness training.
- Daily tool-box talks.

Site inductions and toolbox talks will be used as implementation methods before commencing work on site.

6.2 Relevant Permits and Licences

Permits and licences required to undertake activities outlined in this plan include:

- Animal Welfare and Ethics, administered by the Queensland Department of Agriculture and Fisheries (DAF) under the *Animal Care and Protection Act 2001*.
- Scientific Purposes Permit, administered by DES under the NC Act.
- DES Low Risk and High Risk Species Management Plan (supported by this PFMP).
- Rehabilitation permit, administered by DES under the NC Act and relevant to fauna spotter catcher activities.

6.3 Monitoring and Reporting

The mitigation and management measures outlined in **Section 5.0** will be monitored throughout the duration of the Project. Regularly monitoring the effectiveness of the mitigation and management measures allows the PFMP to be reviewed and updated if performance criteria are not being met.

As part of compliance reporting an Annual Compliance Report will be provided to DCCEEW in accordance with Project approval conditions (if obtained). It is anticipated that all actions relating to the management of fauna will be included, including any non-compliance items. Non-compliance items will also require notification to DCCEEW, where relevant.

6.3.1 Pre-construction

Table 6.1 below outlines the monitoring requirements associated with the pre-construction phase, which includes a pre-clearance survey. Refer to **Section 5.2.3** for details pertaining to the pre-clearance survey methodology.

Table 6.1 Pre-construction Monitoring Requirements

Activity	Timing	Purpose	Deliverable	Responsibility
Pre-clearance survey	To coincide with pre-clearance survey for threatened flora and vegetation as per the Project's Vegetation Management Plan (prior to commencement of site disturbance and any construction activities).	<ul style="list-style-type: none"> Identify and mark high-value fauna microhabitat features and potential or active breeding places. Opportunistic threatened and migratory fauna identification. Identification of pest fauna species. 	Pre-clearance Report	Suitably qualified ecologist
A baseline weed and pest fauna survey	To occur within six-months prior to construction	<ul style="list-style-type: none"> Establish a baseline of weed and pest fauna species occurring within the Disturbance Footprint. Baseline data will be used to compare pre and post construction assemblages of weed and pest fauna species. 	Baseline weed and pest fauna monitoring report	Suitably qualified ecologist

6.3.2 Construction and Operation

The key monitoring and reporting requirements during the construction phase relate to the monitoring of fauna and fauna habitat within areas disturbed by Project construction. The key monitoring and reporting requirements during the operation phase pertain to pest fauna monitoring and nest-box and glider pole monitoring. **Table 6.2** below contains the monitoring requirements associated with these phases.

Table 6.2 Construction and Operation Monitoring Requirements

Activity	Timing	Purpose and Requirements	Deliverable	Responsibility
Post-clearing fauna monitoring	After clearing activities have ceased in an area.	<p>Provide an update on the extent, status and condition of fauna values removed during construction. Including:</p> <ul style="list-style-type: none"> Identification and relocation of fauna microhabitat features. Details of fauna injuries or mortalities. A register of micro-habitat features identified by the fauna spotter catcher and relocated. Register of species (including threatened or migratory species) identified by fauna spotter-catcher. 	Post-clearing Monitoring Report.	Environment Officer and qualified ecologist

Activity	Timing	Purpose and Requirements	Deliverable	Responsibility
Pest fauna monitoring	Within two years of construction being completed.	Pest fauna monitoring will be undertaken to assess the degree of change between baseline pest fauna levels and post construction levels.	Pest fauna monitoring report recommending corrective actions should a significant increase in pest fauna be identified.	Environment Officer
Nest box and glider pole monitoring	Annually for two years after installation. Maintenance checks every 5 years.	<ul style="list-style-type: none"> Nest box management will be undertaken to establish the success of the installments based on the utilisation of nest boxes by greater glider/yellow-bellied glider (as well as other hollow-dependent species). Glider pole monitoring will be undertaken to assess the utilisation of glider poles by glider species. Maintenance checks will be completed every 5 years. Damaged nest boxes will be replaced or repaired. 	Fauna habitat installment utilisation report.	Suitably qualified ecologist

6.4 Roles and Responsibilities

The roles and responsibilities for Project staff are outlined in **Table 6.3** below.

Table 6.3 Roles and Responsibilities

Role	Responsibility	Duties
Project Manager	Oversees the construction and operation phases of the Project.	<ul style="list-style-type: none"> Ensure contractors and all on site personnel are given adequate training in the requirements of this PFMP. Ensure processes and procedures are in place prior to site mobilisation to ensure the successful implementation of this PFMP. Implement the monitoring program, outlined in Section 6.2. Record any non-compliance and corrective actions undertaken. Report to administrating authorities where required.
Construction Manager	Oversees site construction and reports to the Project Manager.	<ul style="list-style-type: none"> Ensure the implementation of this PFMP and the CEMP throughout the construction phase.

Role	Responsibility	Duties
Environment Officer or suitable delegate	Ensures the implementation of this PFMP through the construction and operation phases. Reports to the Project Manager.	<ul style="list-style-type: none"> Notify the Project Manager of any environmental incidents/ non compliances that occur on site. Audit site works in accordance with this PFMP. Notify the Project Manager on project progression. Undertake environmental monitoring and reporting, where applicable.
Rehabilitation Contractor	Undertakes rehabilitation works. Reports to the Environment Officer.	<ul style="list-style-type: none"> Undertake rehabilitation works as per the requirements of this PFMP and the Rehabilitation Management Plan to be developed.
Suitably Qualified Ecologist	Provides independent ecological expertise. Reports to the Environment Officer.	<ul style="list-style-type: none"> Undertake pre-clearance surveys and baseline monitoring as per the requirements of this PFMP. Undertake ecological monitoring and reporting, where applicable.
Fauna Spotter Catcher	Undertakes management and relocation of fauna during vegetation clearing.	<ul style="list-style-type: none"> Undertake an assessment of the clearing area to identify important habitat features prior to the commencement of clearing activities. Responsible for the safe handling and relocation of fauna species associated with vegetation clearing activities.
All Project personnel	Construction, operation, and maintenance. Reporting requirements will differ depending on Project roles.	<ul style="list-style-type: none"> Report environmental incidents and non-compliance to the Environment Officer. Undertake site and role specific training. Follow the requirements outlined in this PFMP.

6.5 PFMP Amendments and Corrective Actions

The PFMP is a dynamic document that requires review and amendment throughout the life of the Project to ensure the measures within remain effective. It is recommended that a suitably qualified person will update this plan:

- When additional ecological data relevant to the protection of threatened fauna values is collected for the Project.
- Where there is significant change to the Project schedule, Disturbance Footprint or a change in the construction methods.
- When an incident occurs that is reportable, such as the injury or mortality of a threatened or migratory fauna species or the identification of a threatened or migratory fauna species that has not been identified in this plan.
- Where a change in legislation or best practice methodology has been identified.

To ensure compliance with this PFMP, a schedule of obligations will be developed to outline all obligations and track how obligations are being met.

During the Project lifecycle corrective actions should be implemented if the performance criteria and management objectives outlined in **Section 5.1** are not being adhered to, when undertaking monitoring activities outlined in **Table 6.1** and **Table 6.2**. The Project Manager and the Construction Manager will be notified within one week of each monitoring event (outlined in **Section 6.2**) if any of the following triggers in **Table 6.4** occur, resulting in non-compliance.

Table 6.4 Corrective Actions

Risk/ threat	Trigger	Corrective Action
Fauna habitat loss, habitat fragmentation or degradation	Clearing of fauna habitat outside of the Disturbance Footprint or approved clearing limits exceeded	<ul style="list-style-type: none"> Notify the Project Environmental Officer. Immediately stop work and review clearing procedures. Re-train site personnel on clearing procedures. Install additional fencing or flagging to reinforce no go areas. Undertake toolbox talks and re-educate site personnel on site practices management obligations.
Loss of individual threatened fauna	Threatened fauna species killed during Project works	<ul style="list-style-type: none"> Assess mitigation and management procedures and update PFMP as necessary. Relevant notification procedure to DCCEEW or DES if a threatened fauna species is killed. Bird and bat notification procedures provided in the Project's BBAMP. Install additional control measures such as additional fencing, signs, and flagging tape. Undertake toolbox talks and re-educate site personnel on site practices management obligations.
Loss of native fauna	Native fauna injured or killed by Project activities	<ul style="list-style-type: none"> Injured fauna are to be managed in accordance with the Injured Fauna Procedure (Section 5.2.4). Events of injury or mortality will be recorded and reported to the Environmental Officer. Assess mitigation and management procedures and update PFMP as necessary.
Introduction and exacerbation of pest fauna species	Increased encounters of pest fauna species (cane toad, horse, feral cat, feral pig, black rat, brown hare)	<ul style="list-style-type: none"> Develop a species-specific control program necessary for managing the pest species population. Review and update the species-specific control program as necessary.
Facilitation of breeding for cane toads	Evidence of cane toads breeding in Project water storage (egg strings or tadpoles identified)	<ul style="list-style-type: none"> Review management and mitigation strategies and update as necessary. Minimise opportunities for water to pond.

Risk/ threat	Trigger	Corrective Action
Loss of native fauna and fauna habitat as a result of bushfire	Bushfire occurring due to project activities.	<ul style="list-style-type: none"> Rehabilitate impacted areas as per the Project's PVMP. Process injured fauna as per the Injured Fauna Procedure in Section 5.2.4. Review the cause of the incident and any immediate actions taken. Review relevant procedures and update where necessary. Re-educate / train site personnel on management requirements, practices and site rules.

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