Theodore Wind Farm

Ecological Assessment Report

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Theodore Energy Development Pty Ltd (TED)

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Theodore Wind Farm

Ecological Assessment Report

0661076





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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
ALA	Atlas of Living Australia
BACI	Before and After Control Impact
BBMP	Bird and Bat Management Plan
BSC	Banana Shire Council
BUS	Bird Utilisation Survey
CRM	Collision Risk Modelling
DAF	Department of Agriculture and Fisheries
DAMS	Development Assessment Mapping System
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEHP	Department of Environment and Heritage Protection
DESI	Department of Environment, Science and Innovation
DIWA	Directory of Important Wetlands in Australia
DoEE	Department of Environment and Energy (now DCCEEW)
DoR	Department of Resources
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning (now Department of Housing, Local Government, Planning and Public Works)
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERM	Environmental Resources Management Australia Pty Ltd
Fisheries Act	*Fisheries Act 1994*
FMP	Fauna Management Plan
HES	High Ecological Significance
HEV	High Ecological Value
LC	Least Concern
LGA	Local Government Area
MCU	Material Change of Use
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
MW	Megawatt
NC Act	*Nature Conservation Act 1992*
OC	Of Concern
PA	*Planning Act 2016*
PMST	Protected Matters Search Tool

Acronyms	Description
PR	*Planning Regulation 2017*
RE	Regional Ecosystem
RSA	Rotor Swept Area
SDAP	State Development Assessment Provisions
SEVT	Semi-Evergreen Vine Thicket
SIG 1.1	Significant Impact Guidelines 1.1 - Matters of National Environmental Significance
SLC	Special Least Concern
SPA	*Sustainable Planning Act 2009*
SPRAT	Species Profile and Threats Database
SRI	Significant Residual Impact
TEC	Threatened Ecological Community
VM Act	*Vegetative Management Act 1999*
VMP	Vegetation Management Plan
Water Act	*Water Act 2000*
WO	Wildlife Online
WONS	Weeds of National Significance
WTG	Wind Turbine Generator

EXECUTIVE SUMMARY

Theodore Energy Development Pty Ltd (TED) / (the Proponent) is developing the Theodore Wind Farm (Proposed Action) approximately 22 km east of the township of Theodore, 50 km south-west of Biloela and 150 km south-west of Gladstone in the Banana Shire Council Local Government Area. The Proposed Action consists of up to 170 wind turbine generators (WTG), and ancillary infrastructure including, but not limited to, access tracks, substations, overhead and underground electrical cabling, hardstands, and an operation and maintenance compound. The Proposed Action is located across three properties comprising approximately 46,830 ha (Study Area).

The Study Area is within a landscape dominated by agriculture, with a history of pastural use and associated industries such as logging for the creation of agricultural related infrastructure and amenities (e.g. fences, gates, cattle yards and firewood), vegetation clearing for grazing lands and access tracks. Present land use is still predominantly for cattle grazing purposes. The Study Area is largely characterised by cleared pastural areas which account for approximately 22,562.1 ha of the 46,830 ha Study Area (approximately 48%). These pastural areas are typically dominated by native and exotic grass cover, also including environmental and invasive weeds (Weeds of National Significance and Biosecurity Matters listed under the *Biosecurity Act 2014*), with occasional sparse to very sparse native vegetation. Clearing for agricultural uses is most prominent in the centre and north of the Study Area, where remnant vegetation is scarce.

Southern portions of the Study Area contain a greater cover of mature woody vegetation. However, these portions still exhibit varying degrees of historic clearing and cattle grazing, evidenced from ringbarking, cut stumps, under scrubbing and incursions of weeds. These areas are largely defined by open eucalypt woodland, riparian woodland in stream corridors and some small, isolated areas of dry rainforest and vine thickets (generally devoid of eucalypts).

The preliminary Development Footprint, under the current Preliminary Design phase for the Proposed Action, is expected to encompass 1,932.2 ha (approximately 4.1% of the Study Area).

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by the Proponent to undertake an Ecological Assessment Report for the Proposed Action. This report presents the findings of ecological assessments based on multiple field surveys within the Study Area and undertake an assessment of potential impacts of the Proposed Action to Matters of National Environmental Significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Matters of State Environmental Significance (MSES) defined in Schedule 2 of the Queensland *Environmental Offsets Regulation 2014*.

Ecological Assessment and Field Surveys

Comprehensive desktop investigations using publicly available databases and eight field survey events have been completed to describe ecological values of the Study Area and to inform avoidance and minimisation measures during the design phase for the Proposed Action and also to support an assessment of the impacts of the Proposed Action.

The Study Area is located in the Brigalow Belt South bioregion as defined by the Interim Biographic Regionalisation of Australia (IBRA) framework and includes a range of landscape features, vegetation communities and habitats typical of the region. The Study Area contains stream order 1-5 watercourses mapped under the *Vegetation Management Act 1999* (VM Act). Impacts within these watercourses will be limited to linear infrastructure such as access tracks and underground/overhead electrical reticulation. Grazing pressures in the adjacent alluvial plains have had a considerable impact on these watercourses and in particular permanent water sources including farm dams, drainage lines, creeks and rivers bisecting the Study Area where clearing has enabled grazing access.

There are existing made and unmade road reserves and farm access tracks which traverse watercourses and generally fragment the present landscape. These access tracks, given their disturbed nature and where reasonably practicable, have been sought for use as access for the Proposed Action to reduce additional fragmentation which may result from development.

Field surveys determined the classification of six broad habitat types within the Study Area. These were defined based on the observed vegetation community types and their associated ecological structure, condition, and function within the landscape. These broad habitat types provide foraging, breeding, roosting and dispersal functions for listed threatened species that are known, likely or have the potential to occur within the Study Area. Ground-truthed habitat mapping for MNES and NC Act listed threatened species has been prepared and is underpinned by the broad habitat types and further refined by the application of specific habitat attributes intrinsic to each respective protected matter. Habitat mapping has been prepared in accordance with relevant survey and impact assessment guidelines.

The six broad habitat types within the Study Area include:

- Grasslands and cultivated agricultural land;
- Eucalypt woodland and open forest;
- Brigalow woodlands;
- Riparian woodlands;
- Vine forest/ thickets and dry rainforest; and
- Waterbodies and drainage features.

A likelihood of occurrence assessment (LoO) has determined four EPBC Act listed threatened species as known or likely to occur within the Study Area. These include koala, squatter pigeon (southern), greater glider (southern and central) and large-eared pied-bat. One listed migratory species is likely to occur and is the satin flycatcher. An additional 10 listed threatened species and two listed migratory species have been considered potential to occur.

Two EPBC Act listed Threatened Ecological Communities (TEC) were determined as known to occur, Brigalow (*Acacia harpophylla* dominant and co-dominant) and Poplar Box Grassy Woodland on Alluvial Plains.

MSES identified as known or likely to occur in the Study Area include the koala (known), squatter pigeon (southern) (known), greater glider (known), the large-eared pied-bat (likely), golden-tailed gecko and Category B and Category R regulated vegetation.

MNES and MSES values known and likely to occur within the Study Area have been mapped and provided to the engineering design team to assist in design-phase avoidance and minimisation measures through layout optimisation.

Potential Impacts and Measures to Avoid Impacts

The disturbance footprint (including location of wind turbine generators (WTGs), access tracks, batching plant, laydown areas, substations etc.) was refined as part of an iterative process and informed by the presence of ecological values related to MNES and MSES. The objective of the design process has primarily been to maximise access to wind resources with a conscious and deliberate consideration for the avoidance of ecological values where reasonably practicable. Importantly, a commitment to pre-clearance surveys, prior to construction of the Proposed Action, will support micro-siting and adjustments of infrastructure to further avoid MNES and MSES. Potential impacts associated with the Proposed Action are summarised below.

MNES

Estimated impacts to MNES species and communities that are known, likely or have the potential to occur include:

Known

- Poplar Box Grassy Woodland on Alluvial Plains TEC – 8.2 ha of clearing to mapped TEC;
- Koala – as a result of targeted surveys across multiple field surveys and seasons, evidence of koala use in the Study Area is limited, and generally absent from large areas of suitable habitat. Despite this, koala habitat has been conservatively mapped in the Study Area. The Proposed Action will result in the clearing of 867.9 ha of preferred foraging and breeding habitat, 16.4 ha of general foraging and breeding habitat, as well as disturbance to 316.1 ha of dispersal habitat;
- Squatter pigeon (southern) – Targeted surveys across multiple field surveys and seasons found evidence of squatter pigeons across the Study Area, albeit with only occasional observations indicating a low population density. The Proposed Action will result in the clearing of 437.2 ha of foraging and roosting habitat and 524.0 ha of breeding habitat; and
- Greater glider (southern and central) – targeted surveys for the greater glider, including spotlight surveys and surveys for hollow bearing trees determined that the species occurs across the Study Area, but with limited denning and breeding habitat largely confined to remnant vegetation associated with waterways. The Proposed Action will result in clearing of 861.9 ha foraging habitat and 15.5 ha of denning and breeding habitat.

Likely

- Brigalow (*Acacia harpophylla* dominated and co dominated) TEC – 8.5 ha of clearing to mapped TEC;
- Large-eared pied-bat – While no records are known for the species within the Study Area, and no direct observations from targeted surveys, records occur for the species in the Locality. The Proposed Action will result in the clearing of 886.3 ha of potential foraging habitat; and
- Satin flycatcher – clearing of 19.6 ha of foraging and roosting habitat.

Potential

- White-throated needle tail – impact is aerial only – no clearing impact;
- Black-breasted button quail – disturbance to 3.1 ha to foraging and breeding habitat;
- Australian painted snipe – disturbance to 1.3 ha to foraging habitat;
- Yellow-bellied glider – disturbance to 303.1 ha to potential foraging and breeding habitat;
- *Cossinia australiana* – disturbance to 3.1 ha to potential habitat;
- *Cadelia pentastylis* – duisturbance to 3.1 ha to potential habitat;
- *Solanum dissectum* – disturbance to 8.7 ha to potential habitat;
- *Rhaponticum australe* – disturbance to 886.3 ha to potential habitat;
- Solanum johnsonianum – disturbance to 8.7 ha to potential habitat; and
- Xerothamnella herbacea – disturbance to 8.7 ha to potential habitat.

MSES

- Regulated Vegetation that is Category B – Endangered REs (1.68 ha) and Of Concern REs (7.2 ha) (no RE will be entirely removed from the Study Area, with the highest percentage of clearance being 0.2% of the RE);
- Regulated Vegetation that is Intersecting a Watercourse (6.08 ha);
- Essential Habitat (no impact);
- Connectivity areas (assessed);
- Koala – (as detailed above);
- Greater glider (southern and central) – (as detailed above);
- Large-eared pied-bat – (as detailed above); and
- Golden-tailed gecko - (14,720 ha).

After the completion of a collision risk assessment and collision risk modelling (CRM), one MNES or MSES listed bird or bat species, white-throated needletail, was considered at moderate risk, and five species, large-eared pied-bat, grey falcon, red goshawk, fork-tailed swift and curlew sandpiper, were considered at low risk. All other MNES or MSES listed bird or bat species were considered to be at negligible risk of collision. Additionally, 21 least-concern species were also considered to be at low risk of collision after being included within the collision risk assessment due to the species being known to fly within or around the rotor swept area.

Of the species considered to be at low or moderate risk of collision, eight had sufficient observations from bird utilisation surveys be included within the collision risk modelling. These species included nankeen kestrel, wedge-tailed eagle, brown falcon, whistling kite, galah, rainbow lorikeet, sulphur-crested cockatoo and torresian crow. The collision risk model completed for these eight species indicated less than one individual bird collision will occur per year from the operation of the Proposed Action.

Significant Impact Assessment

Impact assessments were undertaken against the relevant MNES and MSES impact assessment guidelines under the EPBC Act and *Significant Residual Impact Guideline* (SRI Guideline) (DEHP, 2014).

From this assessment, it was concluded that four EPBC Act listed species that are known or likely to occur in the Study Area, squatter pigeon (southern), koala, greater glider (southern and central) and large-eared pied-bat, are likely to or have the potential to be significantly impacted by the Proposed Action.

Two EPBC Act listed TECs, Brigalow (*Acacia harpophylla* dominated and co dominated) and Poplar Box Grassy Woodland on Alluvial Plains, have been concluded as likely to be significantly impacted by the Proposed Action.

Additionally, it was concluded that the Proposed Action will have a significant residual impact to five MSES listed threatened species assessed as known or likely to occur within the Study Area: (squatter pigeon (southern), koala, greater glider (southern and central), large-eared pied-bat and golden-tailed gecko), as well as to category B regulated vegetation, regulated vegetation intersecting a watercourse, and connectivity areas within the Study Area.

Where significant impacts to MNES cannot be avoided, the Proponent is committed to offsetting the residual impacts to the relevant MNES and MSES, as part of a land-based offset-strategy in accordance with the EPBC Act, detailed in an Offset Management Strategy (OMS).

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) has been engaged by Theodore Energy Development Pty Ltd (TED) / (the Proponent) to prepare an Ecological Assessment Report (Report) for the proposed Theodore Wind Farm located approximately 22 km east of the township of Theodore, Queensland (herein referred to as the Proposed Action).

This Report has been prepared for the area considered for the Proposed Action (herein referred to as the 'Study Area'). The Report will be used to:

- Describe relevant biodiversity values within the Study Area;
- Inform avoidance measures for layout design;
- Mitigate impacts during the construction and operation phases of the development; and
- Support planning applications required for the Proposed Action.

The location of the Study Area and its regional context are provided in Figure 1-1.

This Report outlines the results of the desktop assessment and findings from eight field survey events undertaken in October 2022, February, March, June, September/October and December 2023, February 2024 and June 2024. The aim of this Report is to describe the existing vegetation communities and habitats for listed threatened and/or migratory species that occur or have the potential to occur within the Study Area, including an assessment of bird utilisation and collision risk. The focus of the assessment includes:

- Matters of National Environmental Significance (MNES): threatened ecological communities (TECs), flora and fauna listed as threatened and/or migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act);* and
- Matters of State Environmental Significance (MSES): Vegetation communities, flora and fauna listed under the Queensland *Vegetation Management Act 1999 (VM Act)* and/or *Nature Conservation Act 1999 (NC Act).*

Assessment of impacts to relevant MNES and MSES has been undertaken in Section 7, in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (SIG 1.1) (DoE, 2013)*, the Queensland Environmental Offsets Policy 2014 for Significant Residual Impacts* (SRI) and *State Code 23: Wind farm development* (State Code 23).

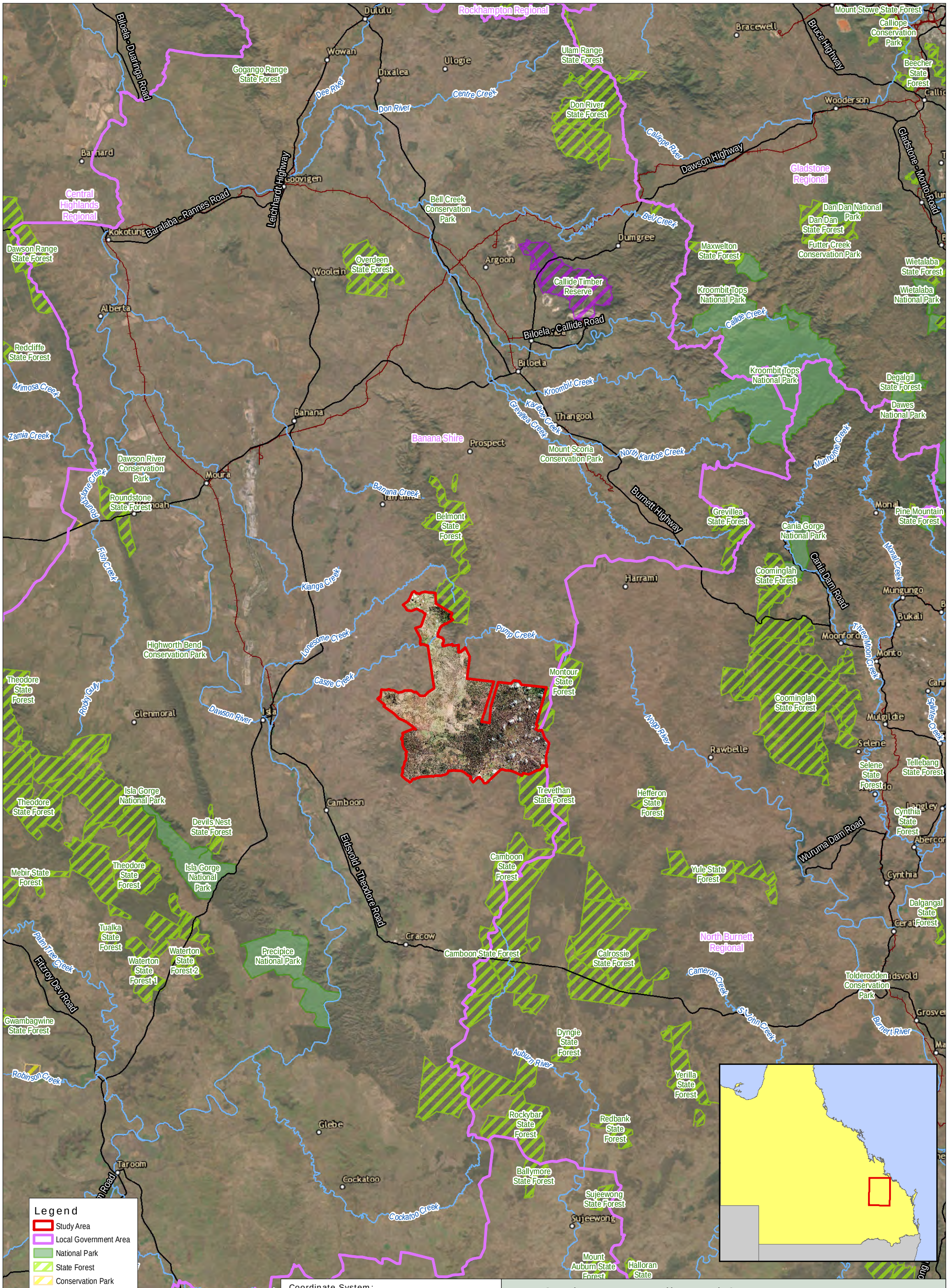
1.1 OBJECTIVES

The purpose of this Report is to document existing ecological values relevant to MNES, MSES within the Study Area. The specific objectives are to:

- Present the results of the EPBC Act Protected Matters Search Tool (PMST), WildNet and other relevant desktop sources to identify MNES and MSES known, likely, or potentially occurring within the Study Area;
- Identify the likelihood of occurrence of listed threatened species and their associated habitat in the Study Area, based on desktop and field collected information;
- Describe and map habitats of MNES and MSES, based on desktop and field collected information;

- Assess the quality and importance of known or potential habitat for MNES and MSES within the Study Area; and
- Complete an impact assessment in accordance with SIG 1.1 (DoE, 2013) and SRI Guideline (DEHP 2014) for all known, likely and potentially occurring MNES ad MSES.

The information collected, and assessment undertaken as part of this Report will be used to inform the Proposed Action layout design and maximise the reduction or avoidance of impacts, where possible.


Dululu
Rockhampton Regional
Mount Stowe State Forest
Bracewell
Calliope Conservation Park
Bruce Highway
Biloela - Duaringa Road
Wowan
Gogango Range State Forest
Dixalea
Ulogie
Ulam Range State Forest
Beecher State Forest
Dee River
Centre Creek
Don River
Don River State Forest
Wooderson
Barnard
Calliope River
Dawson Highway
Gladstone - Monto Road
Gladstone Regional
Leichhardt Highway
Goovigen
Central Highlands Regional
Bell Creek Conservation Park
Baralaba - Rannes Road
Kokotungo
Dan Dan National Park
Dan Dan State Forest
Futter Creek Conservation Park
Bell Creek
Dumgree
Dawson Range State Forest
Overdeen State Forest
Argoon
Maxwelton State Forest
Wietalaba State Forest
Wietalaba National Park
Woolein
Callide Timber Reserve
Kroombit Tops National Park
Alberta
Callide Creek
Biloela - Callide Road
Redcliffe State Forest
Biloela
Mimosa Creek
Kroombit Creek
Kroombit Tops National Park
Degalgil State Forest
Dawes National Park
Grevillea Creek
Karboe Creek
Thangool
Zamia Creek
Banana
Banana Shire
Prospect
Mount Scoria Conservation Park
North Kariboe Creek
Munhojne Creek
Dawson River Conservation Park
Moura
Stone Creek
Roundstone State Forest
Banana Creek
Burnett Highway
Grevillea State Forest
Monal
Pine Mountain State Forest
Belmont State Forest
Cania Gorge National Park
Fish Creek
Kianga Creek
Harrami
Coominglah State Forest
Cania Dam Road
Mungungo
Bukali
Lonesome Creek
Pump Creek
Moonford
Three Moon Creek
Monto
Highworth Bend Conservation Park
Theodore State Forest
Montour State Forest
Casye Creek
Rocky Gully
Glenmoral
Dawson River
Isla
Coominglah State Forest
Mulgildie
Splitter Creek
Nogo River
Rawbelle
Selene
Selene State Forest
Tellebang State Forest
Isla Gorge National Park
Theodore State Forest
Trevethan State Forest
Hefferon State Forest
Camboon
Devils Nest State Forest
Langley
Cynthia State Forest
Eidsvold - Theodore Road
Wuruma Dam Road
Mebir State Forest
Theodore State Forest
Isla Gorge National Park
Camboon State Forest
Yule State Forest
Cynthia
Tualka State Forest
Palm Tree Creek
Fitzroy Dev Road
Waterton State Forest 1
Waterton State Forest 2
Precipice National Park
Cracow
Camboon State Forest
Calrossie State Forest
North Burnett Regional
Cameron Creek
St John Creek
Tolderodden Conservation Park
Eidsvold
Burnett River
Gwambagwine State Forest
Dyngie State Forest
Auburn River
Yerilla State Forest
Robinson Creek
Glebe
Rockybar State Forest
Redbank State Forest
Taroom
Ballymore State Forest
Cockatoo
Sujeewong State Forest
Cockatoo Creek
Sujeewong
Mount Auburn State Forest
Halloran State
Grosmont
Legend
Study Area
Local Government Area
National Park
State Forest
Conservation Park
Resources Reserve
Major Watercourse
State Controlled Road
Railway
Coordinate System:
GDA2020 MGA Zone 56
Date: 24/05/2024
Created By: SP
Drawing Size: A3
0 5 10 15km
1:600,000
1.1 -Study Area Locality and Context
Theodore Wind Farm Impact Assessment Report
RWE Renewables
ERM
0661076_EAR_G001_R4.mxd

1.2 PROPOSED ACTION DESCRIPTION

1.2.1 STUDY AREA AND CONTEXT

The Study Area is approximately 46,830 ha in size and is located 22 km to the east of the township of Theodore, and approximately 50 km south of Biloela in the Banana Shire Council Local Government Area (LGA), Central Queensland. The Study Area lies adjacent to and within the locality (10 km) of several state forests including Belmont State Forest to the east, Montour State Forest to the north and Trevethan State Forest to the south of the Study Area (Figure 1-1).

The Study Area is comprised of 9 lots on 3 properties. The lot on plans are outlined below in Table 1-1 and displayed on Figure 1-1.

TABLE 1-1 RELEVANT STUDY AREA LAND PARCELS

Property	Lot on Plan
Landowner 1	Lot 4 on SP131475 Lot 2 on RP617749 Lot 1 on RP617748 Lot 8 on DW2
Landowner 2	Lot 17 on DW49 Lot 18 on DW550
Landowner 3	Lot 11 on DW446 Lot 19 on DW551 Lot 20 on SP100500
Road Reserves	Part of Defence Road Part of Crowsdale Camboon Road Unnamed Road Reserves
Total Study Area	46,830 ha

The Study Area occurs within the Banana Shire Council LGA and is zoned as Rural under the Banana Shire Council Planning Scheme 2017. Cattle grazing is the dominant land use in the Study Area, with largely cleared areas associated with lower slopes dominating the landscape.

The Study Area is located within the Southern Brigalow Belt bioregion as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) framework. Ecological and topographical features observed within the Study Area are typical of the region and include eucalypt dominated open forest and woodlands on alluvial plains and igneous rock. Open forests and woodlands consistent with this bioregion are generally observed in the south of the Study Area. In the north, the landscape is characterised by non-remnant grasslands with historic land clearing and severe dieback.

Access to the Study Area is from Lyndale Road to the north, Defence Road from the west, and via Crowsdale-Camboon Road from the centre of Study Area. Throughout the duration of the construction and operational phases of the Proposed Action, host properties are able to continue to use land for agricultural activities throughout the life of the Proposed Action and it is anticipated that tracks established during construction of the Proposed Action will aid in continued agricultural activities.

1.2.2 PROPOSED ACTION SPECIFICATIONS

The Proposed Action consists of up to 170 Wind Turbine Generators (WTGs), with a tip height up to 270 m and rotor diameter of up to 175 m, along with the following associated infrastructure:

- WTG foundations and hardstand areas;
- Temporary infrastructure such as concrete batching plants, laydown areas, temporary construction offices and parking and on-site accommodation;
- Access tracks and electrical reticulation;
- Switching stations and substations;
- Battery Energy Storage Systems (BESS);
- Temporary and Permanent meteorological masts; and
- Permanent operation and maintenance facilities, with a variety of associated site facilities and storage laydowns around the proposed site.

The infrastructure design has been refined through an iterative process including environmental, wind resource, constructability, landholder, traditional owner, and transmission network considerations. The design refinement process focused on the avoidance and minimisation of environmental impacts through the various stages of layout planning and the coordination of these aspects with engineering design and wind resource restrictions.

The Proposed Action is proposed to be connected to the grid network via the Banana Range Substation approx. 40 km north of the Study Area, with the transmission line to be under separate ownership and subject to separate EPBC Act Referral and approval processes.

The final selection of turbine locations and dimensions will be determined as part of the detailed design. However, the Study Area has been designed to accommodate the following maximum turbine dimensions (Table 1-2) so that potential impacts on environmental values can be properly considered.

TABLE 1-2 KEY GENERATION AND WTG SPECIFICATIONS

Feature	Statistic
Estimated Proposed Action generation capacity	1152 MW *
WTG electrical output	Up to 8 MW
Number of WTGs	Up to 170
Hub height	Up to 185m
Tip height**	Up to 270 m
Rotor diameter**	Up to 175 m

**The actual output of the wind farm will depend on the size and type of WTG chosen during the detailed design phase. Regardless of the size of the wind farm generation capacity, the Proposed Action will still need to comply with the Queensland Wind Farm State Code and supporting Planning Guidelines, particularly in relation to acoustic amenity and setback criteria.*
***The maximum specifications listed in the table provides represents a "worst case scenario for impact assessment" and provides flexibility for any innovation in WTG design between now and the time of detailed design and construction.*

1.3 PROPOSED ACTION DEVELOPMENT FOOTPRINT

The Development Footprint, at the Preliminary Design scenario, is anticipated to cover approximately 1,932.2 ha. The Development Footprint will be refined through the detailed design phase as well as being adjusted following design maturity, WTG turbine model selection and ground condition proofing. The assessment of impacts presented in this Report has been prepared based on this maximum Development Footprint. Table 1-3 provides an indicative overview of the dimensions and specifications of current Proposed Action design components.

It should be noted that existing land management practices will be largely unaffected by the Proposed Action, host properties are able to continue to use land for agricultural activities throughout the life of the Proposed Action. The Proponent is committed to ensuring that decommissioning is conducted in accordance with best practice and may investigate the opportunity to repower the Proposed Action with new WTGs in the first instance. Where repowering is not possible or at decommissioning the Proponent will commit to reinstating disturbed land. Rehabilitation of disturbed land will achieve a condition similar to pre-construction, or where more appropriate, pre-decommissioning state, where reasonably practicable. This is in accordance with best practice and compliance for approval conditions. The Proponent maintains decommissioning bond clauses in landholder contracts, with options for landholders to retain access tracks and hardstands to benefit agricultural operations.

TABLE 1-3 INDICATIVE PROPOSED ACTION COMPONENT DIMENSIONS (AT PRELIMINARY DESIGN)

Proposed Action Component	Dimensions*
Non-Linear Infrastructure	
WTG Hardstand**	Up to 2.67 ha per hardstand
Internal substation	4 No. 130 x 130
Batch Plant	5 No. 150 x 150m
O&M Compound	3 No. 210 x 210m
Construction Site Compound	3 No. 210 x 210m
Laydown/Bench Locations *(x3)***	3 No. 400x500m 2 No. 300x400m 1 No. 150x150m
Battery Energy Storage System (BESS)	Within Substation/Switching Station footprint
Met Masts	0.45 ha
Linear Infrastructure	
Access Corridors	40 m width
Internal 33kV underground cable reticulation system	30 m width
Internal 33kV overhead cable system	30 m width

*All dimensions are subject to change and further design refinement during the detailed design phase prior to construction. Access corridor widths are likely to decrease.

**WTG hardstand sizing may vary depending on geotechnical conditions at each WTG and shall be developed as part of detailed design following the completion of geotechnical investigations.

***Laydowns have been sized to allow for potential direct delivery and stockpile of WTG components for approximately 60 WTGs during construction and may be reduced pending further development of the construction programming and methodology. Laydowns have typically been placed outside of areas of regulated vegetation

2. LEGISLATIVE AND POLICY CONTEXT

This Report has been undertaken with consideration for Commonwealth, State and Local regulatory frameworks and associated legislation. Table 2-1 summarises the relevant legislation and policies to this Report.

TABLE 2-1 KEY LEGISLATION AND POLICIES

Act/Policy	Administering Authority	Purpose
Commonwealth Legislation		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	This EPBC Act administers the protection of the environment within Australia – in particular Matters of National Environmental Significance (MNES), which include: • World heritage properties; • National heritage properties; • Wetlands of international importance; • Threatened species and ecological communities; • Migratory species; • Commonwealth marine areas; • The Great Barrier Reef Marine Park; • Nuclear Actions (include. uranium mines); and • Water Resources.
EPBC Act Environmental Offsets Policy 2012	DCCEEW	This policy applies where a significant impact on an MNES is expected to occur as a result of the Proposed Action. The policy provides guidance on the role of offsets and when a proposed offset is considered suitable.
State Legislation		
Planning Act 2016 (Planning Act) *Planning Regulation 2017* (Planning Regulation)	Department of State Development, Infrastructure, Local Government and Planning (DSDILGP)	The Planning Act guides Development within Queensland, while the Planning Regulation provides the operational requirements for the Planning Act. Under the Planning Regulation the Proposed Action will trigger a Material Change of Use (MCU) application and will be assessed by the State Assessment and Referral Agency (SARA) as an Assessment Manager, rather than a local planning scheme. Additionally, a trigger for vegetation clearing will require a referral to SARA separately, where an MCU is proposed on a lot that is 5 ha or larger per Schedule 10, Part 3, Section 5, Division 4, Table 1 – Assessable Development under Section 5.

Act/Policy	Administering Authority	Purpose
State Development Assessment Provisions (SDAP), State Code 23: Wind Farm Development ("State Code 23")	DSDILGP	State Code 23 specifically relates to wind farm development and provides guidance regarding ecological assessment requirements. The Report is required to identify and assess the risk to flora, fauna and associated ecological systems and processes. It is then required to determine how this risk may be mitigated or managed, through siting and design of the Proposed Action. Under State Code 23, the assessment must contain the following: • Desktop review of available information to identify birds and bat species that may be impacted by the Proposed Action, including obstruction of and proximity to flight paths (addressed in Section 4 of this Report); • Field surveys to map the vegetation and identify flora and fauna species including corridors (addressed in Section 3 and Section 4 of this Report); • Review of vegetation and corridors including worst-case scenario impacts to regulated vegetation and locally significant vegetation (addressed in Section 3 and Section 4 of this Report); • Species-specific studies to obtain more information about flora and fauna (particularly birds and bats) that may be at risk from the Proposed Action (addressed in Section 3, and Section 4 of this Report); • Avoidance, mitigation and offset strategies to minimise and mitigate impacts on species (addressed in Section 6 and Section 8); • Implementation processes for monitoring programs associated with construction and operational phases (addressed in Section 6 and Section 7 of this Report); and, • Preliminary vegetation, flora and fauna, and bird and bat management plans, attached to this report and are attached as follows: ◦ Vegetation Management Plan ; ◦ Fauna Management Plan; and ◦ Bird and Bat Management Plan.

Act/Policy	Administering Authority	Purpose
State Development Assessment Provisions (SDAP), State Code 16: Native Vegetation Clearing ("State Code 16")	Department of Resources (DoR)	State Code 16 provides the assessment criteria for assessable development that is the clearing of native vegetation under the Planning Act. It aids in the application in preparing development applications for native vegetation clearing and is consistent with the VM Act. State Code 16, and the relevant provisions will be applied when assessing clearing of remnant vegetation, connectivity, and clearing of remnant vegetation intersecting a watercourse.
Nature Conservation Act 1992 (NC Act)	Department of Environment, Science and Innovation (DESI)	The NC Act and associated regulations provides a framework for the creation and management of protected areas and protection of native species. It includes designation of threatened species status and provides for protected plant trigger areas.
Vegetation Management Act 1999 (VM Act)	DoR	The VM Act is the regulatory framework for the management of vegetation using the Regional Ecosystem (RE) classification system and classification of regulated vegetation. It regulates the broad-scale clearing of vegetation, with the intent of conserving remnant vegetation, preventing the loss of biodiversity, maintaining ecological processes and allowing for sustainable use. There are clearing exemptions for some work activities.
Biosecurity Act 2014 (and Regulation)	Department of Agriculture and Fisheries (DAF)	This *Biosecurity Act 2014* provides for the management of biosecurity risks in Queensland. The Act provides measures to safeguard Queensland economy, environment, agricultural and tourism industries and way of life from pests, diseases and contaminants. Restricted matters are assigned a category (or categories) from 1 to 7, with each category placing restrictions on the dealings with the matter.
Environmental Offsets Framework (Environmental Offsets Act 2014 and Regulation, Environmental Offsets Policy Version 1.7)	DESI	An environmental offset condition may be imposed under various State assessment frameworks for an activity that will or is likely to have a significant residual impact on a prescribed environmental matter that is a MSES. There is a guideline to assist in determining whether or not a significant residual impact is likely.

Act/Policy	Administering Authority	Purpose
Fisheries Act 1994 (Fisheries Act)	DAF	The Fisheries Act provides the principal legislative framework for the regulation around fishing activities and areas that are fish habitat within a given area. This outlines how activities are to be conducted given the importance of the habitat for fish. All waters are protected against degradation by direct or indirect impacts associated with development activities. Measures designed to protect fisheries resources include the declaration of fish habitat areas, protection of marine plants and designation of waterways for fish passage.
Water Act 2000 (Water Act)	Department of Regional Development, Manufacturing and Water (DRDMW)	The Water Act provides the framework for the planning and sustainable use and management of groundwater and surface water in Queensland. It also sets up conditions and controls the activities that may impact upon water resources and quality. The DNR Watercourse Identification Map identifies watercourses and drainage features mapped under the Water Act.
Local Legislation		
Banana Shire Council (BSC) Planning Scheme 2021 (BSC Planning Scheme)	Banana Shire Council	The BSC Planning Scheme provides the framework for managing development within the local area including identifying assessable development and outcomes sought to be achieved in the Local Government Area, as the context for assessing development. One of the lots within the Study Area is currently a Grazing Homestead Perpetual Lease that is in the process of freehold conversion. All remaining participating lots are freehold tenure and are within the Rural Zone of the BSC Planning Scheme.

3. ASSESSMENT METHODS

3.1 OVERVIEW

This section outlines the methods implemented to identify ecological values in the Study Area. The methods include a desktop review to identify values that may be present, which informed the design of a field survey and sampling program to collect field data. This data was used to describe on-ground conditions and to assess the known, likely, and potential occurrence of MNES and MSES within the Study Area.

3.2 DESKTOP REVIEW

The databases and other desktop sources reviewed included State, Commonwealth and other publicly available information sources (Table 3-1). A search encompassing the Study Area and a 10 km buffer (the Locality) was utilised for database searches.

WildNet searches were produced using a central point with a buffer used to ensure searches captured WildNet database records with 10km of the Study Area at a minimum. As a result, some records captured in the search may be further than 10 km from the Study Area boundary, in particular to the east and west.

Protected Matters Search Tool (PMST) and WildNet search results are cross-referenced with Atlas of Living Australia (ALA) to further interrogate records of Matters of Significance for recency and distribution within the Locality. Search results for PMST and Wildnet are presented in Appendix B.

The desktop methods described above are in accordance with the requirements for State Code 23 for a desktop review to interrogate available information to identify species sensitive to the Proposed Action, particularly impacts to birds and bats.

Results of the desktop review were used to produce a preliminary likelihood of occurrence analysis for significant species, as detailed in Section 3.3 of this Report. Preliminary likelihood of occurrence analysis informed the methods and survey locations for targeted listed threatened species surveys. This preliminary likelihood of occurrence was then refined to produce a final likelihood of occurrence (Appendix A) informed by field survey data, based on ground-truthed habitat characteristics in the Study Area.

TABLE 3-1 DATABASES REVIEWED FOR DESKTOP ANALYSIS

Information Source	Name	Data Description
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Protected Matters Search Tool (PMST) *The PMST report for assessment was generated 19th March 2024*	The search tool provides predictive results of matters of national environmental significance based on mapping of known and potential species distribution, habitat, ecological communities and wetlands. The outputs are based on modelling results and do not necessarily reflect known records of species or communities. The features highlighted by the search are considered further through a likelihood of occurrence assessment (Appendix A). The PMST is available as Appendix B. Search area: Study Area Boundary .shp file (with a 10 km buffer, referred to as the Locality, around this area drawn in the PMST interactive search map).
Department of Resources (DoR)	Regional Ecosystem Version 13 mapping	This product maps remnant and regrowth vegetation communities across Queensland and identifies communities listed as Endangered, Of Concern or Least Concern status as defined by the VM Act.
DoR	Property Maps of Assessable Vegetation mapping (published 4 May 2017)	This product provides certified property scale maps indicating where landholders can clear regrowth in 'Category X' areas without further approval.
Queensland Government	MSES version 4.1 mapping	This product maps areas of MSES as defined under the QLD State Planning Policy.
DoR	Queensland Globe	A Queensland Government based product that allows viewing of spatial data and imagery covering Queensland.
Department of Environment, Science and Innovation (DESI)	WildNet records (WN) – Through Environmental Reports	A database that contains records of wildlife sightings including threatened flora and fauna species (protected under the NC Act) that have been provided to the agency by Government departments and external organisations. Search area: all Lots within the Study Area
Atlas of Living Australia website at http://www.ala.org.au.	Atlas of Living Australia (ALA) *Atlas of Living Australia occurrence download. Accessed 19 March 2024*	Australia national biodiversity database (supported by the National Collaborative Research Infrastructure Strategy, CSIRO). Database contains records accessed through an interactive spatial portal. Threatened species are searched to identify known records in proximity to the Study Area.
DCCEEW	Species Profile and Threats Database (SPRAT)	The SPRAT profiles and associated conservation advice documents were consulted as they provide detailed information for the likelihood of occurrence assessment on: • Species distribution; and • Species habitat preferred and general. The conservation advice documents are particularly important for assessing TECs found in field surveys, against the listed TEC guidelines.

3.3 LIKELIHOOD OF OCCURRENCE

A preliminary likelihood of occurrence assessment was undertaken informed by desktop sources and database searches. This assessment was then refined using site-specific and specific-species habitat information obtained from field surveys to produce a final likelihood of occurrence (Appendix A).

The assessment ranks the likelihood of the species occurring within the Study Area through analysis of species distribution information and the presence of specific habitat attributes as identified through the desktop analysis and field survey. The criteria are outlined in Table 3-2.

The *Queensland Method for Mapping Matters of state environmental significance* (DES, 2020) defines habitat for threatened species as preferred and general habitat. This approach has been adopted for the likelihood of occurrence, with amendments made to align with the DCCEEW definition of 'habitat critical to the survival of a species' under SIG 1.1.

Preferred habitat is defined as areas or locations which have the potential to provide necessary resources needed for the maintenance of a population. This includes the presence of desired habitat features for a species whereby activities such as breeding, nesting, and foraging contributes to the maintenance of the population. Preferred habitat can also include habitat critical to the survival of the species, whether denoted by the relevant species guidelines (such as conservation advice, recovery plans or scientific literature), or by the definition provided by SIG 1.1, and may support elements such as species dispersal requirements.

General habitat is defined as areas or locations which have the potential to host a species for a limited amount of time or to support an ecological function (such as dispersal) that is not restricted to that area. General habitat may be considered suitable for a species, but not preferred, where there are some desired features present but not all, and so a population may not be maintained, may have poor connectivity to known preferred habitat, or may be known to be disturbed.

Habitat and distribution information for MNES is sourced from SPRAT profiles and/or Conservation Advice where available, supplemented by other primary sources (e.g. published literature). In regard to species records (for both MNES and MSES), these were sourced from WildNet and/or ALA. Where species presence cannot be discounted, they are categorised as potentially to occur.

For defining recent records of threatened species within the Locality, only those that have been recorded in databases searches within the previous 20 years have been included.

State Code 23 details that ecological assessments need to include species-specific studies to understand more information on flora and fauna that are at risk from the Proposed Action. The likelihood of occurrence assessment meets this requirement through analysing each species that is generated from desktop sources, considering ecological assessments from neighbouring areas as well as information from targeted field surveys.

TABLE 3-2 LIKELIHOOD OF OCCURRENCE CRITERIA

	Preferred habitat exists	General habitat exists[1]	Habitat does not exist[2]
Records within the Study Area (based field investigations)	Known	Known	Known
Records in the Locality[3]	Likely	Potential	Unlikely
No records in the Locality, but the Study Area is within the known distribution	Potential	Potential	Unlikely
No records in the Locality, and the Study Area is outside of the known distribution	Unlikely	Unlikely	Unlikely

1. *Habitat may be considered general, but not preferred because: some desired habitat features may be present, but not all; habitat may have poor connectivity; or habitat may be known to be disturbed.*
2. *Based on sources reviewed and/or field survey results.*
3. *'Locality' refers to a 10 km radius centred on the Study Area.*

3.4 FIELD SURVEY

This section details the survey guidelines and methodology utilised for field investigations.

3.4.1 SURVEY GUIDELINES

Table 3-3 provides an overview of relevant state and federally adopted survey guideline documents that were consulted to inform the field survey program.

TABLE 3-3 SURVEY GUIDELINES RELEVANT TO FIELD INVESTIGATION

Guideline Level and Source	Guideline and Reference
Commonwealth Guidelines	
Department of Climate Change, Energy, the Environment and Water (DCCEEW), May 2024	Onshore Wind Farm Guidance - Best practice approaches when seeking approval under Australia's national environment law (draft for consultation)
Department of Sustainability, Environment, Water, Population and Communities (DSEWPCa), 2011	Survey Guidelines for Australia's Threatened Mammals (as listed under the EPBC Act)
Department of Environment, Water, Heritage and the Arts (DEHWA), 2017	Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act
Department of the Environment (DoE), 2015	Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act
DSEWPCa, 2011	Survey guidelines for Australia's threatened reptiles. EPBC Act survey guidelines 6.6
DSEWPCa, 2011	Draft referral guidelines for nationally listed Brigalow Belt reptiles

Guideline Level and Source	Guideline and Reference
Department of the Environment, Water, Heritage and the Arts (DoEWHA), 2010,	Survey Guidelines for Australia's Threatened Bats. EPBC Act survey guidelines 6.1
DEWHA, 2010	Survey Guidelines for Australia's Threatened Birds (as listed under the EPBC Act)
Department of Environment and Energy (DoEE), 2017	Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species
Youngentob et.al., 2021	A review of koala habitat assessment criteria and methods (Commonwealth Information Sheet)
State Guidelines	
DES, 2018	Terrestrial Vertebrate Fauna Survey Guidelines for Queensland
DES, 2020	Flora Survey Guidelines – Protected Plants under the NC Act

3.4.2 SURVEY TECHNIQUES

Eight field investigations have been undertaken across the Study Area between October 2022 and June 2024. Field survey timing, techniques and survey effort are provided in Table 3-4. The location of surveys undertaken during these events are presented in Figure 3-1.

Field investigations are summarised below:

- Four ecologists undertook a six-day ecological survey within the Study Area from 17th of October to the 22nd October 2022, with a total of 240 person hours on the ground. The surveys involved completing vegetation assessments, RE and TEC ground truthing and validation, habitat assessments, targeted threatened species surveys, spotlighting, call playback, deploying camera traps and Anabats, and BUS.
- Two ecologists undertook a five-day bird and bat survey within the Study Area from 13th of February to the 17th of February 2023, with a total of 100 person hours on the ground, completing assessment of threatened fauna, deploying Anabats, and BUS.
- Four ecologists undertook a five-day ecological survey within the Study Area from 27th of March to the 31st of March 2023, for a total of 200 person hours, completing vegetation assessments, RE and TEC ground truthing and validation, habitat assessments, targeted threatened species surveys, deploying Anabats, and BUS.
- Four ecologists undertook a five-day ecological survey within the Study Area from 5th of June to the 9th of June 2023, for a total of 200 person hours, completing vegetation and habitat assessments, targeted threatened species surveys, and BUS.
- Two ecologists undertook a five-day ecological survey within the Study Area from 25th of September to the 29th of September 2023, then another five-day ecology survey from the 9th of October to the 13th of October 2023, for a total of 200 person hours, completing habitat assessments, vegetation assessments, and BUS (survey period spread across two weeks due to site access issues).

- Two ecologists undertook a five-day ecology survey within the Study Area from the 4th of December to the 8th of December 2023, for a total of 100 person hours, completing BUS.
- Two ecologists undertook a five-day ecology survey within the Study Area from the 19th of February to the 23rd of February 2024, for a total of 100 person hours, completing BUS.
- Four ecologists undertook a four-day ecology survey within the Study Area from the 10th of June to the 14th June 2024, for a total of 160 person hours, completing BUS, RE and TEC ground truthing and validation, vegetation and habitat assessments.

The following Sections detail the field investigation techniques undertaken across the Study Area. Based on an assessment of target species considered to potentially occur in the Study Area from the preliminary likelihood of occurrence, a field survey plan was developed to meet required effort and seasonality requirements as defined in relevant Queensland and Commonwealth guidelines. The survey guidelines for species or communities that were used in designing the field survey program are referenced in Section 3.4.1. The locations of survey sampling are provided in Figure 3-1.

Oversight, guidance and technical review for each field investigation have been undertaken by Dr David Dique, a 30-year experienced ecologist. Vegetation assessments, including ground-truthing and mapping of TECs, was led by Jye Dalton, who has 6 years' experience as a botanist and vegetation specialist. Additional technical review of fieldwork has been completed by Matt Davis, an ecologist with 16 years' experience in ecological field surveys and environmental impact assessments.

A summary of the survey effort is provided in Figure 3-1 and a description of survey techniques is detailed in Section 3.4.2.1, Section 3.4.2.2 and Section 3.4.2.3.

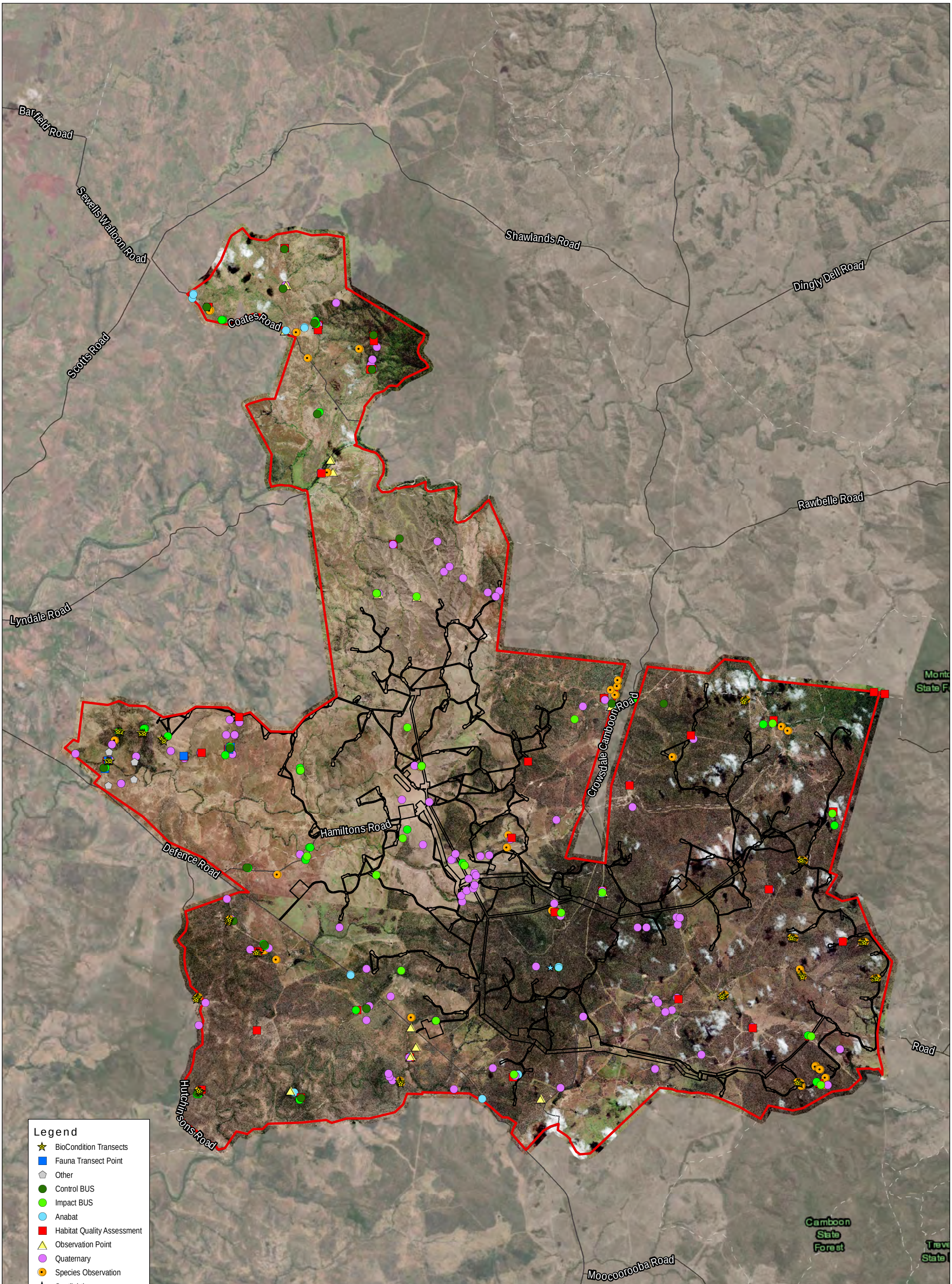
TABLE 3-4 FIELD SURVEYS UNDERTAKEN WITHIN THE STUDY AREA

Dates	Target	Techniques	Survey Effort
17-22 October 2022	Vegetation and habitat assessment (including targeted threatened species surveys)	• Assessment of habitat features present relating to relative cover and abundance of nesting/shelter/basking sites, presence of aquatic habitats, presence of foraging resources, dominant canopy species, connectivity and disturbances. • Representative sampling for regional ecosystem verification using quaternary vegetation sampling (Neldner et al., 2022). • Targeted surveys for threatened species identified with potential to occur, as described in the likelihood of occurrence analysis (Appendix A) including surveys for signs (e.g. scats) with techniques outlined in Section 3.4.2.2 and Section 3.4.2.3.	• 36 individual survey locations where habitat assessments, vegetation assessments and targeted surveys were completed.

Dates	Target	Techniques	Survey Effort
	Targeted fauna surveys	• Deployment of baited camera traps to target terrestrial mammals.	• 4 camera traps deployed for 4 consecutive nights, totalling 16 trap nights. • 2 nights spotlighting transects along Defence Road
	Bird surveys	• Bird utilisation surveys (BUS)	• 23 BUS
	Bat surveys	• Bat detection via the use of ultrasonic devices (Anabats).	• 2 Anabats locations recording for 4 consecutive nights, totalling 8 trap nights.
13-17 February 2023	Bird surveys	• BUS	• 32 BUS
	Bat surveys	• Bat detection via the use of ultrasonic devices (Anabats).	• 4 Anabat locations recording for 4 consecutive nights, totalling 16 trap nights.
27-31 March 2023	Vegetation and habitat assessment (including targeted threatened species surveys)	• Assessment of habitat features present relating to relative cover and abundance of nesting/shelter/basking sites, presence of aquatic habitats, presence of foraging resources, dominant canopy species, connectivity and disturbances. • Representative sampling for RE verification using quaternary vegetation sampling (Neldner et al., 2022) • Targeted surveys for threatened species identified with potential to occur, as described in the likelihood of occurrence analysis (Appendix A), including surveys for signs (e.g. scats) with techniques outlined in Section 3.4.2.2 and Section 3.4.2.3.	• 60 individual survey locations.
	Bird surveys	• BUS	• 27 BUS

Dates	Target	Techniques	Survey Effort
	Bat surveys	• Bat detection via the use of ultrasonic devices (Anabats).	• 4 Anabat locations recording for 4 consecutive nights, totalling 16 trap nights.
5-9 June 2023	Vegetation and habitat assessment (including targeted threatened species surveys)	• Assessment of habitat features present relating to relative cover and abundance of nesting/shelter/basking sites, presence of aquatic habitats, presence of foraging resources, dominant canopy species, connectivity and disturbances. • Representative sampling for RE verification using quaternary vegetation sampling (Neldner et al., 2022) • Targeted surveys for threatened species identified with potential to occur, as described in the likelihood of occurrence analysis (Appendix A), including surveys for signs (e.g. scats) with techniques outlined in Section 3.4.2.2 and Section 3.4.2.3.	• 48 individual survey locations
	Additional targeted fauna surveys	• Targeted spotlighting transects as well as koala SATs	• 4 spotlighting nights totalling 12 hours survey effort • 7 koala SATs
	Bird surveys	• BUS	• 24 BUS
25 September -13 October 2023 (Survey period split over two weeks)	Habitat quality assessments	• Modified Habitat Quality Assessment (MHQA) and BioCondition Assessments	• 17 transects
	Bird surveys	• BUS	• 26 BUS
4-8 December 2023	Bird surveys	• BUS	• 40 BUS
19 – 23 February 2024	Bird surveys	• BUS	• 27 BUS

Dates	Target	Techniques	Survey Effort
10 – 14 June 2024	Vegetation assessments	• Representative sampling for RE verification using quaternary vegetation sampling (Neldner et al., 2022)	• 31 individual survey locations
	Habitat quality assessments	• Modified Habitat Quality Assessment (MHQA) and BioCondition Assessments	• 8 transects
	Bird surveys	• BUS	• 18 BUS



Coordinate System:
GDA2020 MGA Zone 56

Date: 13/08/2024
Created By: SP
Drawing Size: A3

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3.1 -Survey Effort and Locations in the Study Area

Theodore Wind Farm Impact Assessment Report

RWE Renewables

ERM

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3.4.2.1 VEGETATION AND HABITAT ASSESSMENTS

Vegetation assessments and habitat quality assessments were undertaken to describe the type and condition of the vegetation communities within the Study Area. The outcomes of these assessments were used to inform a final likelihood of occurrence assessment of listed threatened species and TECs. The assessments undertaken include:

- Representative sampling of REs. This included quaternary assessments in accordance with Neldner et al., (2022);
- Assessment of water features (such as dams) and habitat values;
- Recording of topographical features; and
- Defining barriers of both disturbed and undisturbed areas.

Parameters measured during habitat assessments critical to identifying potential MNES and MSES include:

- Context with regard to landscape features (connectivity, proximity to water);
- Condition (weeds, evidence of disturbance, invasive species);
- Breeding and roosting habitat features (e.g. hollows, nests, caves);
- Foraging sources (flowering tree species, termite mounds);
- Microhabitat presence (woody debris, leaf litter specifically important for small mammals and reptiles);
- Wetland presence (presence of aquatic vegetation, water depth); and
- Signs of threatened species (such as scats, scratches and tracks).

Vegetation communities identified as potentially meeting the key diagnostic criteria and condition thresholds of EPBC Act listed TECs were sampled with a greater scrutiny to verify the status of these communities.

Targeted surveys for listed flora and fauna identified with potential to occur in the Study Area (refer to Appendix A) were undertaken at the same location as habitat assessments. The survey locations are shown in Figure 3-1.

3.4.2.2 TARGETED SURVEYS FOR LISTED FLORA SPECIES

Nine flora species, recognised as MNES and MSES were identified through desktop assessment. Targeted surveys were undertaken during field survey events in October 2022, March, June and September/October 2023 for listed flora species assessed as potentially occurring within the Study Area. Following field surveys, this was refined down to six potentially occurring species:

- Cossinia (*Cossinia australiana*);
- Cadelia (*Cadelia pentastylis*);
- Austral cornflower (*Rhaponticum australe*);
- *Solanum dissectum*;
- *Solanum johnsonianum*; and
- *Xerothamnella herbacea*.

Targeted flora surveys for these species were undertaken concurrently with vegetation and habitat assessments throughout the Study Area.

One flora trigger area has been detected in the east of the Study Area. This flora trigger area was surveyed for threatened flora during habitat assessments conducted in Spring (not all plant species exhibit diagnostic features (such as flower and fruit) at this time). Currently, as the Developmental Footprint does not overlap with this flora trigger area, targeted flora surveyed (random meander surveys) following the *Flora Survey Guidelines – Protected Plants*, NC Act ('Flora Survey Guidelines') (DES, 2020), are not required. However, if future changes to the Development Footprint result in an overlap with the flora trigger area, these surveys will be required to be conducted in accordance with the Flora Survey Guidelines.

Listed species targeted during the field surveys, their survey guideline requirements, as well as whether the survey effort has met guideline requirements, have been included in Table 3-14.

3.4.2.3 TARGETED SURVEYS FOR LISTED FAUNA SPECIES

The likelihood of occurrence assessment identified the koala, squatter pigeon (southern), large eared pied bat, greater glider (southern and central) as known or likely to occur within the Study Area after a targeted survey approach was implemented to assess the presence of these species within the Study Area.

Targeted surveys were undertaken during all field survey events for listed fauna species identified from desktop analysis and the preliminary likelihood of occurrence assessment (see Appendix A).

Detail on all the listed species targeted during the field surveys, their survey guideline requirements, as well as whether the survey effort has met guideline requirements has been included in Table 3-15.

The following Sections summarise the main techniques used when targeting listed threatened mammals, birds and reptiles within the Study Area.

Terrestrial and Arboreal Mammals

Koala, greater glider (southern and central) and yellow-bellied glider (south-eastern), that have been considered potential to occur in the Study Area (Appendix A), have been targeted during field surveys.

A targeted survey approach was implemented to assess the presence of these species in line with DSEWPC (2011a) and Eyre et al. (2022) as follows:

- Koala:
  - Nocturnal spotlighting for smaller sites to determine presence and density;
  - Spot Assessment Technique (SAT) which involves looking at the base of koala food trees for presence of koala scats and the trunks of smooth bark gums for koala scratches; and
  - Call playback playing a downloaded koala call through a speaker for 3 minutes followed by listening for a response for three (3) minutes and repeating this process for three (3) times at each three (3) unique call playback locations (prior to spotlighting).
- Greater glider (southern and central):
  - Two (2) person, 30-minute spotlight searches of 100 x 100 m survey sites; and
  - Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrats of the survey site.

- Yellow-bellied glider (south-eastern):
  - Two (2) person, 30-minute spotlight searches of 100 x 100 m survey sites; and
  - Daytime searches for signs of activity.

Reptiles

Targeted searches for listed reptiles within the Study Area were focused on identification of the ornamental snake and golden-tailed gecko as per the likelihood of occurrence assessment (Appendix A). These searches were undertaken in accordance with the following guidelines:

- Survey guidelines for Australia's threatened reptiles (DSEWPC, 2012).
  - Searches of suitable gilgai habitat (small depressions and mounds in clay soils) while preferred prey species (frogs) are active;
  - Diurnal searches under sheltering sites such as rocks, logs or other large objects on the ground; and
  - Pitfall and tunnel traps can also be employed.
- EPBC Act - Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPC, 2012).
  - Spotlighting transects targeting water-inundated gilgais, wetlands, riparian habitats and surrounding environments and large logs between dusk and early morning hours, ideally on warm and humid evenings;
  - Pitfall and funnel trapping;
  - Opportunistic road surveys while driving along roadways in the identified study area, especially following large rainfall events and on warm evenings; and
  - Microhabitat searches during the coolest parts of the day, including carefully turning woody debris, rocks and artificial debris, raking the soil surface or leaf litter beneath trees.

Whilst there are no prescribed survey guidelines specific to golden tailed geckos, microhabitat searches in suitable habitat are deemed a suitable detection method for this species.

Birds

Squatter pigeon (southern) was identified via the likelihood of occurrence assessment as known to occur within the Study Area (Appendix A). This species' survey guidelines are different to most avifauna due to being a mostly ground-dwelling species. Searches were undertaken in accordance with the following guidelines:

- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017).
  - Recommended methods include 15 hours of flushing surveys over a 3-day survey period; and
  - 10 hours of area searches or transect surveys over a 3-day survey period in suitable habitat (short, grassy understory of eucalypt woodland, nearly always near permanent water).

All other listed threated and/or migratory birds were targeted through bird utilisation surveys (BUS).

Bird Utilisation Surveys

BUS involve 20-minute fixed point surveys to provide data based on the species present and their height, speed and direction of flight as required to complete collision risk modelling using the Band Model (SNH 2012, Band 2007).

Each fixed-point survey site was located to provide a search radius of at least 100 m for small birds and up to 800 m for large birds with range finders used to determine distances. Searches primarily focused on birds most likely to be affected by the development, such as raptors (birds of prey) and large flocks of birds. This technical requirement for BUS is outlined in AusWind's Report, *Wind Farms and Birds: Interim Standards for Risk Assessment* (AusWEA, 2006), draft *Onshore Wind Farm Guidance* (DCCEEW, May 2024) and Appendix 1 – Ecological assessment methodology and bird and bat studies of the draft *Planning guidance State code 23: Wind farm development* (DSDILGP, August 2023).

The survey guidelines for diurnal bird surveys and their requirements are as follows:

- *Survey Guidelines for Australia's threatened birds* (DEWHA, 2011):
    - Point surveys involve recording the presence, and usually number of individuals, of each taxon detected at a series of specified locations. The sampling points are usually pre-determined and selected either randomly or systematically within the Study Area; and
    - Point surveys typically involve an allocated survey time of 20-minutes.

As surveys commenced in October 2022, the BUS survey design was implemented with reference to the *Onshore Wind Farms – interim guidance on bird and bat management* by DAWE dated 2021, which required BUSs to be completed over each relevant season over a minimum of 24 months prior to commissioning of a wind farm. This survey effort is also consistent with the requirements of the updated draft *Onshore Wind Farm Guidance* (DCCEEW, 2024), which requires site utilisation surveys to be undertaken for each relevant season over at least two years (up to 8 survey events).

There are two distinct seasons in Queensland, wet season and dry season. The Study Area experiences a higher mean rainfall and higher mean temperatures between November and February (often extending into March). This also coincides with the season for migratory birds, including wetland birds.

To inform species use across the Study Area as part of the risk assessment for threatened birds with the potential to be impacted by WTG strike, eight BUS survey trips have been conducted to date across these two seasons (four surveys in the wet season and four surveys in the dry season), over a 20-month period. It is noted that the Proponent has committed to further survey events prior to commissioning of the Proposed Action, meeting the 24 month requirement.

BUS points were dispersed across the Study Area during the first two sampling events in October 2022 and February 2023, with the same sites subject to repeat visits in both the morning and afternoon period during all subsequent sampling events. A summary of the BUS survey effort is described in Table 3-5.

TABLE 3-5 SUMMARY OF BUS EFFORT

BUS Survey Event	BUS survey effort
October 2022 Dry season	23 surveys, 12 morning and 11 afternoon
February 2023 Wet season	32 surveys, repeat visits to BUS points including 16 morning and 16 afternoon surveys
March 2023 Wet season	28 surveys, repeat visits to BUS points including 14 morning and 14 afternoon surveys
June 2023 Dry season	24 surveys repeat visits to BUS points including 12 morning and 12 afternoon surveys
September/October 2023 Dry season	26 surveys, repeat visits to BUS points including 12 morning and 14 afternoon surveys
December 2023 Wet season	40 surveys, repeat visits to BUS points including 20 morning and 20 afternoon surveys
February 2024 Wet season	27 surveys, repeat visits to BUS points including 13 morning and 14 afternoon surveys
June 2024 Dry season	18 surveys, repeat visits to BUS points including 9 morning and 9 afternoon surveys

Survey Guidelines for Australia's threatened birds (DEWHA, 2011) outlines steps that aid in determining survey effort and timing, noting a particular focus on optimal timing for surveys of 'target' taxa. With the timing of surveys critical to species detection, it is important that surveys be timed to maximise potential detection across the year. As such, eight BUS events have been completed over the two distinct seasons observed within Central Queensland (wet and dry).

State Code 23 details the requirement for BUS for wind farm developments. Such surveys identify avian species, numbers present, height flown and site utilisation. The eight field investigations undertook BUS at waterbodies and in open areas for birds of prey. Thus, the survey effort was performed in accordance with State Code 23 requirements.

The updated DCCEEW draft guidelines on the management of bird and bat species in onshore wind farms details the need to undertake a risk assessment for birds and bats following bird utilisation surveys for the Study Area (DCCEEW, 2024). This risk assessment has taken into account the likelihood and consequences of events including collision with wind turbines and the impact of construction and operation on the Proposed Action causing changes in site utilisation by bird and bat species.

State Code 23 also recommends Before-After-Control-Impact (BACI) design principle for surveys where the Study Area is determined to support significant bird species. The aim of the BACI design is to compare environmental variables before and after a human activity and between the areas affected by the development (impact site) and areas unaffected by the development (control sites) (Stewart-Oaten, 1986). In this instance, this would compare control and impact BUS sites, before and after the construction of the Proposed Action, to determine if there are any avian impacts as a result of the development. For the Proposed Action, impact sites are generally located within 1 km of the proposed turbine locations. Control sites are defined as sites that are placed at a sufficient distance from the proposed

turbine locations to obtain data outside the zone of influence of the turbines (as defined in *State code 23: Wing farm development* (DSDILGP, 2022)).

Twenty potential impact sites and 18 potential control sites were visited over the eight survey events between October 2022 and June 2024 (Figure 3-1). These areas will be revisited and resurveyed during construction and after construction (operation phase) of the Proposed Action development, following the Proposed Actions Bird and Bat Management Plan (BBMP).

State Code 23 also requires Collision Risk Modelling (CRM) and Population Viability Analysis be conducted when a collision risk assessment identifies a risk to significant species, such as threatened birds, raptors and wetland birds. Collision Risk Modelling will be undertaken in future in accordance with the Band CRM Method (Band, 2007) for any listed threatened and/or migratory species, or non-threatened raptor species, recorded in the Study Area and assessed as having a potential collision risk. This will only be possible if the BACI designed surveys collect sufficient data to undertake this analysis. New draft guidance from DCCEEW on the management of birds and bats for onshore wind farms has detailed how CRM needs to be undertaken for listed threatened species (MNES) where risks from the Proposed Action, particularly collision risks, have been identified (DCCEEW, 2024). This CRM should consider a Study Area-wide assessment and identify high risk turbines as well as results from pre-commissioning surveys from a minimum period of 24 months.

In addition to the BUS, targeted threatened species surveys were also completed following the methods described below. All bird survey locations are shown in Figure 3-1.

Point Surveys

Point surveys were conducted to target diurnal woodland and riparian bird species. Four ecologists during the October 2022 surveys, two ecologists during the February 2023 surveys, four ecologists during the March 2023 surveys and four ecologists during the June 2023 surveys traversed suitable woodland and riparian habitats and conducted 20-minute timed surveys for all birds in the area. This survey effort was targeted for listed threatened birds, and is additional to the BUS effort.

Transect Surveys

Transect surveys were conducted in order to diurnal woodland and riparian bird species. Two ecologists during the February 2023 surveys, four ecologists during the March 2023 surveys and four ecologists during the June 2023 surveys traversed suitable riparian habitats and conducted transect walks for all birds in the area. This survey effort was targeted for listed threatened birds, and is additional to the BUS effort.

Waterbody Surveys

Waterbody surveys were conducted in order to target aquatic species and woodland species utilising the waterbody. Observations were made from a stationary position, and birds were identified by call detection and visual observations. The Study Area contained several artificial waterbodies, likely to act as important water sources in the landscape, particularly during dry conditions. This survey effort was targeted for listed threatened birds, and is additional to the BUS effort.

Bat Surveys

Microbat surveys were conducted to determine the presence/absence of bats within and surrounding the Study Area, with four ultrasonic bat detectors (Anabats) placed throughout the relevant properties in the Study Area. The four Anabat devices were placed in 10 total locations throughout the Study Area over the October 2022, February, March and June 2023 field surveys. Anabats were not deployed during the June 2023 winter surveys. These devices were used to detect ultrasonic signals from bat species in the Study Area, for either two or four consecutive survey nights.

The bat detectors were placed across representative remnant vegetation/habitat types. This included riparian woodlands and eucalypt or acacia open forest or woodlands. The detectors were specifically placed in areas that were in close proximity to potential flight paths/water sources (farm dams) and in relative proximity to proposed turbine locations. The survey locations were selected on the basis that they provided the greatest likelihood of detecting an abundance and diversity of bat species.

The detectors were secured onto trees at approximately 1.8 m above the ground. They were collected and the information recorded on the Anabats was then analysed by a specialist to determine the species recorded.

The BACI design has also been implemented for bat surveys (explained in Section 3.4.2.3), in order to identify any impacts on bats as a result of the Proposed Action, with control sites determined based on the current Preliminary Design and locations of WTGs.

The survey requirements and recommended survey effort and methods for bats is as follows:

- *Survey guidelines for Australia's threatened bats* (DEWHA, 2010):
    - Trapping methods such as harp traps are recommended. Such effort is not precisely stated, but studies have found that the use of 20 or more traps a night a good for detection (Schulz, 1999). Harp trapping was not utilised as the target species, ghost bat (*Macroderma gigas*), can be detected via various other methods including however not limited to acoustic monitoring and spotlighting.
    - Echolocation call detection to be carried out for a recommended 30-60 minutes per night for four to five survey nights Detectors were deployed to exceed these minimum requirements and set to record from dusk through to dawn during each sampling event.
    - Recommended that a variety of trapping and call detection methods are used together, where possible.

State Code 23 identifies that methods must be carried out to determine which bat species occur on the Study Area. It recommends the use of survey techniques including mist nets and/or bat detection systems that record and analyse echolocation calls of bats. The survey efforts involved the use of Anabats and spotlighting, thus meeting the State Code 23 requirement.

The full echolocation analyses for the anabats deployed during the October 2022, February and March 2023 field investigations can be found in Appendix C, with a summary of species recorded in Table 4-10. The bat survey locations are shown in Figure 3-1.

3.4.3 CLIMATIC CONDITIONS

During all field investigation periods, the weather typically remained dry (with the exception of a maximum 24.2 mm during the October 2022 survey period). Moderate wind conditions and temperatures were typical for the periods that each survey took place. A summary of the daily weather observations for each survey period is presented in Table 3-6 to Table 3-14.

It should be noted that creek flooding occurred within the Study Area during the October 2022 survey period, and thus, impacted levels of access across survey sites.

Weather observations were sourced from the Thangool weather station (station number 039089), located approximately 50 km north-east of the Study Area.

TABLE 3-6 DAILY WEATHER OBSERVATIONS OCTOBER 2022 - THANGOOL QUEENSLAND

	Daily Temp		Rain	9:00AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
17/10/22	16.6	29.3	7	22.5	79	NW	7	24.5	71	SE	13
18/10/22	14.8	28.9	0	25.5	65	NNE	20	26.8	53	N	20
19/10/22	19	23.9	1.4	21.5	89	NE	7	23.1	78	NNE	9
20/10/22	19.3	25.5	24.2	21.2	93	WNW	6	24.2	73	NE	15
21/10/22	17.1	29.5	14.6	25.4	72	NNE	11	28.3	52	NNE	22
22/10/22	17.6	27.2	23.2	18.2	99	ESE	13	25.2	59	ESE	13

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-7 DAILY WEATHER OBSERVATIONS FEBRUARY 2023 - THANGOOL QUEENSLAND

	Daily Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
13/02/23	19.4	37.9	0	29.4	58	NW	11	37.5	31	NNW	9
14/02/23	19	38.1	0	30.8	57	N	19	37.3	28	NNW	22
15/02/23	20.4	32.4	9.6	28.1	66	E	13	31	49	NNE	11
16/02/23	19	33.3	0.2	25.9	58	E	17	32	36	SE	11
17/02/23	15	32.2	0	25.9	53	E	6	31.2	38	SSE	13

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-8 DAILY WEATHER OBSERVATIONS MARCH 2023 - THANGOOL QUEENSLAND

	Daily Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
27/03/23	17	33.7	0	26	63	NE	4	33.4	38	WNW	13
28/03/23	16.6	34.6	0	26.6	70	ENE	2	33	37	NE	7
29/03/23	18.6	32	0	25.7	71	N	11	30.8	48	W	6
30/03/23	21.1	33.3	0	25.8	73	NW	13	31.7	44	SW	13
31/03/23	15.4	32.4	2.2	25	46	ESE	9	31.4	23	W	9

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-9 DAILY WEATHER OBSERVATIONS JUNE 2023 - THANGOOL QUEENSLAND

	Daily Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
05/06/23	14	26.8	0	21.1	66	ESE	22	25.5	41	ENE	22
06/06/23	12.1	24.9	0	18.8	74	ESE	17	22.5	54	ESE	17
07/06/23	9.4	26.4	0	19.2	68	ESE	15	25.6	38	ESE	9
08/06/23	4.7	26.4	0	16	82	SE	6	25.3	34	NNW	9
09/06/23	7.9	27.7	0	17.6	69	E	7	24.9	40	SSW	13

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-10 DAILY WEATHER OBSERVATIONS SEPTEMBER 2023 - THANGOOL QUEENSLAND

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
25/09/2023	8.1	27.9	0	20.9	51	ESE	17	26.0	30	ESE	7
26/09/2023	6.9	29.8	0	21.0	53	SSE	7	29.2	19	SW	6
27/09/2023	8.2	31.4	0	21.6	58	NNW	9	29.3	22	NNE	15
28/09/2023	9.3	32.9	0	21.7	58	NNW	7	31.9	18	ESE	9
29/09/2023	13.5	31.9	0	23.3	54	NNE	9	29.5	28	ESE	11

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-11 DAILY WEATHER OBSERVATIONS OCTOBER 2023 - THANGOOL QUEENSLAND

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
09/10/2023	8.3	28.9	0	23.1	35	E	13	26.6	26	SE	11
10/10/2023	8.1	30.0	0	22.0	54	S	7	27.0	31	ENE	7
11/10/2023	9.5	31.9	0	23.2	48	ENE	9	31.3	21	E	11
12/10/2023	11.0	32.2	0	23.7	52	WSW	9	30.6	25	NNW	9
13/10/2023	10.5	33.2	0	23.8	53	NNW	15	32.5	21	SSW	9

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-12 DAILY WEATHER OBSERVATIONS DECEMBER 2023 - THANGOOL QUEENSLAND

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
04/12/2023	20.7	38.7	0	31.1	53	NE	7	36.6	27	SW	6
05/12/2023	19.4	35.8	0	28.9	55	N	13	34.1	33	WNW	17
06/12/2023	17.5	38.4	0	29.3	47	WSW	6	36.5	18	ESE	17
07/12/2023	14.9	38.6	0	26.8	49	SE	7	37.1	16	NE	31
08/12/2023	15.1	37.7	0	28.5	45	SE	15	36.3	22	E	20

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-13 DAILY WEATHER OBSERVATIONS FEBRUARY 2024 - THANGOOL QUEENSLAND

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
19/02/2024	17.6	34.5	0	27.0	63	ESE	20	34.4	34	SE	11
20/02/2024	19.8	34.4	0	27.4	58	SE	9	32.4	37	S	7
21/02/2024	20.2	34.2	0	27.5	62	W	4	31.4	46	NE	20
22/02/2024	19.1	34.3	0	27.7	63	W	4	32.1	43	NNW	11
23/02/2024	19.4	35.6	0	28.1	66	N	4	34.5	35	SE	9

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

TABLE 3-14 DAILY WEATHER OBSERVATIONS JUNE 2024 – THANGOOL QUEENSLAND

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max	mm	Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C		°C	%		km/hr	°C	%		km/hr
11/06/2024	2.6	26.1	0	14.8	57	SE	11	25.9	19	NW	6
12/06/2024	2.3	26.2	0	13.6	60	SSE	2	25.5	19	SSW	17
13/06/2024	0.9	24.0	0	14.7	51	SE	13	22.7	19	SSE	9
14/06/2024	1.6	24.0	0	12.6	47	E	7	23.3	17	N	11

Dir = wind direction; Spd = wind speed; RH = relative humidity
Blue denotes the lowest daily temperature; Red denotes the highest daily temperature.
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

3.4.4 SURVEY ADEQUACY

A survey adequacy review has been undertaken for the survey effort applied across the Study Area, with a full list of the targeted EPBC Act and NC Act listed flora and fauna assessed as known or likely to occur. Survey guideline requirements and survey adequacy is outlined in Table 3-14 and Table 3-15.

TABLE 3-15 SURVEY ADEQUACY FOR LISTED THREATENED FLORA WITH THE POTENTIAL TO OCCUR

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Ooline (*Cadellia pentastylsis*)	VU	V	*Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* (DES, 2020) Random, non-selective traverses of all habitat types throughout the Study Area, whether identified as suitable or un-suitable habitat for threatened flora.	175 vegetation and habitat assessments were completed across four survey periods. Meander searches were undertaken at the same time as vegetation and habitat assessments within flora trigger areas of the Study Area.	This species has not been observed during field surveys, despite suitable habitat being identified. Meanders completed concurrently with 175 vegetation and habitat assessments in suitable habitat across the Study Area
Cossinia (*Cossinia australiana)*	EN	E	*Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* (DES, 2020) Random, non-selective traverses of all habitat types throughout the Study Area, whether identified as suitable or un-suitable habitat for threatened flora.	175 vegetation and habitat assessments were completed across four survey periods. Meander searches were undertaken at the same time as vegetation and habitat assessments within flora trigger areas of the Study Area.	This species has not been observed during field surveys, despite suitable habitat being identified. Meanders completed concurrently with 175 vegetation and habitat assessments in suitable habitat across the Study Area
Austral cornflower (*Rhaponticum australe)*	VU	V	*Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* (DES, 2020) Random, non-selective traverses of all habitat types throughout the Study	175 vegetation and habitat assessments were completed across four survey periods. Meander searches were undertaken at the same time as vegetation and habitat	This species has not been observed during field surveys, despite suitable habitat being identified. Meanders completed concurrently with 175 vegetation and habitat

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
			Area, whether identified as suitable or un-suitable habitat for threatened flora.	assessments within flora trigger areas of the Study Area.	assessments in suitable habitat across the Study Area
Solanum dissectum	EN	E	*Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* (DES, 2020) Random, non-selective traverses of all habitat types throughout the Study Area, whether identified as suitable or un-suitable habitat for threatened flora.	175 vegetation and habitat assessments were completed across four survey periods. Meander searches were undertaken at the same time as vegetation and habitat assessments within flora trigger areas of the Study Area.	This species has not been observed during field surveys, despite suitable habitat being identified. Meanders completed concurrently with 175 vegetation and habitat assessments in suitable habitat across the Study Area.
Solanum johnsonianum	EN	E	*Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* (DES, 2020) Random, non-selective traverses of all habitat types throughout the Study Area, whether identified as suitable or un-suitable habitat for threatened flora.	175 vegetation and habitat assessments were completed across four survey periods. Meander searches were undertaken at the same time as vegetation and habitat assessments within flora trigger areas of the Study Area.	This species has not been observed during field surveys, despite suitable habitat being identified. Meanders completed concurrently with 175 vegetation and habitat assessments in suitable habitat across the Study Area.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Xerothamnella herbacea	EN	E	*Flora Survey Guidelines – Protected Plants, Nature Conservation Act 1992* (DES, 2020) Random, non-selective traverses of all habitat types throughout the Study Area, whether identified as suitable or un-suitable habitat for threatened flora.	175 vegetation and habitat assessments were completed across four survey periods. Meander searches were undertaken at the same time as vegetation and habitat assessments within flora trigger areas of the Study Area.	This species has not been observed during field surveys, despite suitable habitat being identified. Meanders completed concurrently with 175 vegetation and habitat assessments in suitable habitat across the Study Area.

[1] NC Act status: EN = endangered; VU = vulnerable
[2] EPBC Act status: E = endangered; V = vulnerable;

TABLE 3-16 SURVEY ADEQUACY FOR LISTED THREATENED OR MIGRATORY FAUNA KNOWN, LIKELY OR POTENTIAL TO OCCUR

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Birds					
Squatter pigeon (southern) (*Geophaps scripta scripta*)	VU	V	*Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2017) Area searches or transect surveys in suitable habitat. Flushing surveys also likely to be useful. Area searches or transect surveys for 15 hours over 3 days. Flushing surveys for 10 hours over 3 days.	171 dawn and dusk timed surveys (20 minutes), bird utilisation surveys across 35 locations in the Study Area. 3 area/transect searches were also conducted during bird utilisation surveys in appropriate habitat. These area/transect searches were completed by 2 ecologists for 1.5 hours each (9 total hours)	*Survey effort considered adequate* The southern squatter has been observed on one occasion during the October 2022 survey at a farm dam located in the northern section of the Study Area, on one occasion during the September/October 2023 survey in the north-western section of the Study Area, and on one occasion during December 2023 survey. 171 surveys across 25 locations. Surveys were conducted throughout the Study Area, in suitable patches of open eucalypt woodlands and areas close to permanent bodies like farm dams and waterways.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Listed Threatened Mammals					
Greater glider (southern & central) (*Petauroides volans)*	EN	E	*Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (DES, 2018)* Requires two-person 30-minute spotlight searches of 100 x 100 m survey site across multiple nights. This can include spotlighting up one side of the 100 x 100 m area and then spotlighting back the other side of the 100 x 100m area. Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrates of the survey site. Survey Guidelines for Australia's Threatened Mammals (DSEWPC, 2011) Bright moonlight aids in detecting greater gliders. Spotlighting should be at least two 200 m transects per 5 ha sites. It is also recommended there be 100 m between survey transects.	175 diurnal vegetation and habitat assessments determining the presence of suitable habitat features for the species, including any hollow-bearing trees within mature forests. 6 hours of spotlighting over two nights in October 2022. (Impacted by inclement weather) 12 hours of spotlighting over four nights in June 2023 5 x camera traps for 4 trap nights in suitable habitats.	*Survey effort considered adequate* This species was observed on 14 occasions during June 2023 surveys. Diurnal searches were undertaken in areas of potential habitat for this species with the aim of identifying suitable microhabitat features, namely mature hollow-bearing trees with > 20cm diameter hollows in areas of eucalypt forest. Spotlighting surveys were undertaken by foot and slow vehicle within suitable habitats and vegetation communities, totalling 18 hours and 6 nights of survey effort.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Koala (*Phascolarctos cinereus)*	EN	E	*Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (DES, 2018)* Requires two- person 30-minute spotlight searches of 100 x 100 m survey site across multiple nights. This can include spotlighting up one side of the 100 x 100 m area and then spotlighting back the other side of the 100 x 100m area. Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrates of the survey site. *EPBC Act referral guidelines for the vulnerable koala* (DoE, 2014) Strip transects which involve diurnal distance sampling and density searches. Nocturnal spotlighting for smaller sites to determine presence and density. Scats – Spot Assessment Technique (SAT) which involves looking at food trees for presence of koala scats.	175 diurnal vegetation and habitat assessments determining the presence of any suitable habitat features for the species, including any eucalypt forest and riparian vegetation. 5 x camera traps for 4 trap nights in suitable habitats. 6 hours of spotlighting over two nights in October 2022. (Impacted by inclement weather) 12 hours of spotlighting over four nights in June 2023 12 koala SATs conducted in suitable habitat to detect the species (diurnal searches)	*Survey effort considered adequate* This species was not directly observed, a single faecal pellet was recorded during field surveys. Diurnal searches during habitat assessments were conducted to indicate presence. Spotlighting surveys were undertaken by foot and slow vehicle within suitable habitats and vegetation communities, totalling 18 hours and 6 nights of survey effort.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Large-eared pied-bat (*Chalinolobus dwyeri*)	VU	V	Survey guidelines for Australia's threatened bats (DEWHA) A combination of survey efforts is recommended for this species. This includes unattended bat detectors for 16 detector nights for a minimum of four nights and attended bat detectors for six detector hours for a minimum of three nights. It is also including harp traps and/or mist nets for 16 trap or net nights for a minimum of four nights. Surveys are best undertaken from October through to March.	10 Anabats have been deployed in 10 locations within the Study Area (all for 4 nights), for a total of 40 Anabat trapping nights. 38 habitat assessments determining the presence of any suitable habitat features for the species, including any camps or roosting sites.	*Survey effort considered adequate to detect large-eared pied bat.* This species' call was recorded as 'probable' on Anabat devices deployed across four locations in the October 2022 and March 2023 surveys. Surveys were conducted in suitable habitat of well-vegetated areas such as eucalypt forest and in the appropriate seasons of October to March.
Black-breasted buttonquail (*Turnix melanogaster)*	VU	V	*Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2017) Area searches of suitable habitat with detection of flushing birds or hearing of foraging scratching for 15 hours over 3 days.	171 dawn and dusk timed surveys (20 minutes), bird utilisation surveys across 35 locations in the Study Area. 38 habitat assessments determining the presence of any suitable habitat features for the species.	*Survey effort considered adequate* Suitable habitat for the species was detected within the Study Area, with flushing surveys being conducted within this habitat during habitat assessments. The species was not observed in any surveys.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
White-throated needletail (*Hirundapus caudacutus)*	VU	V, Mi	*Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) No survey guidelines specific to white-throated needletail – however, recommended to focus survey efforts from high vantage points. This species is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground and have been recorded over most types of habitat.	171 dawn and dusk timed surveys (20 minutes), bird utilisation surveys across 35 locations in the Study Area.	*Survey effort considered adequate* Surveys were conducted from vantage points in the Study Area and done in the appropriate timing to detect the species. The species was not detected in any of the surveys. The habitat in the Study Area, was not deemed suitable for the species to forage and roost in.
Australian painted snipe (*Rostratula australis)*	EN	E	*Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA, 2017) Area searches or transects through suitable wetlands; detection by sighting and flushing. Conducted for 10 hours over 3 days. Targeted stationary observations at dawn and dusk of suitable foraging locations within wetlands; detection by sighting. Conducted for 10 hours over 5 days Also a brief spotlight search shortly after dusk may detect birds.	171 dawn and dusk timed surveys (20 minutes), bird utilisation surveys across 35 locations in the Study Area. 38 habitat assessments determining the presence of any suitable habitat features for the species. 6 hours of spotlighting over two nights in October 2022. (Impacted by inclement weather) 12 hours of spotlighting over four nights in June 2023	*Survey effort considered adequate* Waterbodies were surveyed across the Study Area, with flushing being conducted habitat assessments and timed stationary surveys being conducted at dawn and dusk. Spotlighting was also conducted. The species was not observed in any surveys.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Yellow-bellied glider (south-eastern) (*Petaurus australis australis)*	VU	V	Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2022). Feeding mark searches on trees are an effective way to identify this species. This is because these gliders use their teeth to incise tree bark for feeding. A list of tree species the yellow-bellied glider prefers is found in the guidelines. Call playback is another method that can detect this species. This method involves conducting playback on two occasions over different nights in a survey area. This is then followed by a 5-minute listening period for un-elicited calls. These surveys must be done on numerous occasions however, given the species large home range and mobility. Recommended four spotlight/call playback surveys to a site (two in each survey event).	175 diurnal vegetation and habitat assessments determining the presence of suitable habitat features for the species, including any hollow-bearing trees within mature forests. 38 habitat assessments determining the presence of any suitable habitat features for the species. 6 hours of spotlighting over two nights in October 2022. (Impacted by inclement weather) 12 hours of spotlighting over four nights in June 2023 5 x camera traps for 4 trap nights in suitable habitats	*Survey effort considered adequate* No yellow-bellied gliders were observed from diurnal surveys, nocturnal surveys, or the presence of feeding marks located within the Study Area. Suitable foraging habitat was located, and therefore, the species is considered as potentially occurring.

Target Species	Listing Status		Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
	NC Act[1]	EPBC Act[2]			
Rufous fantail (*Rhipidura rufifrons)*	-	Mi	Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act (DoE, 2015): No specific survey guidelines, however in breeding season (September to February), a two-hectare survey in 20 minutes in preferred habitat such as moist forests or eucalypt forests as well as Brigalow woodlands, should be undertaken. During migration surveys should be taken over standardised time periods and observers should recognise calls as well as the species.	171 dawn and dusk timed surveys (20 minutes), bird utilisation surveys across 35 locations in the Study Area. 38 habitat assessments determining the presence of any suitable habitat features for the species.	*Survey effort considered adequate* Surveys were conducted in the appropriate season (summer). Survey effort was conducted in a range of habitats throughout the Study Area by suitably qualified ecologists. No observation of the species occurred during field surveys however suitable habitat for denning and foraging was detected within the Study Area.
Fork-tailed swift (*Apus pacificus)*	-	Mi	*Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) No survey guidelines specific to the fork-tailed swift – however, recommended to focus survey efforts from high vantage points. This species is found across a range of habitats (non-breeding habitats only), from inland plains to wooded areas. It is exclusively aerial.	171 dawn and dusk timed surveys (20 minutes), bird utilisation surveys across 35 locations in the Study Area.	*Survey effort considered adequate* Surveys were conducted from vantage points in the Study Area and done in the appropriate timing to detect the species. The species was not detected in any of the survey. The habitat in the Study Area, was not deemed suitable for the species to forage and roost in.

[1] NC Act status: EN = endangered; VU = vulnerable

[2] EPBC Act status: E = endangered; V = vulnerable;

3.5 VEGETATION COMMUNITY AND HABITAT MAPPING

Habitat for listed threatened and/or migratory species and threatened communities known, likely or potentially occurring within the Study Area has been mapped.

Broad habitat types (BHT) within the Study Area were identified based on vegetation communities ground-truthed during field surveys (Section 4.2). These BHTs were used to map habitat for listed threatened and/or migratory species and threatened communities known, likely or potentially occurring within the Study Area, based on the specific habitat requirements and preferences of the species/communities. For specific species (e.g. yellow-bellied glider), regional ecosystem mapping was also used to delineate the extent of habitat.

Specifically, the following datasets and field information were used to produce BHTs and habitat maps:

- Ground-truthed vegetation assessments and high resolution aerial imagery to generate vegetation boundaries and delineate vegetation characteristics;
- DoR RE mapping; where reflective of observed conditions, with minor amendments to an extent as a result of field observations and high resolution aerial imagery;
- DoR high value regrowth mapping: where reflective of observed conditions, with minor amendments to an extent as a result of field observations and high resolution aerial imagery; and
- Regrowth mapping prepared from the ground-truthed field observations and recent high resolution satellite and aerial imagery.

3.5.1 MNES HABITAT MAPPING

The mapped habitat for threatened and/or migratory species and threatened communities listed under the EPBC Act has been categorised with consideration of the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (SIG 1.1) (DEWHA, 2013). Habitat definitions within SIG 1.1 relevant to this assessment are:

- Habitat critical to the survival of the species (relevant to vulnerable, endangered and critically endangered flora, fauna and ecological communities) (Section 3.5.1.1); and
- Important habitat (relevant to migratory species) (Section 3.5.1.2).

Individual species/ecological communities approved conservation advice or recovery plans were used to provide species-specific description of habitat critical to the survival of the species and important habitat where appropriate.

Each relevant MNES known, likely or potential to occur within the Study Area are assessed against SIG 1.1 to determine if the Proposed Action will result in a significant impact to that MNES.

3.5.1.1 HABITAT CRITICAL TO THE SURVIVAL OF A SPECIES

For all EPBC Act listed species and ecological communities, 'habitat critical to survival of the species' is referenced within the relevant SIA criteria. As defined in the *SIG 1.1* (DEWHA, 2013), habitat critical to the survival of a species or ecological communities are areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal;*
- *For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);*
- *To maintain genetic diversity and long-term evolutionary development; and/or*
- *For the reintroduction of populations or recovery of the species or ecological community.*

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

3.5.1.2 IMPORTANT HABITAT

For migratory species, 'important habitat' is referenced within the relevant SIA criteria. As defined in the *SIG 1.1* (DEWHA, 2013), important habitat is:

- Habitat utilised by a migratory species occasionally or periodically within a *region that supports an ecologically significant proportion of the population of the species; and/or*
- *Habitat that is of critical importance to the species at particular life-cycle stages; and/or*
- *Habitat utilised by a migratory species which is at the limit of the species range; and/or*
- *Habitat within an area where the species is declining.*

3.6 ASSUMPTIONS AND LIMITATIONS

The field and desktop assessment undertaken provide an overview of the ecological values that exist within the Study Area. Surveys were undertaken throughout the Study Area to gain a comprehensive understanding of the species, communities and habitat features that occur. Sampling methods were distributed across the Study Area to obtain a spread of survey locations and across eight survey events spanning multiple seasons and years. The use of a combination of field survey data and desktop information is considered appropriate through the legislative and policy context (Section 2), and the relevant survey guidelines (Section 3.4.1) to identify ecological values within the Study Area.

The absence of a species from a database list or observational studies does not confirm its absence from the Study Area. The lack of existing records from databases is more likely to indicate a low historic sampling effort in the region, as opposed to an absence of threatening processes and species. To overcome these limitations, the likelihood of occurrence assessment takes a precautionary approach and identifies species that have the potential to occur, based on field-verified habitat suitability mapping, in order to assess potential impacts accordingly.

The final likelihood of occurrence assessment to identify species that are known, likely or have the potential to occur in the Study Area and be subject to impacts has been developed based on results of targeted species surveys and habitat mapping that incorporates field data on specific habitat requirements as defined in relevant DCCEEW and State guidance. It should be noted that this assessment is initially guided by a desktop search derived by distribution modelling for EPBC Act species (PMST Search), however NC Act listed species are identified through records alone, resulting in a more restricted initial search for NC Act species than EPBC Act species.

4. ECOLOGICAL VALUES

The following Sections present a description of the ecological values of the Study Area based on the findings from the desktop review and eight field surveys. General information of the Study Area within the landscape context and classification and descriptions of the vegetation communities and broad habitats are presented in Section 4.1 and 4.2. Information specific to MNES and MSES is presented in Sections 4.3 and 4.4 respectively. While detailed descriptions of values are provided, a brief summary of MNES and MSES is included at the beginning of each Section.

4.1 LANDSCAPE CONTEXT

The Study Area lies within the Brigalow Belt Southern bioregion, within the Fitzroy catchment. The topography of the Study Area is characterised by rolling hills and flat plains. Across the Study Area the landscape features vary in geology, from torsdale volcanics mixed with camboon volcanics, to rocky outcrops of large boulders, open flat areas on tops of ridges, and sedimentary stratigraphy on the western extent of the Study Area. The Study Area is intersected by serval major waterways, those being Castle Creek in the northern section of the Proposed Action boundary, and Boam Creek in the southern end of the Study Area.

The ecological condition of the Study Area is majorly influenced by historical land clearing and cattle grazing, with large patches of cleared land featuring no remnant vegetation occurring throughout. This is most prominent in the centre and north of the Study Area, though some large swathes of cleared land also occur in the southeast of the Study Area. Almost half of the Study Area, or 22,562.1 ha is cleared.

No protected areas occur within the boundary of the Study Area, however the north-east section of the Study Area neighbours the Belmont State Forest, the south-east section of the Study Area is adjacent to Montour State Forest and the southern section of the Study Area abuts Trevethan State Forest, as shown on Figure 1-1.

4.2 VEGETATION COMMUNITIES AND BROAD HABITAT TYPES

The Study Area has been classified into six broad habitat types, defined based on vegetation community type and structure. These habitat types have then been considered as respective foraging, breeding, roosting, denning, dispersal and movement functions for listed threatened and/or migratory species that are known, likely or have the potential to occur within the Study Area. Ground-truthed habitat mapping has been informed by these six habitat types, and subsequently used to identify areas of habitat for listed threatened species.

The habitats in the Study Area are generally in a moderate to low condition, with signs of degradation and fragmentation due to cattle grazing, dieback, erosion, and the presence of introduced flora species. Where there are areas of higher quality habitat in a remnant condition, these are in discrete patches and sections of the Study Area, predominantly in the south and east. The dominant broad habitat type across the Study Area is grasslands and cultivated agricultural land, accounting for almost half of the Study Area. A summary of these habitat types, along with their vegetation community classifications and attributes, are provided in Table 4-1 and presented in Figure 4-1.

TABLE 4-1 BROAD HABITAT TYPES IN THE STUDY AREA

Habitat Type and Occurrence in Study Area	Structure	Habitat Features / Condition	Photographic Example
Grasslands and cultivated agricultural land including cultivated alluvial plains, and grassland with occasional presence of *Eucalyptus spp.*, often in the form of small regrowth patches or small clusters of mature paddock trees. Indicative habitat available: 22,760.9 ha	**Tree layer:** Sparse eucalyptus paddock trees, dead stags sporadic throughout. Minimal habitat values. **Shrub layer:** Sparse to absent. Mainly Acacia sp. **Ground microhabitat layer:** Native and exotic grasses. Suitable cover and habitat for ground foraging species such as squatter pigeon.	This broad habitat type is often found linking denser eucalypt woodlands to riparian habitats. There is limited habitat value present due to the lack of dense vegetation. Longer native and non-native grass species can be used for sheltering and dispersal by smaller mammal species. Very limited to low necessary microhabitat features for reptiles.	

Habitat Type and Occurrence in Study Area	Structure	Habitat Features / Condition	Photographic Example
Waterbodies and drainage features located throughout Study Area. These were mainly farm dams which were found in conjunction with cleared agricultural land and creeks. Indicative habitat available: 56.0 ha	**Tree layer:** Eucalyptus spp. and or melaleuca spp. **Shrub layer:** sparse often weedy. Presence of Acacia spp. **Ground microhabitat layer:** Native and exotic grassland	The farm dams are generally in a poor condition due to being eroded from heavy cattle use. These farm dams provide a refuge for a range of bird species, including birds of prey. Drainage features in the Study Area including rivers, creeks, and adjacent remnant vegetation provide value for a range of species of birds, mammals and reptiles.	

Habitat Type and Occurrence in Study Area	Structure	Habitat Features / Condition	Photographic Example
Riparian woodland and open forest dominated by *Eucalyptus populnea*, *E. tereticornis* often associated with stream channels. *Associated commonly with C. tessellaris +/- E. camaldulensis.* Indicative habitat available: 1,732.3 ha	**Tree layer:** *Eucalyptus tereticornis, E. camaldulensis*, and *Melaleuca bracteata* **Shrub layer:** *Melaleuca* and *acacia spp.* usually sparse. **Ground microhabitat layer:** Native and exotic grasses and sedge tufts, minimal habitat value. Woody debris often present along active parts of creek beds such as depositions/ meanders which provide habitat for smaller mammals and reptiles.	This habitat was generally of moderate to poor condition due to presence of weedy species of grasses and shrubs such as L*antana camara* and erosion caused by cattle, high grazing pressures.	

Habitat Type and Occurrence in Study Area	Structure	Habitat Features / Condition	Photographic Example
Vine Forest/Thickets and Dry Rainforest Including *Brachychiton sp*. *+/-Flindersia sp*. Indicative habitat available: 232.3 ha	**Tree layer:** *Brachychiton sp*. *+/-Flindersia sp*. **Shrub layer:** Commonly vine thicket species such as Wilga (*Geijera parviflora*) and *Eremophila spp.* **Ground microhabitat layer:** Native and exotic grasses. Suitable cover and habitat for ground foraging species such as squatter pigeon.	Trees present may provide habitat for birds and mammals. However, these areas are quite isolated and degraded. Woody debris generally absent. The ground layer largely consists of natives such as *Aristida spp.* (wire grass), *Heteropogon sp* grass), and *Bothriochloa decipiens.*	
Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey *+/- Eucalyptus populnea +/- C. tessellaris +/- E. tereticornis +/- C. erythrophloia +/- E. melanophloia +/- C. citriodora.*	**Tree layer:** dominated by *E. crebra, E. populnea +/- C. tessellaris +/- E. tereticornis +/- C. erythrophloia +/- E. melanophloia +/- C. citriodora.* **Shrub layer:** sparse often weedy. Presence of Acacia spp. **Ground microhabitat layer:** Native and exotic grasses. Suitable cover and habitat for	The trees present may provide habitat for birds and mammals. However, habitat for arboreal mammals is likely to be sparse due to the limited amount of hollow bearing and mature trees observed within the Study Area. The ground layer largely consists of natives such as *Aristida spp.* (wire grass),	

Habitat Type and Occurrence in Study Area	Structure	Habitat Features / Condition	Photographic Example
Indicative habitat available: 21,719.7 ha	ground foraging species such as squatter pigeon.	*Heteropogon sp* grass), and *Bothriochloa decipiens.*	
Brigalow woodlands- dominated by *Acacia harpophylla +/- Casuarina spp.* Indicative habitat available: 328.8 ha	**Tree layer:** Acacia harpophylla dominant. **Shrub layer:** Sparse cover which can include species such as Wilga (*Geijera parviflora*) and *Acacia spp.* **Ground microhabitat layer:** Sparse grasses, saltbush and woody debris. Occasionally cracking clay soils creating gilgai.	Habitat is suitable for some threatened species such as *Denisonia maculata*, where cracking clay depressions are readily available and there is a moderate presence of woody debris. Also potential habitat for Solanum spp., as well as Xerothamnella spp. where water pools. Often observed as heavily grazed in pure stands on alluvial soils. Condition varies depending on grazing pressure and access to cattle as well as presence of weedy vegetation.	

Barfield Road
Sewells Walloon Road
Shawlands Road
Dingly Dell Road
Coates Road
Scotts Road
Rawbelle Road
Lyndale Road
Crowsdale Camboon Road
Hamiltons Road
Defence Road
Road
Hutchinsons Road
Camboon State Forest
Moocoorooba Road

Legend

- Study Area
- Development Footprint
- Road
- Track and Path
- Riparian woodland and open forest dominated by Eucalyptus tereticornis often associated with stream channels
- Brigalow woodlands- dominated by Acacia harpophylla +/- Casuarina spp.
- Vine forest/thickets and dry rainforest
- Eucalypt woodland and open forest dominated by Eucalyptus crebra with a grassy understorey +/- E. populnea +/- C. tessellaris +/- E. tereticornis +/- C. erythrophloia +/- E. melanophloia +/- C. citriodora.
- Waterbodies and drainage features located throughout Study Area
- Grasslands and Cleared Areas

Coordinate System:
GDA2020 MGA Zone 56

Date: 24/05/2024
Created By: SP
Drawing Size: A3

0 1 2 3km

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4.1 -Broad Habitat Types in the Study Area

Theodore Wind Farm Impact Assessment Report
RWE Renewables

ERM

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4.3 FLORA DIVERSITY

A total of 96 flora species from 40 families and 67 genera were identified during the field survey period within the Study Area. The plant families to represent the most taxa were Myrtaceae (17 taxa or 17.7%), Poaceae (8 taxa or 8.3%), Asteraceae (8 taxa or 8.3%), and Fabaceae (8 taxa or 8.3%).

Within these species, field surveys identified 16 introduced species, which represented 16.6% of the total flora species identified. Further information on invasive flora species is provided in Section 5.5.3.1.

No threatened species have been recorded within the Study Area.

The full list of flora species identified during field surveys is included in Appendix H.

4.4 FAUNA DIVERSITY

4.4.1 AVIFAUNA

A total of 127 bird species have been confirmed to occur within the Study Area during field surveys. These species make up 16 orders, 49 families and 94 genera, with Passeriformes showing the highest diversity (55 taxa or 47.4% of the recorded avifauna), followed by Psittaciformes (7 taxa or 6.0% of the recorded avifauna) and Cuculiformes (7 taxa or 6.0% of the recorded avifauna).

Only one invasive species, common myna, was recorded, representing only 0.9% of the avifauna species recorded. Further information on invasive fauna species is provided in Section 5.5.3.2.

Additionally, one NC Act listed species, southern squatter pigeon, and two EPBC Act listed species, southern squatter pigeon, and satin flycatcher, were identified within the Study Area during field surveys. Further information on these species is provided within Section 5.5.3.2 (MSES listed species) and Section 5.6.3 and Section 5.6.4 (MNES listed species).

A full list of these bird species is provided within Appendix H.

4.4.2 MAMMALS

A total of 28 mammal species (including 18 microbat species further detailed below in Section 4.4.2.1) have been confirmed to occur within the Study Area through either direct sighting during field surveys, previously recorded within the Study Area (WildNet), or detected using anabat detectors (microbats). Of the non-microbat species, these mammals make up six orders, nine families and ten genera.

Five of these mammal species are invasive to Australia. Invasive fauna species are further detailed in Section 5.5.3.2.

Out of the native species, two species are ground dwelling, including species of kangaroo, and echidna, and three species are arboreal, including koala and species of glider.

Additionally, four NC Act listed threatened species, Yellow-bellied glider, Greater glider, Koala, and Short-beaked echidna, were identified within the Study Area during field surveys. Three EPBC Act species, Yellow-bellied glider, Greater glider, and Koala were also identified within the Study Area during field surveys.

Further information on these species is provided within Section 5.5.3.2 (MSES listed species) and Section 5.6.3 and Section 5.6.4 (MNES listed species).

A full list of these mammal species is provided within Appendix H.

4.4.2.1 MICROBATS

A total of 18 microbat species were either confirmed 'definite', 'probable' or 'possible' within the Study Area based on data collected from anabat detectors during field surveys. All bats identified on the site were expected to be present within the region.

These 18 species make up five families, and eleven genera within the order Chiroptera. These include one species of sheath-tailed bat (family Emballonuridae), five species of free-tailed bat (family Molossidae), ten species of wattled bat (family Vespertilionidae), one species of horseshoe bat (family Rhinolophidae) and two species of bent-wing bat (family Miniopteridae).

Additionally, one NC Act and EPBC Act listed species, Large-eared pied bat, was identified within the Study Area during field surveys as 'Probabale'. Further information on this species is provided within Section 5.5.3.2 (MSES listed species) and Section 5.6.3 and Section 5.6.4 (MNES listed species).

A full list of these microbat species is provided within Appendix H.

4.4.3 REPTILES

A total of four reptile species have been confirmed to occur within the Study Area through either direct sighting during field surveys or previously being recorded within the Study Area (WildNet). These reptile species make up one order, three families and four geneses, including species of gecko, snake and skink.

No threatened species have been recorded within the Study Area.

A full list of these reptile species is provided within Appendix H.

4.4.4 AMPHIBIANS

A total of one amphibian species has been confirmed to occur within the Study Area through either direct sighting during field surveys or previously being recorded within the Study Area (WildNet). This is the invasive species, cane toad (*Rhinella marina*). Invasive fauna species are further detailed in Section 5.5.3.2.

No threatened species have been recorded within the Study Area.

A full list of this reptile species is provided within Appendix H.

4.5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The MNES relevant to the Study Area are summarised in Table 4-2, with detailed descriptions provided in the sections following.

Four EPBC Act listed threatened fauna species were considered likely or known to occur in the Study Area. One listed migratory species was considered known to occur within the Study Area. One TEC was considered known to occur and one TEC was considered likely to occur.

Three listed threatened fauna species, six listed threatened flora species and three migratory species were determined to potentially occur within the Study Area. Although no records of these species occur within the Study Area or Locality, and no observations were made during field surveys, the potential future presence of these species cannot be ruled out due to an overlap of distribution and potential general habitat within the Study Area. The full likelihood of occurrence for known, likely and potential species is attached in Appendix A.

TABLE 4-2 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE IN THE STUDY AREA

Matter	Relevance to the Study Area
World heritage properties	There are no world heritage properties within the Study Area.
National heritage properties	There are no national heritage properties within the Study Area.
Wetland of international importance	There are no wetlands of international importance associated with the Study Area.
Threatened species and ecological communities	Based on direct observations during targeted field surveys, four EPBC Act listed threatened species have been concluded as known or likely to occur. • Squatter pigeon (southern) (*Geophaps scripta scripta*) - listed as Vulnerable under the EPBC Act (known); • Koala (*Phascolarctos cinereus*) - listed as Endangered under the EPBC Act (known); • Greater glider (southern and central) (*Petauroides volans*) - listed as Endangered under the EPBC Act (known); and • Large-eared pied-bat (*Chalinolobus dwyeri*) – listed as Endangered under the EPBC Act (likely). Four additional EPBC Act listed fauna species are considered to have the potential to occur, due to the presence of general habitat for these species observed within the Study Area and recent records in the Locality, including: • Black-breasted buttonquail (*Turnix melanogaster*), listed as Vulnerable under the EPBC Act; • White-throated needletail (*Hirundapus caudacutus*), listed as Vulnerable under the EPBC Act; • Australian painted snipe (*Rostratula australis*), listed as Endangered and Migratory under the EPBC Act; and • Yellow-bellied glider (south-eastern) (Petaurus australis australis), listed as Vulnerable under the EPBC Act. No listed flora species have been assessed as known or likely to occur within the Study Area. Based on survey effort and habitat suitability, six

Matter	Relevance to the Study Area
	listed threatened flora species have been assessed as having the potential to occur: • Ooline (*Cadellia pentastylis*), listed as Vulnerable under the EPBC Act; • Cossinia (*Cossinia australiana*), listed as Endangered under the EPBC Act • Austral Cornflower (*Rhaponticum australe*), listed as Vulnerable under the EPBC Act • *Solanum dissectum,* listed as Endangered under the EPBC Act • *Solanum johnsonianum,* listed as Endangered under the EPBC Act • *Xerothamnella herbacea,* listed as Endangered under the EPBC Act The PMST identified five EPBC Act listed TECs with potential to occur within the Study Area. Based on in-situ ground-truthing via completion of quaternary vegetation assessments and Biocondtion transects, as well as desktop assessment of aerial imagery, one TECs has been considered known to occur: • Poplar Box Grassy Woodland on Alluvial Plains. With another TEC being determined likely to occur: • Brigalow (*Acacia harpophylla* dominant and co-dominant).
Migratory species	There is one EPBC Act listed migratory species that is regarded as known to occur within the Study Area based on direct observations during targeted field surveys in 2022 and 2023: • Satin flycatcher (*Myiagra cyanoleuca*). An additional three listed migratory species were regarded as having the potential to occur within the Study Area: • Rufous fantail (*Rhipidura rufifrons*); • Fork-tailed swift (*Apus pacificus*); and • White-throated needletail (*Hirundapus caudacutus*).
Commonwealth marine area	There are no Commonwealth marine areas within the Study Area.
The Great Barrier Reef Marine Park	The Great Barrier Reef is not associated with the Study Area.
Nuclear actions	Not Applicable
Water resources	Not Applicable

4.5.1 LISTED THREATENED ECOLOGICAL COMMUNITIES

The desktop review of the EPBC Act PMST (Appendix B), identified the potential occurrence of five EPBC Act listed TECs within the Study Area.

Two (2) TECs are considered known to occur within the Study Area:

- Poplar Box Grassy Woodland on Alluvial Plains ('Poplar box woodlands'); and
- Brigalow (Acacia harpophylla dominant and co-dominant) ('Brigalow TEC').

Poplar box woodlands were confirmed following completion of three (3) Biocondition transects in accordance with Eyre et al, (2015) and 15 quaternary vegetation assessments in accordance with Neldner et al, (2022) in areas of state-mapped habitat. Brigalow TEC was considered known to occur after completion of 21 quaternary vegetation assessments and three (3) Biocondition transects in state-mapped and regrowth habitat within the Study Area.

Tertiary and quaternary level vegetation assessments have not been completed in all areas where REs consistent with TECs are mapped to occur. In these instances, desktop imagery analyses and assessment of representative sampling points has been completed to determine TEC presence. In locations where the Proposed Action footprint is projected to intersect with a mapped TEC, potential, likely or know to occur, further ground-truthing via quaternary vegetation assessments and Biocondition transects will be completed.

The TEC *Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions* ('SEVT') was originally assessed as having the potential to occur in the Study Area before being downgraded to unlikely to occur. The semi-evergreen vine thicket RE that occurs in the Study Area does not align with the SEVT TEC as per *Approved conservation advice for semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (DCCEEW, 2023)* (The Conservation Advice).

Additional ground-truthing, including four (4) quaternary vegetation assessment and two (2) Biocondition transect completed in areas of state-mapped semi-evergreen vine thicket REs confirmed this, as did desktop assessments of geological composition of potential SEVT TEC patches. Key diagnostic criteria are further described in Table 4-3.

TABLE 4-3 KEY DIAGNOSTIC CRITERIA FOR SEVT TEC RELEVANCE TO THE STUDY AREA

Key Diagnostic Criteria for TEC	Comment on Requirement met in Study Area
The ecological community Semi-evergreen vine thickets of the Brigalow Belt Bioregions (North and South) includes the following Regional Ecosystems (RE), as defined in the Conservation Advice for the TEC: • Semi-evergreen vine thicket and semi-deciduous notophyll rainforest on Cainozoic alluvial plains (RE 11.3.11) • Semi-evergreen vine thicket +/- Casuarina cristata on Cainozoic clay plains including extensively weathered Tertiary basalt (RE 11.4.1) • Semi-evergreen vine thicket on remnant Tertiary surfaces and sometimes eroded scarp slopes. Deep red and yellow earths (RE 11.5.15) • Semi-evergreen vine thicket and microphyll/notophyll rainforest on Cainozoic igneous rocks. Lowlands (RE 11.8.13) • Semi-evergreen vine thicket on Cainozoic to Proterozoic consolidated, fine-grained sediments. Emergents may be present including Acacia	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks (RE 11.12.4) is the only RE that occurs in the Study Area which could correlate to the SEVT TEC. The Conservation Advice does not recognise this RE as constituting SEVT TEC due to its occurrence in RE land zone 12 – hills and lowlands on granitic rocks. (DCCEEW, 2023) Desktop assessment of state-mapped geology data via Queensland Globe confirmed a predominantly granitic and igneous geological composition of the areas in the Study Area where potential SEVT TEC occurs, indicating the land zone composition of 11.12.4 communities that

Key Diagnostic Criteria for TEC	Comment on Requirement met in Study Area
harpophylla, Eucalyptus populnea, Casuarina cristata, Cadellia pentastylis and Brachychiton spp. (RE 11.9.4) • Semi-evergreen vine thicket on Mesozoic to Proterozoic moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Lowlands (RE 11.11.18) • Low microphyll rainforest on Quaternary coastal dunes and beaches (RE 11.2.3) • Semi-evergreen vine thicket which may have emergent Acacia harpophylla, Casuarina cristata, Eucalyptus spp. On Cainozoic igneous rocks. Steep hillsides (RE 11.8.3) • Macropteranthes leichhardtii thicket on Cainozoic igneous rocks. Steep hills (RE 11.8.6) • Macropteranthes leichhardtii thicket on Cainozoic to Proterozoic consolidated, fine-grained sediments. Lowlands (RE 11.9.8) • Semi-evergreen vine thicket in the Brigalow Belt South and Nandewar Bioregions (NSW SAC, 1999).	occur within the Study Area are correctly mapped. Additionally, one quaternary assessment completed in a patch of 11.12.4 in the southeast of the Study Area identified the presence of *Eucalyptus moluccana* as a dominant tree in the emergent and upper canopy layer of the patch, indicating a floristic consistency with RE 11.12.4. This quaternary assessment did not identify any emergent *Araucarian* spp. in the patch, however. The Biocondition transect completed in a patch of 11.12.4 to the west of the Study Area identified inconsistent floristics with the mapped RE, primarily through insufficient tree and shrub species richness (sub-40% of benchmark for both), however the floristics were also inconsistent with the SEVT TEC, with a dominance of *Acacia rhodoxylon* and *Alphitonia excelsa* at the tree and shrub layer, though some SEVT TEC species where observed in the understorey, including *Strychnos psiloderma* and *Flindersia collina*. Therefore, SEVT is concluded as not likely to occur within the Study Area.

4.5.1.1 BRIGALOW TEC

Brigalow TEC has been determined as likely to occur within the Study Area. Survey effort for this TEC included 21 quaternary assessments in mapped vegetation patches of brigalow woodland as well as regrowth patches that were identified to have required floristic composition.

More than 40 disjunct patches of likely Brigalow TEC have been mapped, as shown in Figure 4-2. Two quaternary assessments returned suitable composition to be considered likely TEC, while the remaining 19 assessments either ruled out the TEC occurring or identified the need for further detailed assessment to determine the patch's ability to constitute Brigalow TEC. This is outlined in Table 4-4.

In patches of likely brigalow woodland where field verification has not been completed, desktop imagery analyses and assessment of representative sampling points has been undertaken to map likely Brigalow TEC.

Further vegetation assessments will be completed at areas where mapped Brigalow TEC intersects the Proposed Action layout, including both quaternary and tertiary level assessment.

Brigalow TEC coincides with 16 REs in Queensland, including RE 11.12.21 which is mapped ito occur in the Study Area, as well as any regrowth patch of a sufficient size dominated or co-dominated by *A. harpophylla* which has not been comprehensively cleared in 15 years (DoE, 2013). Remnant vegetation patches mapped as RE 11.12.21 and regrowth vegetation patches with canopy composition consistent with RE 11.12.21 were identified during the survey effort of the Study Area. These communities were considered to be of poor to moderate quality, with occasionally high presence of weeds in the understorey. With the exception of small fragmented patches of brigalow dominant vegetation, which do not meet the patch size criteria (detailed below in Table 4-4), remnant and regrowth patches of *A. harpophylla* dominant vegetation observed across the Study Area were considered likely to constitute Brigalow TEC.

A total of 326.9 ha of Brigalow TEC has been mapped to occur within the Study Area, as presented in Figure 4-2.

Table 4-4 details how the key diagnostic criteria for the Brigalow TEC have been met based on data collected from field surveys.

TABLE 4-4 KEY DIAGNOSTIC CRITERIA FOR BRIGALOW TEC RELEVANCE TO THE STUDY AREA

Key Diagnostic Criteria for TEC	**Comment on Requirement met in Study Area**
The patch is ≥ 0.5 ha; and	Patches are greater than 0.5ha in size across the Study Area. Where patches smaller than this size occur, they have been excluded from consideration.
Exotic perennial plants comprise less than 50% of total vegetation cover of the patch.	Rapid ground-truthing via quaternary assessment revealed exotic perennial plants comprised less than 50% of total vegetation in two patches of brigalow woodland. It is noted that these were rapid assessments that potentially did not capture the entire vegetation cover of the survey patches, hence the determination of Brigalow TEC being likely to occur, rather than known. In accordance with a conservative approach, and because delineation of patches is not possible at the current scale of mapping, areas mapped as RE 11.12.21 or exhibiting traits similar to mapped areas were determined to likely be Brigalow TEC, based on analysis of field data from sampled plots and mapping of extent of Brigalow using aerial and satellite imagery.

4.5.1.2 POPLAR BOX GRASSY WOODLANDS ON ALLUVIAL PLAINS TEC

Poplar box woodlands TEC has been determined as known to occur within the Study Area. Survey effort for this TEC included nine quaternary assessments and two Biocondition transects in state-mapped vegetation patches of poplar box alluvial woodland.

In patches of Poplar box woodlands TEC where in-situ assessment has not been completed, satellite imagery analyses and assessment of representative sampling points has been undertaken to map the TEC.

Further tertiary vegetation assessments will be completed at areas where mapped Poplar box woodlands TEC intersects the Proposed Action layout.

Poplar box grassy woodlands TEC occurs in Queensland RE Land Zone 3 (quaternary alluvium deposited from stream flow) and Land Zone 4 (quaternary clay plains originating in ancient alluvium deposits) (DAWE, 2019). The TEC is best represented by five REs in Queensland, though can occur outside of these mapped REs, including as regrowth vegetation (DAWE, 2019). Poplar box woodlands TEC has been mapped to occur within the southeast of the Study Area in one mostly intact patch associated with RE 11.3.2 along Oxtrack creek, as shown in Figure 4-2.

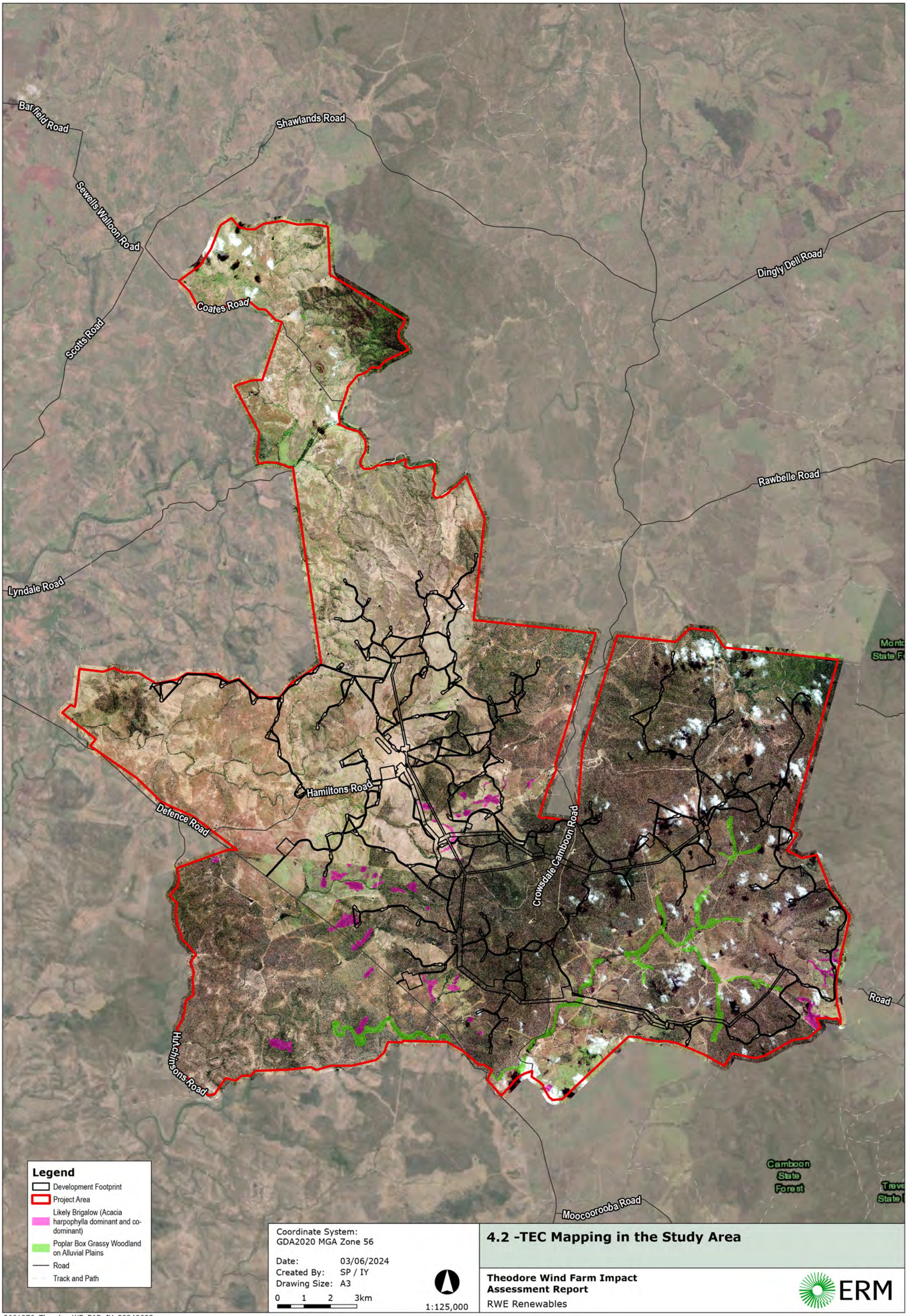
Three Biocondition transects confirmed the presence of the TEC due to meeting 'Class B Good Quality' key diagnostic condition criteria, as detailed further in Table 4-5. Additionally, six quaternary assessments ground-truthed suitable dominance in the canopy of *Eucalyptus populnea* (Poplar box), though further detailed assessment, post analysis, is required to determine if the TEC criteria is met and in what condition class. The remaining nine quaternary assessments ruled out the TEC occurring due to inconsistent floristics. This is outlined further in Table 4-5.

A total of 501.1 ha of poplar box woodland TEC has been mapped to occur within the Study Area, as presented in Figure 4-2.

Table 4-5 details how the Category B key diagnostic criteria for the Poplar Box Woodlands TEC were met based on data collected from surveys.

TABLE 4-5 KEY DIAGNOSTIC CRITERIA FOR POPLAR BOX TEC RELEVANCE TO THE STUDY AREA

Key Diagnostic Criteria for TEC	Comment on Requirement met in Study Area
The crown cover of canopy trees in the patch is ≥ 10%; and	Biocondition transects returned a canopy cover of 47% and 37.5%. Quaternary assessments generally showed signs of canopy cover greater than 10%. Portions of the eucalypt woodland and open forest in alluvial zones contained variation in the dominance of eucalypt species in the canopy with some areas dominated by *Eucalyptus tereticornis*. Delineation of these patches is not possible at the current scale of mapping completed and a conservative approach has been applied and all alluvial and riparian woodlands mapped as 11.3.2 have been classified as Poplar Box woodland TEC.
≥ 50% of perennial vegetation cover in ground layer is native; and	Biocondition transects returned non-native plant cover of 1%. Quaternary assessments generally showed signs of cattle grazing and some exotic cover, though further assessment would be required at these locations to determine perennial native ground cover.
Either; ≥ 20 perennial native plant spp. Per patch in ground layer; OR ≥ 10 mature trees/ha with ≥ 30cm dbh (and/or hollows).	Biocondition transects returned recordings of 'large *Eucalyptus* species' (>44cm dbh) of 20 per ha and 16 per ha. Quaternary assessments recorded large poplar box (*E. populnea*) individuals greater than 15m in height and with dbh likely broader than 30cm. It should be noted that the Biocondition transect with 20 large *Eucalyptus* species per ha featured only poplar box as the dominant canopy species. The other Biocondition transect occurred in a vegetation community co-dominant with other *Eucalyptus* species such as forest red gum (*E. tereticornis*) and Moreton Bay ash (*Corymbia tesselaris*). However, the threshold of 10+ poplar box individuals p/ha with a greater than 30cm dbh was met.



4.2 -TEC Mapping in the Study Area

Theodore Wind Farm Impact Assessment Report

RWE Renewables

ERM

0661076_TheodoreWF_EAR_IY_20240603.aprx

4.5.2 LISTED THREATENED FLORA SPECIES

The PMST results (Appendix B) indicated the possible occurrence of eight EPBC Act listed threatened flora species within the Study Area, through analysis of habitat suitability based on field data and historical records in database searches this list was refined down to six potential flora species. Targeted field surveys did not detect any EPBC Act listed threatened flora species. However, their presence is not able to be ruled out due to the presence of suitable habitat within the Study Area. During the assessment phase of the Proposed Action, additional targeted flora surveys will be conducted as the Development Footprint is further defined.

4.5.2.1 LISTED THREATENED FLORA SPECIES WITH THE POTENTIAL TO OCCUR

Six listed threatened flora species were determined to have the potential to occur within the Study Area (Appendix A). No threatened flora species were detected across eight field survey events between 2022 and 2024. However, distribution of these species overlaps with the Study Area and suitable habitat was observed. On this basis, their potential presence cannot be ruled out. The threatened flora species with potential to occur within the Study Area are listed in Table 4-6 and potential habitat for these species is mapped in Figure 4-3.

TABLE 4-6 EPBC ACT LISTED FLORA SPECIES WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Study Area
Cadellia pentastylis	Ooline	V	There is potential habitat of vine forest/thickets and dry rainforest present within the Study Area for this species. The total potential habitat is 232.3 ha, shown on Figure 4-3.
Cossinia australiana	Cossinia	E	There is potential habitat of vine forest/thickets and dry rainforest present within the Study Area for this species. The total potential habitat is 232.2 ha, shown on Figure 4-3.
Rhaponticum australe	Austral cornflower	V	There is potential habitat of eucalypt woodlands and open forests present within the Study Area. The total potential habitat is 21,719.7 ha, shown on Figure 4-3.
Solanum dissectum	-	E	There is potential habitat of brigalow woodlands present within the Study Area. The total potential habitat is 328.8 ha, shown on Figure 4-3.
Solanum johnsonianum	-	E	There is potential habitat of brigalow woodlands present within the Study Area for this species. The total potential habitat is 328.8 ha, shown on Figure 4-3.
Xerothamnella herbacea	-	E	There is potential habitat of brigalow woodlands present within the Study Area. The total potential habitat is 328.8 ha, shown on Figure 4-3.

Status listing per EPBC Act: E = Endangered; V= Vulnerable.
For the full reasoning for the potential outcomes for such species, refer to Appendix A.

Barfield Road
Sewells Walloon Road
Shawlands Road
Dingly Dell Road
Coates Road
Scotts Road
Rawbelle Road
Lyndale Road
Crowsdale Camboon Road
Hamiltons Road
Defence Road
Hutchinsons Road
Road
Camboon State Forest
Moocoorooba Road

Legend

- Study Area
- Development Footprint
- Road
- Track and Path
- Potential habitat for Solanum johnsonianum, Xerothamnella herbacea and Solanum dissectum
- Potential habitat for Ooline, Cossinia
- Potential habitat for Austral cornflower

Coordinate System:
GDA2020 MGA Zone 56

Date: 24/05/2024
Created By: SP
Drawing Size: A3

0 1 2 3km

1:125,000

4.3 -Potential EPBC Act Listed Threatened Flora Habitat in the Study Area

Theodore Wind Farm Impact Assessment Report
RWE Renewables

ERM

0661076_EAR_G005_R8.mxd

4.5.3 LISTED THREATENED FAUNA SPECIES

The PMST results (Appendix B) indicated the possible occurrence of 25 EPBC Act listed threatened fauna species within the Study Area. Based on field surveys and a likelihood of occurrence assessment, four EPBC Act listed threatened fauna species, were considered known to occur within the Study Area. These EPBC Act listed threatened fauna species that are considered known or likely to occur within the Study Area are further discussed in the following Sections.

4.5.3.1 TERRESTRIAL MAMMALS

Koala

Koala is listed as Endangered under the EPBC Act (as of the 12th of February 2022) and is known to occur within the Study Area (Appendix A).

Koala utilisation in the Study Area is very low, consistent with low density populations in the Central Queensland area. Melzer et al., (2001) have reported on koala density within Central Queensland, which is considered generally very low, particularly where access to water is low / absent. Koalas occur in widely distributed and low populations across their range, however, elevated areas on rocky soils can often be absent of koalas despite eucalypts being present (Melzer et al., 2001).

The presence of koala has been assessed as known due to two positive identifications of a single faecal pellets for the species, recorded in the south-east corner of the Study Area. Historical records of the species within the Study Area also include a single observation from 1996. The general lack of evidence of the species as a result of targeted surveys across multiple field visits is aligned with observations of Melzer et al. (2001). The Study Area is within the range for the species, and contains elements of habitat critical to the survival of the species with foraging, breeding and dispersal habitat present.

The koala is generally found in temperate to tropical forests as well as woodlands and semi-arid communities dominated by eucalyptus species (Martin and Handasyde, 1999). The species can be found in habitat broadly defined as woodlands and open forests, as long as food trees are present (DOE, 2020). The koala has one of the broadest distributions of threatened terrestrial species under the EPBC Act with a range extending from north-eastern Queensland to the south-east corner of Southern Australia. The biological species distribution is widespread in coastal and inland areas that extends over approximately one million square kilometres (Martin & Handasyde, 1999). Koala food trees are typically considered to be those of the following genus: *Angophora, Corymbia, Eucalyptus, Lophostemon* and *Melaleuca*.

Under the revised Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE, 2022), released on 12 February 2022, habitat for the koala is described as:

> *Koala habitat includes both coastal and inland areas that are typically characterised by Eucalyptus forests and woodlands. Biophysical habitat attributes for the Koala include places that contain the resources necessary for individual foraging, survival (including predator avoidance), growth, reproduction and movement.*

Habitat critical to the survival of the species is defined as those that the species relies on to avoid or halt decline and promote the recovery of the species. Under the EPBC Act, the following factors are considered when identifying habitat that is critical to the survival of the species:

> *(a) Whether the habitat is used during periods of stress (examples: flood, drought or fire);*
>
> *(b) Whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);*
>
> *(c) The extent to which the habitat is used by important populations;*
>
> *(d) Whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development;*
>
> *(e) Whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements;*
>
> *(f) Whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation; and*
>
> *(g) Any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.*

In Central Queensland, koala habitat is defined into preferred habitat and general habitat, with preferred habitat including:

- Contiguous remnant Eucalyptus open forest and woodlands on alluvial soils or with connection to seasonal aquifers where palatable food tree species occur frequently, and are typically dominant. Preferred Koala habitat is typically centralised around riparian forests and woodlands where forest red gum (*E. tereticornis)* and river red gum (*E. camaldulensis*) are the dominant or sub-dominant species;
- Habitat trees greater than 10 cm in DBH (Youngentob et al., 2021);
- Preferred foraging and breeding trees within Central Queensland include: Brown's box (*Eucalyptus brownii*), river red gum (*E. camaldulensis*), coolibah (*Eucalyptus coolabah*), narrow-leaved ironbark (*E. crebra*), Queensland grey ironbark (*E. drepanophylla*), Queensland peppermint (*E. exserta*), broad-leaved ironbark (*E. fibrosa*), silver-top stringybark (*E. laevopinea*), black box (*E. largiflorens*), silver-leaved ironbark (*E. melanophloia*), coastal grey box (*E. moluccana*), mountain coolibah (*E. orgadophila*), poplar box (*E. populnea*), and forest red gum (*E. tereticornis*) (Youngentob et al., 2021);
- General habitat for the koala in Central Queensland includes all other remnant and regrowth Eucalyptus open forest and woodland on alluvial areas or with connection to seasonal aquifers and all other fragmented and sparsely distributed woodlands (including open woodlands), shrub lands and forests where some food tree species occur, which are connected to areas of preferred habitat;

- Koala ancillary habitat trees that are classified as species general habitat in Central Queensland include: brigalow (*Acacia harpophylla*), cooba (A*. salicina*), boree (A*. tephrina*), lemon-scented gum (*Corymbia citriodora*), Dallachy's ghost gum (*C. dallachiana*), red bloodwood (*C. erythrophloia*), pink bloodwood (*C. intermedia*), Moreton Bay ash (*C. tessellaris*), white mahogany (*E. acmenoides*), Dawson River blackbutt (*E. cambageana*), white gum (E*. platyphylla*), Thozet's box (E*. thozetiana*) and black tea-tree (*Melaleuca bracteata*) (Youngentob et al., 2021).

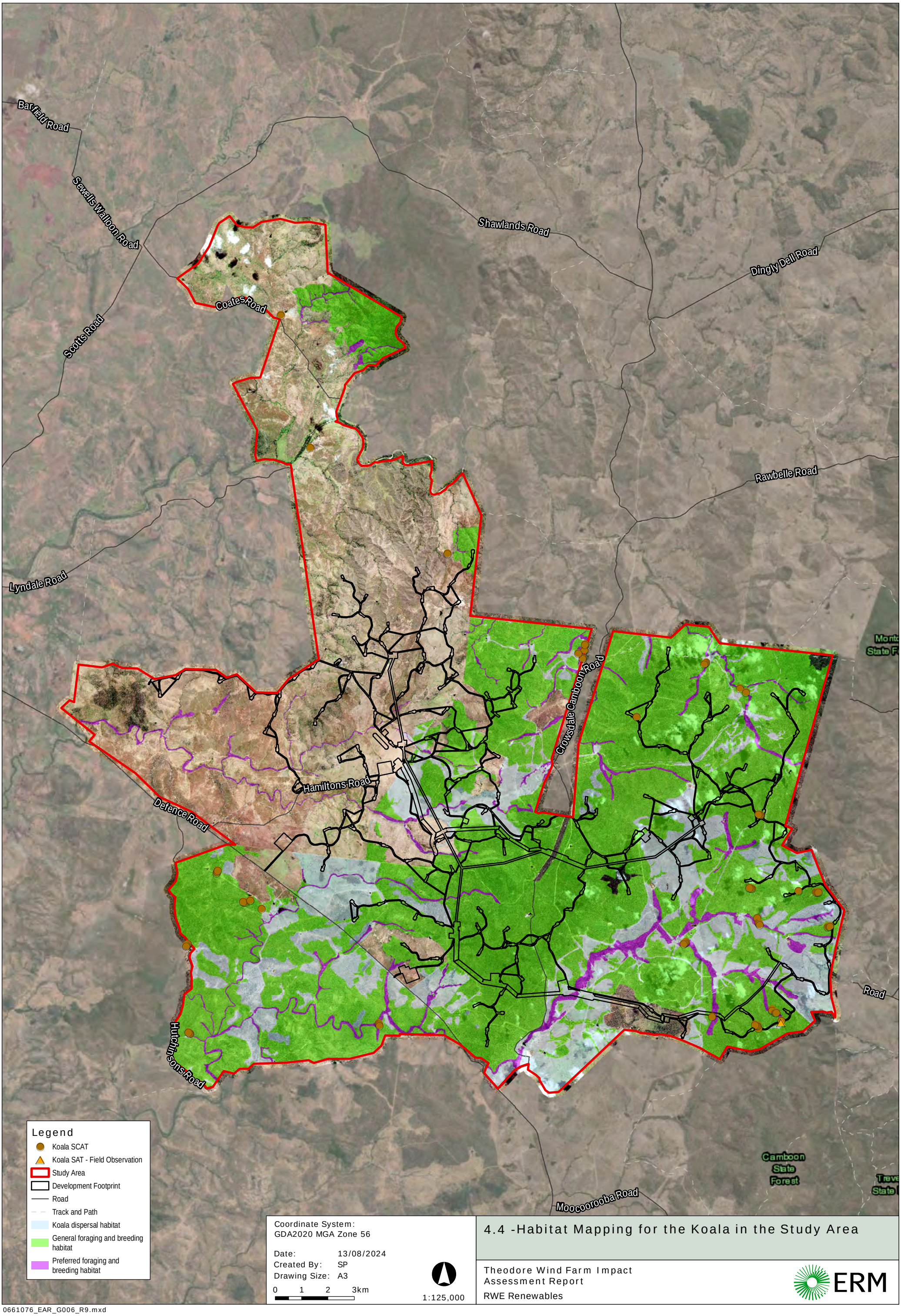
Foraging and breeding habitat for koala associated with eucalypt dominated communities occurs within the Study Area. It should be noted that in the centre and north of the Study Area, dieback of eucalypt species was widely observed, to the extent it was determined most vegetation patches in that region of the Study Area do not constitute koala habitat.

Open grassy areas and cleared agricultural land with occasional standalone koala food trees are also present within the Study Area, mostly in the centre and north. Due to the lack of connectivity and observed effects of dieback and drought within these areas, this habitat type in those areas is also deemed generally unsuitable for koala. Koala dispersal habitat has been identified where cleared areas contain occasional eucalypt paddock trees that are directly adjacent to eucalypt woodlands.

The broad habitat types that comprise each koala habitat are presented in Table 4-7, with preferred foraging and breeding habitat, general foraging and breeding habitat and dispersal habitat considered to meet the definitions of habitat critical to the survival of the koala. The majority of the Study Area contains general foraging and breeding habitat and dispersal habitat for koala. Areas of preferred foraging and breeding habitat are located in riparian zones and adjoining alluvial areas where preferred foraging trees occur, and higher moisture content of leaves provides increased nutritional value. These habitats are mapped on Figure 4-4.

TABLE 4-7 KOALA HABITAT SUMMARY IN THE STUDY AREA

	Preferred foraging and breeding habitat	**General foraging and breeding habitat**	**Dispersal habitat**	**Generally unsuitable habitat**
Description	Contiguous remnant Eucalyptus open forest and woodlands on alluvial soils or with connection to seasonal aquifers where palatable food tree species occur frequently, and are typically dominant.	Any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. This includes remnant and regrowth vegetation.	Part of the broader landscape that includes cleared areas. Contains isolated or scattered foraging or shelter trees. Contains vegetation generally not used frequently for foraging and breeding purposes by the species.	Not suitable habitat includes barriers (natural or artificial) that prevent the movement of koalas, such as mountain ranges, water bodies or treeless areas that are greater than 500m wide.
Presence within the Study Area	Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels.	Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey.	Brigalow woodlands; Cleared grasslands that contain occasional paddock trees	Vine forests/thickets and dry rainforest; Grasslands and cultivated agricultural land; and waterbodies and drainage features (predominately farm dams).
Total in the Study Area	1,618.2 ha preferred foraging and breeding habitat	21,067.5 ha general foraging and breeding habitat.	6,808.0 ha dispersal habitat.	17,336.3 ha of generally unsuitable areas


Barfield Road
Sewells Walloon Road
Scotts Road
Coates Road
Shawlands Road
Dingly Dell Road
Rawbelle Road
Lyndale Road
Crowsdale Camboon Road
Hamiltons Road
Defence Road
Hutchinsons Road
Road
Camboon State Forest
Moocoorooba Road
Legend
Koala SCAT
Koala SAT - Field Observation
Study Area
Development Footprint
Road
Track and Path
Koala dispersal habitat
General foraging and breeding habitat
Preferred foraging and breeding habitat
Coordinate System:
GDA2020 MGA Zone 56
Date: 13/08/2024
Created By: SP
Drawing Size: A3
0 1 2 3km
1:125,000
4.4 -Habitat Mapping for the Koala in the Study Area
Theodore Wind Farm Impact Assessment Report
RWE Renewables
ERM
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Greater Glider (Southern and Central)

The greater glider (southern and central) ('greater glider') was upgraded from a listing of Vulnerable to Endangered under the EPBC Act, on the 5th of July 2022. This species was concluded as known to occur within the Study Area as per the likelihood of occurrence assessments (Appendix A).

Greater glider was recorded within the Study Area during targeted spotlighting surveys in the June 2023 surveys, with 14 individuals observed in the southeast of the Study Area and in the central-north of the Study Area. Additionally, one ALA record of the species (2020) is present within the Locality, this is undated.

It is noted in the Conservation Advice that two separate taxa of subspecies likely co-exist in this area. However, until such ambiguity is resolved, the listed entity will be referred to as *Petauroides volans* (DCCEEW, 2022).

Greater glider habitat consists of tall, eucalypt forests with mature hollow-bearing trees (Eyre, 2004). Micro-habitat and landscape features essential for greater glider include live and dead hollow bearing trees for denning function, habitat connectivity for dispersal function and feed trees for foraging purposes.

Habitat critical to survival for the greater glider has been defined in Conservation Advice for *Petauroides volans* (Greater Glider (southern and central) (DCCEEW, 2022) as:

- *Large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region; and*
- *Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization; and*
- *Cool microclimate forest/woodland areas (e.g., protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes); and*
- *Areas identified as refuges under future climate changes scenarios; and*
- *Short-term or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.*

Greater glider habitat within the Study Area can be considered to contain large contiguous areas of eucalypt forest containing mature hollow-bearing trees and a diverse range of the preferred food species as well as a smaller or fragmented habitat patches connected to larger patches of habitat. Suitable greater glider foraging and denning habitat has been identified within the Study Area based on ground-truthing of habitat attributes and confirmed records of the species during survey effort. Therefore, this habitat has been considered habitat critical to the survival of the species.

The Study Area contained the following broad habitat types as denning habitat, foraging habitat, and generally unsuitable habitat for the species. Note, in accordance with the habitat guidance provided by Eyre et al. (2022), mapping was restricted to areas containing trees with > 30 cm diameter at breast height (DBH) for foraging and > 50 cm DBH for denning.

- Denning habitat:
  - Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels;
- Foraging habitat:
  - Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; and
- Generally unsuitable habitat:
  - Brigalow woodlands;
  - Vine forest/thickets and dry rainforest;
  - Waterbodies and drainage features; and
  - Grasslands and cultivated agricultural land.

Ground-truthed surveys have identified 1,425.3 ha of greater glider denning habitat and 20,859.0 ha of foraging habitat within the Study Area, which meets the definition of habitat critical to the survival of the species. There is 24,545.7 ha of generally unsuitable habitat within the Study Area. This habitat mapping is presented on Figure 4-5, with a summary of habitat types in the Study Area presented below in Table 4-8.

Based on the vegetation structure of the riparian woodland, and the presence of hollow-bearing trees, these areas have been mapped as potential denning habitat in this impact assessment report.

TABLE 4-8 GREATER GLIDER HABITAT SUMMARY IN THE STUDY AREA

	Denning Habitat	**Foraging Habitat**	**Generally Unsuitable Habitat**
Description	Any eucalypt forest or woodland containing mature, hollow-bearing canopy trees and a diverse range of the species' preferred food trees. This includes remnant and regrowth vegetation.	Any eucalypt forest or woodland containing a range of the species' preferred food trees and canopy dense enough to allow gliding function from tree to tree. This includes remnant and regrowth vegetation.	Not suitable habitat includes vegetation communities which do not provide sufficient foraging function (absence of eucalypt species) or which do not provide suitable denning function (absence of mature hollows)
Presence within the Study Area	Suitably large and connected communities of: • Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels.	Suitably large and connected communities of: • Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;	• Vine forests/thickets and dry rainforest; and • Waterbodies and drainage features (predominately farm dams); and • Brigalow woodlands; and • Grasslands and cultivated agricultural land.
Total in the Study Area	1,425.3 ha denning habitat	20,859.0 ha foraging habitat	24,545.7 ha unsuitable habitat

Barfield Road
Sewells Walloon Road
Scotts Road
Coates Road
Shawlands Road
Dingly Dell Road
Rawbelle Road
Lyndale Road
Crowsdale Camboon Road
Hamiltons Road
Defence Road
Hutchinsons Road
Road
Camboon State Forest
Moocoorooba Road

Legend

- Greater Glider - WildNet
- Greater Glider - Field Observation
- Study Area
- Development Footprint
- Road
- Track and Path
- Greater Glider Denning Habitat
- Greater Glider Foraging Habitat

Coordinate System:
GDA2020 MGA Zone 56

Date: 24/05/2024
Created By: SP
Drawing Size: A3

0 1 2 3km

1:125,000

4.5 -Habitat Mapping for the Greater Glider in the Study Area

Theodore Wind Farm Impact Assessment Report
RWE Renewables

ERM

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4.5.3.2 BIRDS

A total of 127 bird species were identified across eight field surveys, with a full species list in Appendix D. One EPBC Act and NC Act listed threatened species, the squatter pigeon (southern), was observed during field surveys. One EPBC Act listed migratory species, satin flycatcher, was recorded during field surveys.

Birds were recorded in a variety of habitats including non-native grasslands, eucalypt woodlands, riparian corridors and waterbodies. Bird abundance was regarded as generally low. The Study Area contained a number of active and abandoned small and medium-sized nests. Bird abundance and species richness remained relatively constant across seasons. Additional detail is provided below on listed threatened species, woodlands birds, birds of prey and bats.

Squatter Pigeon (Southern)

The squatter pigeon (southern) (squatter pigeon) is listed as Vulnerable, under the EPBC Act, as of 16th July 2000. This species has been concluded as known to occur within the Study Area, as per the likelihood of occurrence (Appendix A). This species was successfully identified on three occasions during field surveys in October 2022, September/October 2023 and December 2023. All observations were made in the north to north-west section of the Study Area outside the Development Footprint.

Squatter pigeon is a ground-dwelling pigeon and can be differentiated from the northern subspecies by its larger body, and the skin around the eyes being predominantly blue-grey compared with yellowy-orange to orange-red in the northern subspecies (Crome, 1976; Ford, 1986; Higgins & Davies, 1996; Squatter Pigeon Workshop, 2011). The squatter pigeon inhabits open forests to sparse, open woodlands and scrub mostly dominated in the overstorey by *Eucalyptus, Corymbia, Acacia* or *Callitris* species, on sandy or gravelly soils, within approximately 3 km of a suitable, permanent or seasonal waterbody. Retention of these woodland canopy species, which provide shelter from predatory birds, is an important habitat factor for the squatter pigeon and is a notable distinction between the habitat value of open woodland compared to cleared land (which does not constitute important or critical habitat for the species).

Additional to presence of woodland canopy species, squatter pigeon conservation guidelines identify proximity to water as the most important determinant of habitat suitability, with open ground cover that permits ease of movement also crucial:

> *It is nearly always found near permanent water such as rivers, creeks and waterholes. Sandy areas dissected by gravel ridges, which have open and short grass cover allowing easier movement, are preferred (DCCEEW, 2015).*

Specifically in Queensland, foraging and breeding habitat is known to occur on well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills, and lateritic (duplex) soils on low 'jump-ups' and escarpments within 1 km of watercourses. The squatter pigeon nests on the ground where it forages for seeds among ground layers where these is sparse and low density grass cover. Suitable low grass cover for foraging will vary across the year in the Study Area, with cover reducing during dry the dry season. It roosts in low trees at night. Based on the presence of woodland canopy species and the proximity to water, the mapped squatter pigeon habitat within the Study Area (which is assumed to provide breeding and foraging function for the known species), is considered habitat critical to the survival of the species.

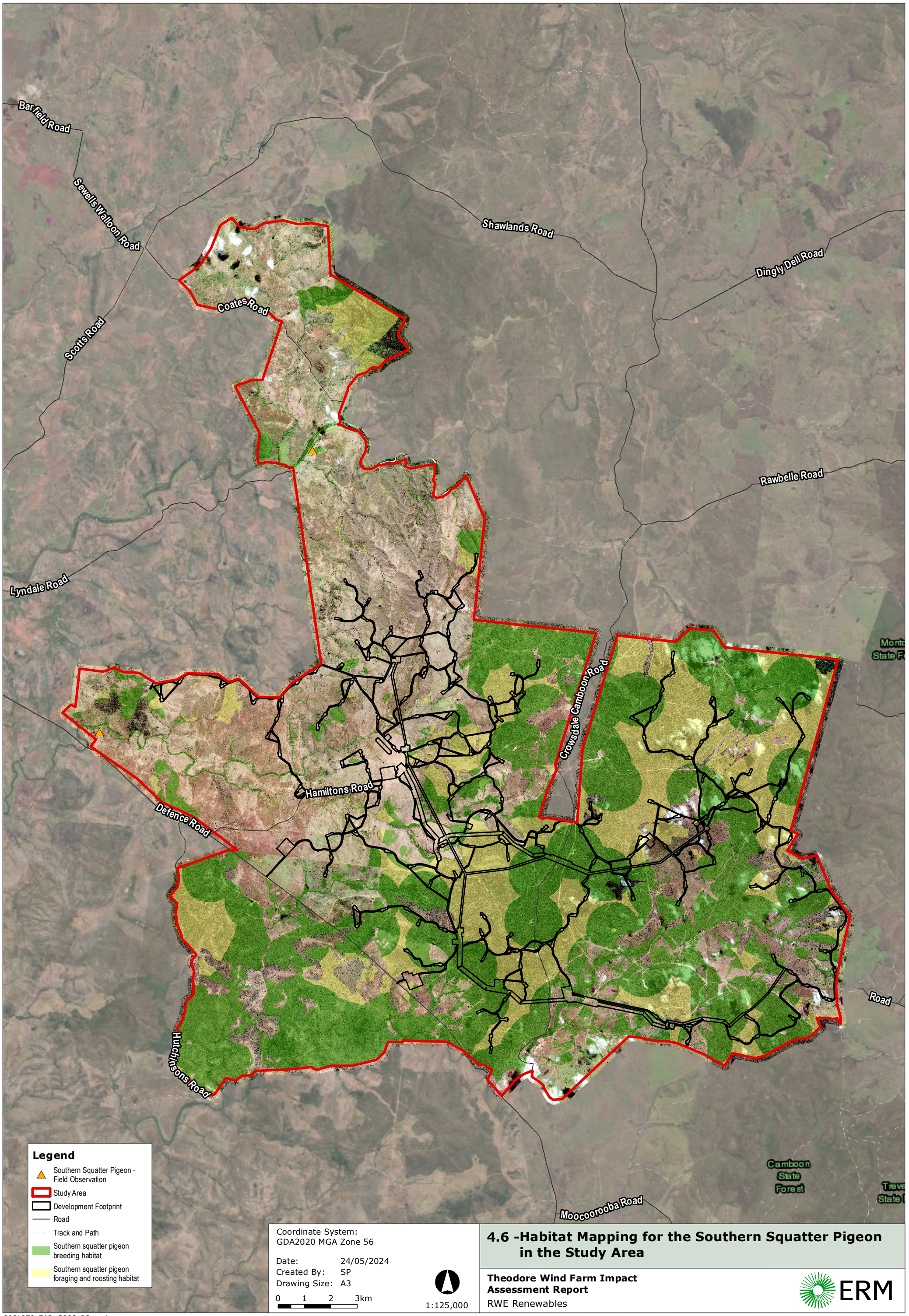
Habitat for the squatter pigeon has been delineated from the broad habitat types, based on the habitat requirements for the species. This is as follows:

- Foraging habitat:
  - Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;
  - Brigalow woodlands, within 3 km of permanent or seasonal waterbodies; and
  - Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels, within 3 km of permanent or seasonal waterbodies.
- Breeding habitat:
  - Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;
  - Brigalow woodlands, within 1 km of permanent waterbodies; and
  - Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels, within 1 km of permanent waterbodies.
- Generally unsuitable habitat:
  - Vine forest/thickets and dry rainforest;
  - Waterbodies and drainage features; and
  - Grasslands and cultivated agricultural land.

There is a total of 8,023.0 ha foraging and dispersal habitat and 16,267.8 ha of breeding habitat mapped in the Study Area, which meets the definition of habitat critical to the survival of the species. There is 22,539.2 ha of generally unsuitable habitat within the Study Area. The habitat for the squatter pigeon is shown in Figure 4-6, with habitat types summarised below in Table 4-9.

TABLE 4-9 SQUATTER PIGEON (SOUTHERN) HABITAT SUMMARY IN THE STUDY AREA

	Breeding Habitat	**Foraging and Dispersal Habitat**	**Generally Unsuitable Habitat**
Description	Low, open eucalypt woodland on well-draining, gravelly, sandy or loamy soils and escarpments within 1 km of permanent dams, watercourses and waterbodies.	Low, open eucalypt woodland on well-draining, gravelly, sandy or loamy soils and escarpments within 3 km of dam, watercourses and waterbodies.	Not suitable habitat includes areas either bereft of suitable roosting and shelter sites or areas that are too dense for movement.
Presence within the Study Area	Within 1 km of permanent waterbodies; • Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; and, • Brigalow woodlands; • Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels	Within 3 km of permanent and seasonal waterbodies; • Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; and, • Brigalow woodlands; • Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels	• Vine forest/thickets and dry rainforest; • Waterbodies and drainage features; and • Grasslands and cultivated agricultural land.
Total in the Study Area	16,267.8 ha of breeding habitat	8,023.0 ha foraging and dispersal habitat	22,539.2 ha generally unsuitable habitat



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4.5.3.3 BATS

The full echolocation analyses for the anabats deployed during the October 2022, February and March 2023 field investigations can be found in Appendix C, with a summary of species recorded in Table 4-10.

A total of 17 microbat species, and two microbat families (could not be identified to species level) were recorded in the Study Area. Call identification for this dataset was based on call keys and descriptions published for Queensland (Reinhold et al., 2001) and New South Wales (Pennay et al., 2004).

Species' identification was further refined using the probability of occurrence of each species based on their geographic distribution, with reliability of identification defined as:

- Definite - one or more calls where there is no doubt about the identification of the species;
- Probable - most likely to be the species named, low probability of confusion with species that use similar calls; and
- Possible - call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

As outlined in the analysis of echolocations calls in Appendix A, where ambiguity occurs between species/families calls, further justification of species identification is provided. For example, probable *Nyctophilus* species were identified, and subsequent assessment indicated that they were likely to be the calls of *N. geoffroyi* and *N. gouldii*, neither of which are listed threatened species under the EPBC Act or NC Act. Further, the report also indicated that such calls are often confused with *Myotis macropus* microbats, which have been recorded in the Study Area.

There are three listed threatened bat species identified in the PMST in the Study Area as Known and potentially occurring, which are:

- Large-eared pied bat (*Chalinolobus dwyeri*) (likely to occur);
- Corben's long-eared bat (*Nyctophilus corbeni*) (potential to occur); and
- Ghost bat (*Macroderma gigas*) (potential to occur).

As a result of the likelihood of occurrence assessment (Appendix A), ghost bat and Corben’s long-eared bat are unlikely to occur and the large-eared pied-bat is likely to occur. Audio detection is the preferred method of detection for each of the three species. Audio detection was noted as “probable” for the large-eared pied-bat, with no other listed species calls occurring in the field from the Anabat surveys.

TABLE 4-10 BAT RESULTS SUMMARY FROM THE ECHOLOCATION ANALYSIS

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Survey Period Identified	Reliability of identification
Austronomus australis	white-striped free-tailed bat	-	LC	October 2022, February and March 2023	Definite
Chaerephon jobensis	northern free-tailed bat	-	LC	October 2022, February and March 2023	Definite (March) Probable (October and February)
Chalinolobus dwyeri	large-eared pied-bat	V	VU	February and March 2023	Probable
Chalinolobus gouldii	Gould's wattled bat	-	LC	October 2022, February and March 2023	Definite (one Anabat with Probable)
Chalinolobus morio	chocolate wattled bat	-	LC	February and March 2023	Probable (one Anabat with definite)
Chalinolobus nigrogriseus	hoary wattled bat	-	LC	October 2022, February and March 2023	Definite
Miniopterus australis	little bent-wing bat	-	LC	March 2023	Probable
Miniopterus orianae[1]	large bent-wing bat	-	LC	October 2022, February and March 2023	Probable
Myotis macropus	southern myotis	-	LC	October 2022, February and March 2023	Possible
Nyctophilus sp	long-eared bat species	-	LC	October 2022, February and March 2023	Possible
Ozimops lumsdenae	molossid bat	-	LC	October 2022, February and March 2023	Possible
Ozimops ridei	molossid bat	-	LC	October 2022, February and March 2023	Definite (October 2022, February 2023) Probable (March 2023)

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Survey Period Identified	Reliability of identification
Rhinolophus megaphyllus	smaller horseshoe bat	-	LC	October 2022, February and March 2023	Definite
Saccolaimus flaviventris	yellow-bellied sheathtail bat	-	LC	March 2023	Definite
Scotorepens balstoni	inland broad-nosed bat	-	LC	October 2022, February and March 2023	Definite
Scotorepens greyii	little broad-nosed bat	-	LC	October 2022, February and March 2023	Probable
Scotorepens sp.	broad-nosed bat species	-	LC	October 2022, February and March 2023	Probable
Setirostris eleryi	bristle-faced free-tailed bat	-	LC	October 2022, February and March 2023	Probable
Taphozous troughtoni	Troughton's sheathtail bat	-	LC	October 2022, February and March 2023	Definite
Vespadelus troughtoni	eastern cave bat	-	LC	October 2022	Probable
Vespadelus vultumus	little forest bat	-	LC	October 2022, March 2023	Possible

The free-tailed bats recorded (family *Molossidae*) include white-striped free-tailed bat (*Austronomus australis*), northern free-tailed bat (*Chaerephon jobensis),* mossolid bats (*Ozimops ridei* and *Ozimops lumsdenae*), bristle-face free-tailed bat (*Setirostris eleryi*). Australian *molossids* have been recorded in a variety of habitats, including form closed forest to deserts. To be suitable habitat for free-tailed bats, habitat must supply roosting sites which can including buildings, hollow trees or rock crevices in rocky outcrops, riverbanks or stones. Free-tailed bats feed on a range of insects from moths to hard-shelled beetles (Allison, 1989).

The wattled bats recorded, including Gould's wattled bat (*Chalinolobus gouldii*), chocolate wattled bat (*Chalinolobus morio*) and hoary wattled bat (*Chalinolobus nigrogriseus*), occupy a wide range of habitats, including forests and woodlands and typically roost in tree hollows. Wattled bats prefer a diet of moths and beetles, however, they will feed on other insects if available (Churchill, 2008).

The bent-winged bats recorded, including little bent-wing bat (*Miniopterus australis*) and large bent-wing bat (*Miniopterus orianae)*, occupy well-timbered habitats, often in wetter areas or in close proximity to water features. Bent-winged bats species typically roost in caves or other man-made structures and show a dietary preference for moths (Churchill, 2008).

Nyctophilus species are found over a variety of habitats. The lesser long-eared bat (*Nyctophilus geoffroyi*) occupies tropical to alpine woodlands, mangroves, urban areas, wet and dry sclerophyll forests and rain forests (Churchill, 2008). Corben's long-eared bats (*Nyctophilus corbeni*) are found within semi-evergreen vine thicket, dry sclerophyll forests, Callitris forest and open forests with poplar box (Churchill, 2008). The eastern long-eared bats (*Nyctophilus bifax*) reside under the loose bark of melaleuca, in tree hollows as well amongst dense foliage of vegetation. Gould's long-eared bat (*Nyctophilus gouldi*) is a generalist and resides across a range of wet and dry sclerophyll forests and woodlands, roosting under loose bark and in tree hollows (Menkhorst, 2011).

The large-eared pied-bat habitat requirements have been discussed in the following section and Appendix E.

The yellow-bellied sheathtail bat (*Saccolaimus flaviventris*), has a diet preference for beetles, and is found in nearly all habitats, utilising large tree hollows for roosting (Armstrong & Lumsden, 2017). Very little is known about Troughton's sheathtail bat (*Taphozous troughtoni*), this species is only found in Australia (Tate, 1952). The species roosts in caves and mines and the species is highly vulnerable to disturbance from human visitors as well as habitat clearing and land degradation as a result of agricultural practices (Tate, 1952).

The little forest bat (*Vespadelus vultumus*) was recorded in the Study Area. Forest bats live predominantly in eucalypt forests which are present in the Study Area and can also be found in subalpine woodland to alpine moors, where they feed upon insects and spiders and may roost in hollows of old eucalypts (Hall, 2008).

Broad nosed bats have been detected by the anabats within the Study Area. The little broad-nosed bat (*Scotorepens greyii*) roosts in hollows in old, unused buildings, inside hollow fence posts. Broad-nosed bats are insectivores (Churchill, 2008).

The southern myotis (*Myotis macropus*) roost in tree hollows, caves, mines, culverts and under bridges, often close to water (Law & Anderson, 1999).

The eastern cave bat (*Vespadelus troughtoni*) lives in caves that occur along Australia's east coast as well as caves that are found next to inland ranges (Ellis, 2001).

Large-eared Pied-bat

The large-eared pied-bat is listed as Endangered under the EPBC Act, as of 15th November 2023. This species has been concluded as likely to occur within the Study Area as per the likelihood of occurrence (Appendix A), due to 'probable' recordings of the species that were produced from Anabats deployed in four locations throughout the Study Area across multiple survey events.

A total of 10 Anabats were deployed over four of the eight surveys for a total of 40 trapping nights. A total of 144 habitat and vegetation assessments were completed over the eight surveys and identified suitable habitat of ironbark woodlands close to a waterbodies where 'probable' large-eared pied bat calls were recorded. Additionally, the Study Area is within the range for the species and contains habitat suitable for large-eared pied-bat survival (as evidenced by species presence), as further explained below.

The large-eared pied-bat is a medium-sized bat that is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland, down south to Bungonia in the NSW Southern Highlands (DERM, 2011). Large-eared pied-bat prefers a specific intersection of habitat traits which makes habitat for the species both uncommon and susceptible to clearing-related impacts. Per the conservation guidelines for the species:

> *Large-eared pied-bat has close association with the presence of sandstone escarpment (for roosts) and fertile valleys (for foraging), particularly where the valleys support box gum woodland. This is a relatively restricted combination of habitat factors, and the extent of woodlands on fertile soils within its range has been greatly diminished by clearing (Pennay, 2008*).

Escarpments provide roosting habitat for this species, with the availability of diurnal roost options an important indicator of habitat suitability. Large-eared pied-bat prefers rhyolite cliffs and caves for roosting purposes, although geology is secondary to presence of suitably deep and high caves and overhangs which provide shelter from natural disturbances (DCCEEW, 2021). There were no deep caves or overhangs observed within the Study Area during field surveys. Based on an observed lack of these roost sites, there is an absence of roosting and breeding habitat in the Study Area, however the species may utilise habitats for foraging.

Fertile valleys and vegetated areas provide foraging habitat for large-eared pied-bat, with riverine and riparian corridors being identified as favourable for the insectivorous species. The species has been recorded foraging in canopied vegetation communities of various descriptions including dry and wet sclerophyll forest, grassy woodland, *Callitris* dominated forest, tall open eucalypt forest with a rainforest sub-canopy, subtropical rainforest and small clearings adjacent to rainforest (DCCEEW, 2021).

Based off the species Approved Conservation Advice, any known roost site, or caves that could be roost sites, are considered habitat critical to the survival of the species. Additionally, all populations are considered important due to their likely role in maintaining genetic diversity necessary for the ecological survival of the species (DCCEEQ, 2023). As the species is considered likely to occur within the Study Area, it is considered likely that the identified habitat within the Study Area constitutes habitat critical to the survival of the species.

Though not confirmed, the majority of records in canopied woodland indicates a sensitivity to broadscale land clearing. However, narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used (DCCEEW 2024). Habitat within the Study Area for this species can likely be defined as woodland foraging habitat within a proximity of several kilometres to roosting habitat as it is stated that that “Almost all records are within several kilometres of cliff lines or rocky terrain and it is likely that critical foraging resources are also located in these areas” (DAWE 2021). There are areas of potential steep, rocky terrain located to the north of the Study Area around Belmont State Forest, to the west of the Study Area at Isla Gorge and to the east at Kroombit Tops National Park. Belmont State Forest is located adjacent to the Study Area, while Isla Gorge is located over 40km to the west and Kroombit Tops National Park over 60km to the north-east from the Study Area. Potential bat roost caves and cliffs at Isla Gorge National Park and Kroombit Tops National Park are located beyond the likely distance the species will move during nightly foraging activities.

Due to the proximity of Belmont State Forest to the northern boundary of the Study Area, there is a potential that areas of steep terrain may support roosting bats in this location that utiise the Study Area for foraging.

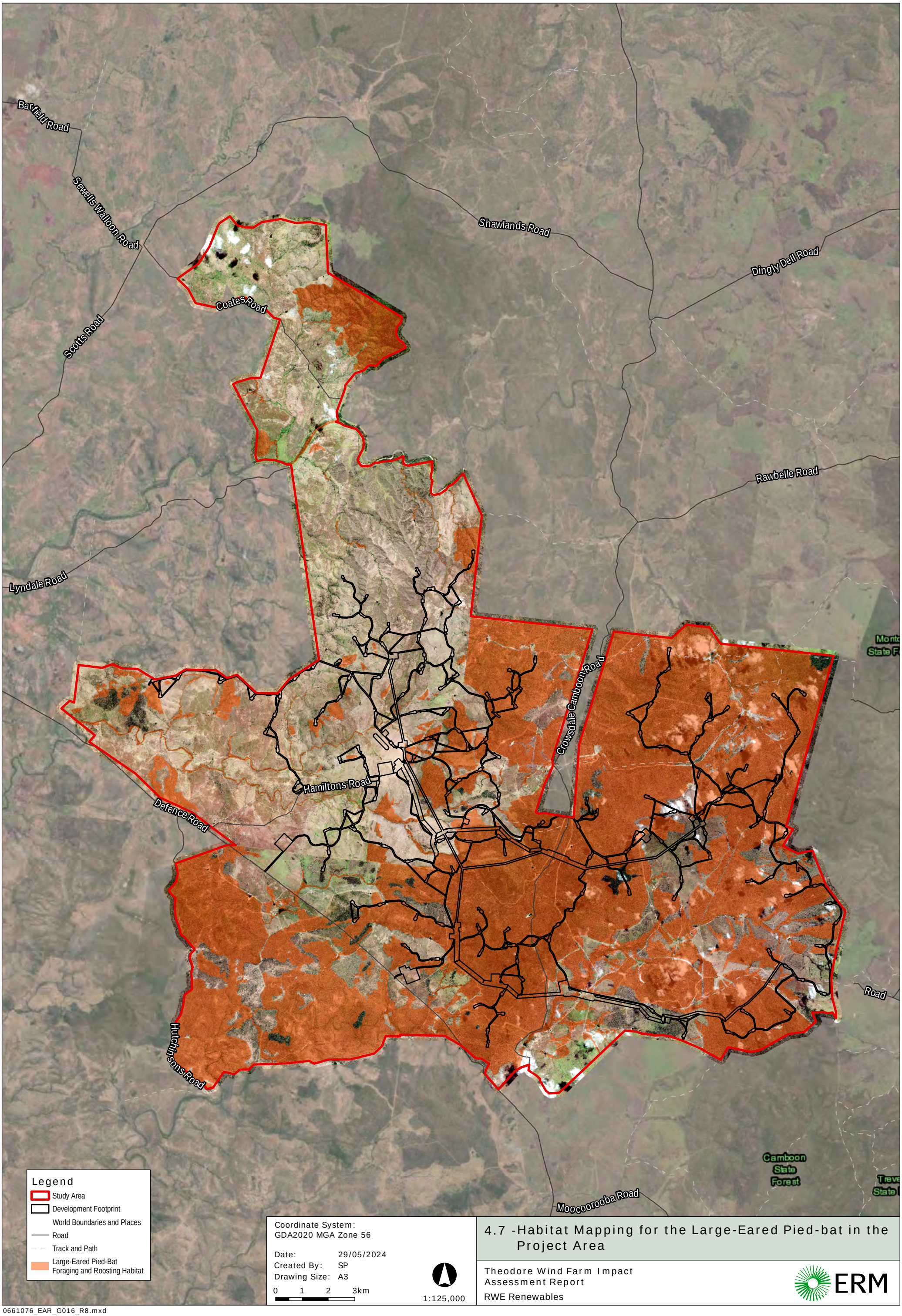
Habitat for the large-eared pied-bat has been delineated from the broad habitat types, based on the habitat requirements for the species. This is as follows:

- Foraging habitat:
  - Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; and
  - Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels.
- Generally unsuitable habitat:
  - Vine forest/ thickets and dry rainforest;
  - Waterbodies and drainage features;
  - Grasslands and cultivated agricultural land; and
  - Brigalow woodlands dominated by *Acacia harpophylla*.

There is a total 21,719.7 ha foraging habitat which meets the definition of habitat critical to the survival of the species, and 25,110.4 ha of generally unsuitable habitat, within the Study Area. No roosting habitat for this species was identified within the Study Area, however there is potential for such habitat to occur in the Locality. Mapped habitat for the large-eared pied-bat is shown on Figure 4-7, with habitat types summarised below in Table 4-11.

TABLE 4-11 LARGE-EARED PIED BAT HABITAT SUMMARY IN THE STUDY AREA

	Foraging Habitat	**Generally Unsuitable Habitat**
Description	Fertile valleys and vegetated areas, riverine and riparian corridors, dry and wet sclerophyll forest and grassy woodland	Cleared areas are likely to constitute unsuitable habitat, with Acacia woodland also not suitable within the Study Area. Though the species has been recorded foraging in subtropical and dry rainforest, vegetation communities within the Study Area are of generally low quality and do not form suitable habitat.
Presence within the Study Area	Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey. Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels.	Vine forest/ thickets and dry rainforest; Waterbodies and drainage features; Grasslands and cultivated agricultural land; and Brigalow woodlands dominated by *Acacia harpophylla*.
Total in the Study Area	21,719.7 ha of foraging habitat	25,110.4 ha of generally unsuitable habitat



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4.5.3.4 LISTED THREATENED FAUNA SPECIES WITH POTENTIAL TO OCCUR

A total of four EPBC Act listed threatened fauna species have been assessed as having the potential to occur within the Study Area as per the likelihood of occurrence (Appendix A), which is supported by field assessments of habitat suitability and targeted species surveys conducted over eight separate events. These species' distribution overlaps with the Study Area, with suitable habitat also occurring.

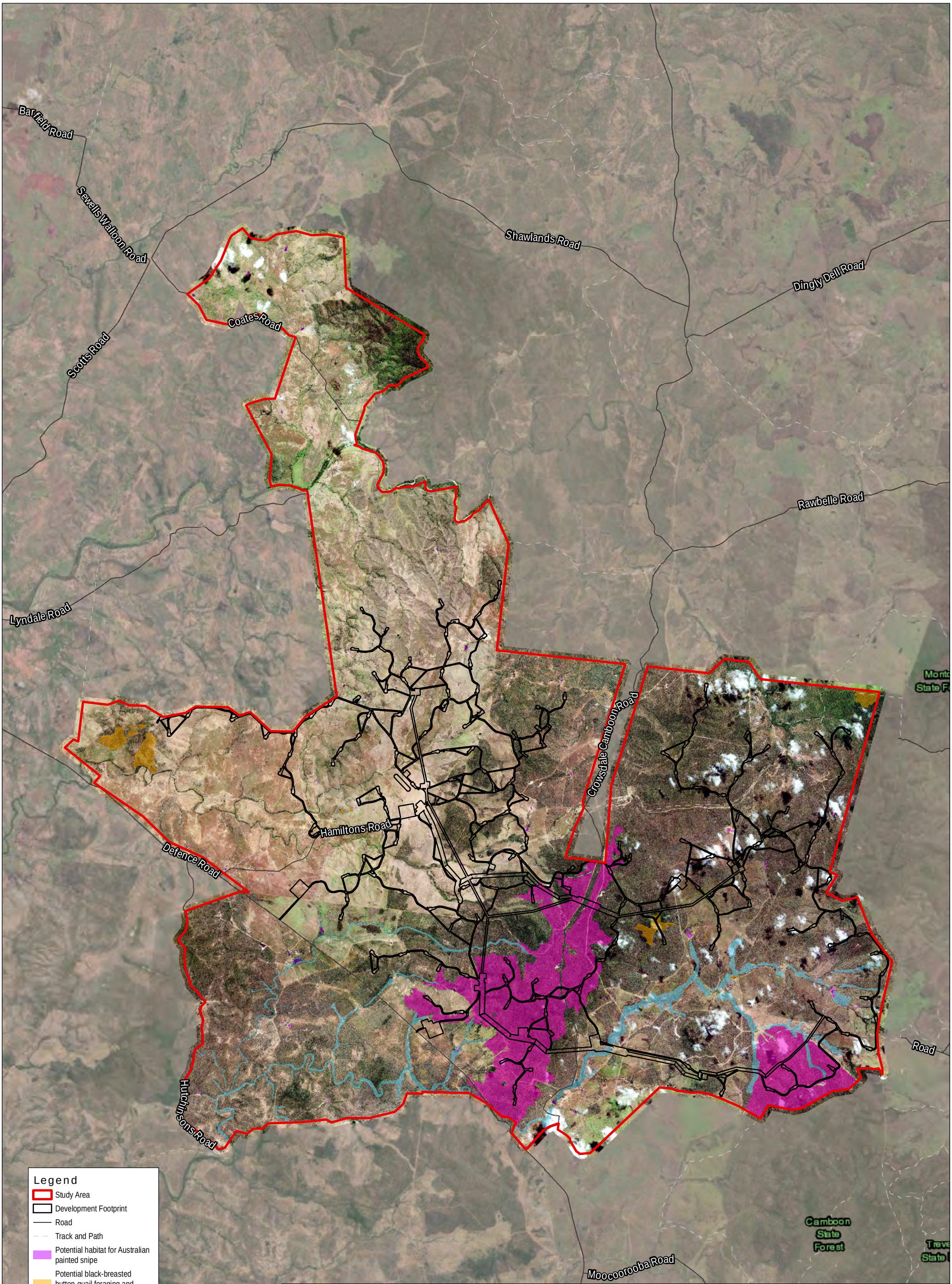
No observations of these species within the Study Area or Locality have been made to date, however their presence cannot be ruled out. The threatened fauna species with potential to occur in the Study Area and their appropriate habitat are listed in Table 4-12. The mapped habitat for each potential threated fauna species are shown in Table 4-8a and Table 4-8b.

TABLE 4-12 EPBC ACT LISTED FAUNA SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Study Area
Turnix melanogaster	Black-breasted buttonquail	V	Potential foraging and roosting habitat is present in the Study Area in the form of vine thickets/forests and dry rainforest. Habitat critical to the survival of the black-breasted button-quail has been defined within the National Recovery Plan for Black-breasted Button-quail (Turnix melanogaster) (DCCEEW, 2022): • Foraging and breeding habitat; • Habitat for the long-term maintenance of the species; • Areas with potential habitat; and • Areas supporting recovery. Therefore, this potential foraging and roosting habitat has been considered habitat critical to the survival of the species and has been mapped across 232.3 ha of the Study Area (Figure 4-8).
Hirundapus caudacutus	White-throated needletail	V, Mi	Species likely to fly aerially over the Study Area, utilising this area for foraging. Potential roosting habitat may be present in the form of tall eucalypt forests, however these areas are not elevated and are therefore unlikely to be utilised by the species. Habitat has not been mapped for this species as roosting habitat is unlikely to occur and the species only forages aerial. To be conservative, the entire Study Area has been considered habitat critical to the survival of the species based on its potential utility for foraging behaviour.
Rostratula australis	Australian painted snipe	E	Potential foraging habitat for this species is present in the form of waterbodies which are predominantly farm dams within the Study Area. While potential habitat for this species has been mapped, it is not expected to constitute habitat critical to the survival of the species due to the degraded nature of this habitat. This potential foraging habitat totals 56.0 ha and is presented in Figure 4-8.

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Study Area
Petaurus australis australis	Yellow-bellied glider (south-eastern)	V	There is potential denning and foraging habitat for the species in the form of old growth eucalypt forests present within the Study Area, where a suitable tree canopy species composition contains known foraging resources. 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 (DCCEEW 2022) The locality contains remnant vegetation such as state forests that would make the Study Area a movement corridor, should suitable foraging resources be present. A total of 3,171.8 ha of potential foraging habitat and 921.1 ha of potential denning habitat has been mapped within the Study Area, presented in Figure 4-8. Areas of potential foraging and denning habitat have been mapped using field data and RE mapping to identify areas where smooth-barked eucalypts are dominant or sub-dominant in the canopy layer. This includes areas where *Eucalyptus tereticornis* occurs in riparian zones and *Corymbia citriodora* is co-dominant or sub-dominant in areas of ironbark woodland and open forest. Under the *Conservation Advice for Petaurus australis australis (yellow-bellied glider (south-eastern))* (DAWE, 2022), habitat critical to the survival of the species is habitat that contains any one of the following attributes: • Large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees; • Areas identified as refuges under future climate change scenarios; • Short or long-term post-fire refuges that allow the species to persist, recover and recolonise burnt areas; • Habitat corridors required to facilitate dispersal between fragmented habitat patches and/or that enable recolonization or movement away from threats; and • Areas in which some trees have evidence of use for sap extraction by yellow-bellied glider. Due to potential habitat being dominated by smooth-bark eucalypts, and/or potentially providing a movement corridor for the species, the mapped potential habitat has been considered potential habitat critical to the survival of the species.

Status listing per EPBC Act: CE = Critically Endangered; E = Endangered; V= Vulnerable; Mi =Migratory.
For the full Likelihood of Occurrence, refer to Appendix A.



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4.5.3.5 LISTED MIGRATORY BIRDS

One EPBC Act listed migratory species, satin flycatcher, was identified as known to occur within the Study Area due to observations during the October 2022 field surveys. Habitat for this species within the Study Area is discussed in the following section and mapped in Figure 4-9. The desktop review also identified 11 EPBC Act listed migratory species with the potential to occur within 10 km of the Study Area, with only two concluded to potentially occur in the Study Area. These are further discussed in the following section. No other species were considered known or likely to occur.

Listed Migratory Species Known to Occur

Satin Flycatcher

The satin flycatcher is listed as 'Migratory' under the EPBC Act. This species was considered known to occur as per the likelihood of occurrence (Appendix A), due to positive identification of the species via direct observation and bird call identification during the October 2022 and September/October 2023 field surveys. The Study Area occurs within the range for the species, and the habitat requirements for the species occur within the Study Area as explained below.

Satin flycatchers inhabit heavily vegetated gullies and tall woodlands in eucalypt-dominated forests, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. There is no information available on roosting habitat and the species is known to forage in the canopy and subcanopy of its preferred habitat type. Breeding occurs within south-east Australia. The species is often found near wetlands and watercourses, often in moister, taller forests.

Important habitat for the species is described as (DoE, 2015):

> *Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.*

Suitable habitat occurs in the Study Area in the form of taller riparian woodlands and heavily vegetated gullies of vine thicket/dry rainforest which provide foraging and dispersal habitat for the species. All other habitat in the Study Area is generally unsuitable for the species.

- Foraging habitat:
  - Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels; and
  - Vine forest/ thickets and dry rainforest.
- Generally unsuitable habitat:
  - Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;
  - Waterbodies and drainage features;

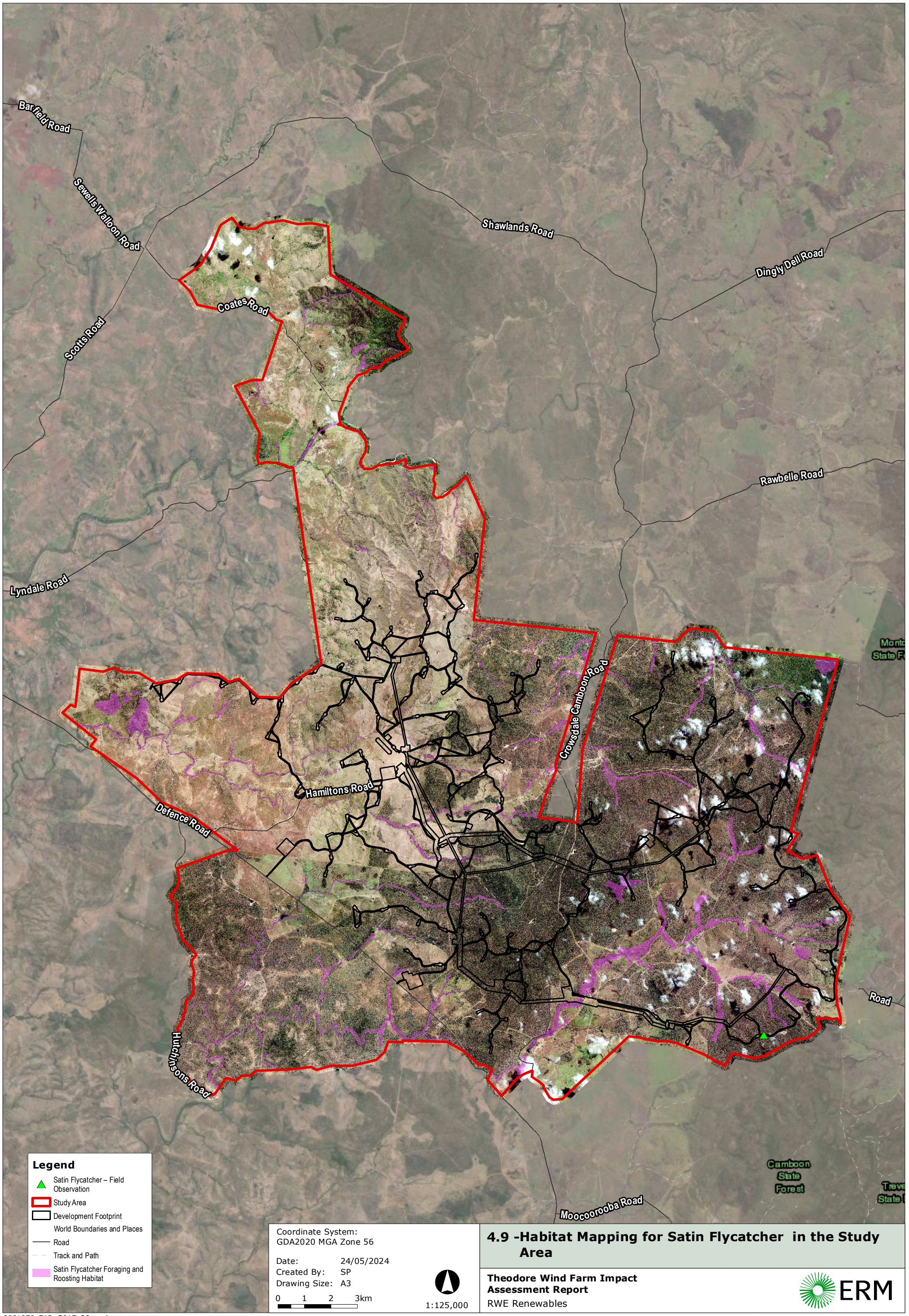
- Grasslands and cultivated agricultural land; and
- Brigalow woodlands dominated by *Acacia harpophylla*.

Ground-truthed surveys have identified 1,964.6 ha of satin flycatcher foraging and dispersal habitat within the Study Area, which meets the definition of important habitat for this species. This habitat is mapped in Figure 4-9, with habitat types summarised in Table 4-13.

Due to a high level of disturbance (e.g., weeds and introduced predators) to these existing habitats, the species is only likely to occupy these habitats for movement, rather than breeding purposes.

TABLE 4-13 SATIN FLYCATCHER HABITAT SUMMARY IN THE STUDY AREA

	Foraging and Dispersal Habitat	**Generally Unsuitable Habitat**
Description	Heavily vegetated gullies and taller woodlands in eucalypt-dominated forests, and during migration, coastal forests, woodlands, mangroves and drier woodlands and open forests.	Not suitable habitat includes unvegetated areas or areas with open and spare vegetation. Brigalow woodlands are also considered unsuitable due to absence of Eucalypt species and dense vegetation
Presence within the Study Area	Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels; and Vine forest/ thickets and dry rainforest	Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; Waterbodies and drainage features; Grasslands and cultivated agricultural land; and Brigalow woodlands dominated by *Acacia harpophylla.*
Total in the Study Area	1,964.6 ha of foraging and dispersal habitat	44,865.4 ha of generally unsuitable habitat



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GDA2020 MGA Zone 56

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4.9 -Habitat Mapping for Satin Flycatcher in the Study Area

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Listed Migratory Species with Potential to Occur

Two EPBC Act listed migratory species have been assessed as having the potential to occur within the Study Area as a result of the likelihood of occurrence (Appendix A). No signs or observations of these species within the Study Area during field surveys. However, species' presence within the Study Area cannot be ruled out due to overlapping distribution and suitable habitat occurring within the Study Area. Migratory species with potential to occur in the Study Area and their appropriate habitat are listed in Table 4-14. The mapped habitat for each potential threated fauna species is shown in Figure 4-10.

White-throated needletail (EPBC Act Vulnerable) is also listed as migratory. This species has already been addressed within Section 4.3.3.4, and is therefore not included within Table 4-14.

TABLE 4-14 EPBC ACT LISTED MIGRATORY SPECIES WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Species Name	Common Name	EPBC Act Status	Potential Habitat Mapped within the Study Area
Rhipidura rufifrons	Rufous fantail	Mi	A small amount of potential foraging and roosting habitat is present in the Study Area in the form of vine thickets/forests and dry rainforest. However, no important habitat of the species was identified from field surveys. This potential foraging and roosting habitat totals 232.3 ha and is presented on Figure 4-10.
Apus pacificus	Fork-tailed swift	Mi	Potential aerial habitat only. Lack of preferred coastal and riparian heathland for foraging and roosting. Potential aerial foraging habitat over dry open habitats present. There is a lack of preferred coastal and riparian heathland or swamp habitat. No habitat has been mapped due to the species likely being a flyover visitor only.

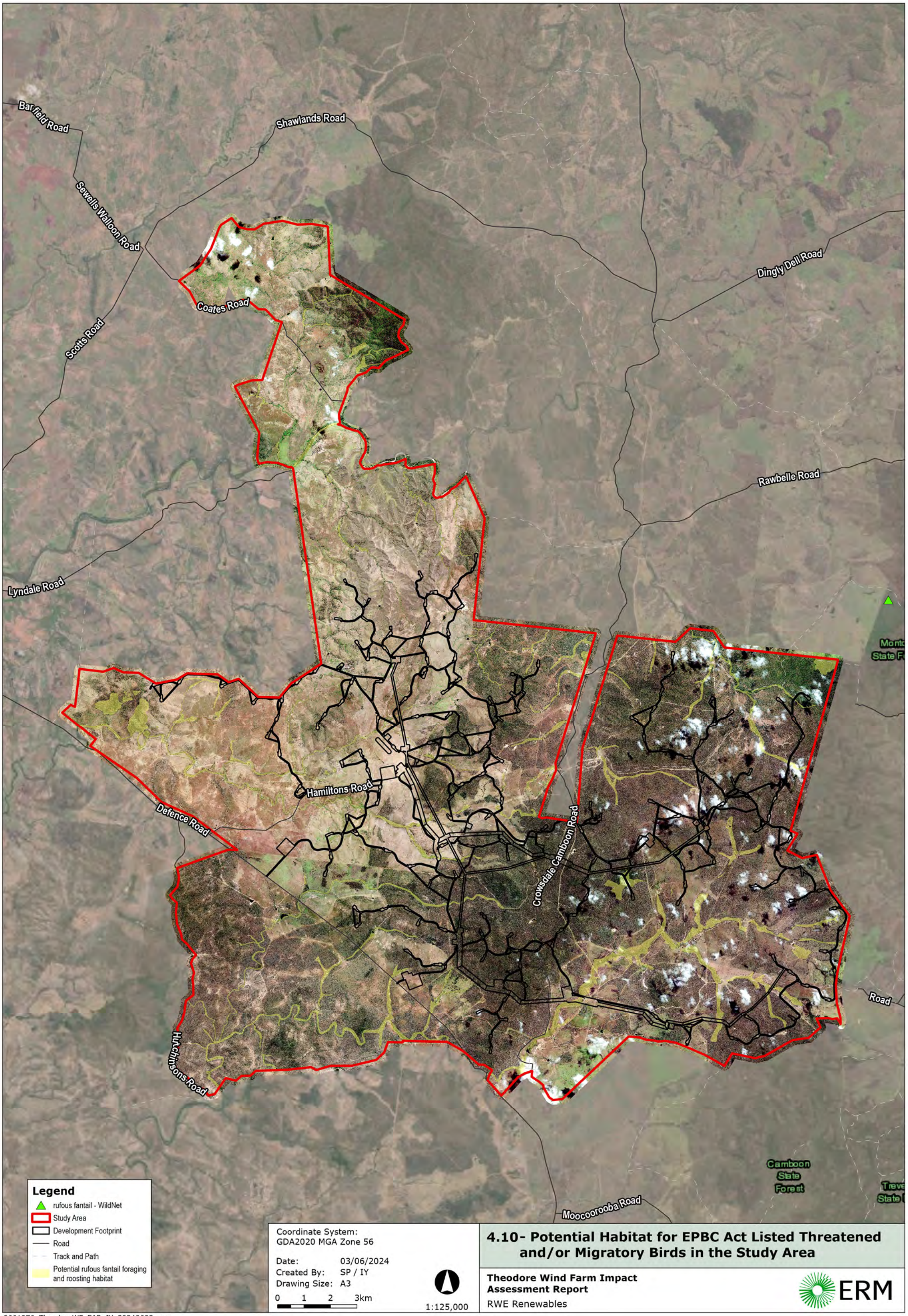
Status listing per EPBC Act: CE = Critically Endangered; V= Vulnerable; Mi = Migratory.
For the full reasoning for the potential outcomes for such species, refer to Appendix A.

Migratory Flyways

The East Asia/Australasia Flyway is the most common and frequented flyway travelled by migratory shorebirds *en route* to, and within, Australia (BirdLife International, 2020). This flyway occurs over a total of 84,765,020 km^2 and occurs through 37 countries, including Australia (BirdLife International, 2020). This flyway extends from Arctic Russia and North America to the southern extents of Australia and New Zealand (BirdLife International, 2020). This flyway predominantly traverses the coastal extents of Australia, occasionally travelling inward through parts of South Australia and Western Australia (BirdLife International, 2020). When examining the records of the listed migratory shorebirds species from desktop searches, the vast majority of incidental records are consistent with the coastal routes of the East Asia/Australasia Flyway. Additionally, when examining the records of non-shorebird migratory birds, these species also generally traverse coastal areas.

Migratory flyways are known to correspond with the vast majority of Important Bird and Biodiversity Areas (IBAs). Such IBAs are globally known for their importance in bird conservation, particularly due to the number of migratory and/or threatened species that are found there. The East Asia/Australasia Flyway triggers a total of 1,184 migratory IBAs (BirdLife International, 2020), none of which occur within, or in close proximity to, the Study Area.

Therefore, it is concluded that the Study Area does not fall within an important flyway or IBA for migratory birds.



4.10- Potential Habitat for EPBC Act Listed Threatened and/or Migratory Birds in the Study Area

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4.6 MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE

MSES are defined within the SRI Guidelines (DEHP, 2014) and prescribed activities assessable under the *Sustainable Planning Act 2009*. *Sustainable Planning Act 2009* has been superseded by the Planning Act, but the Policy only references the *Sustainable Planning Act 2009* at this time. The MSES has been assessed against the SRI Guidelines.

The MSES within the Study Area are summarised in Table 4-15. For further information regarding Regulated Vegetation and Res, refer to Section 4.4.1. For information regarding NC Act threatened species and their potential to occur within the Study Area, refer to Sections 4.4.3, 4.4.4 and Appendix A. Waterways and wetlands are discussed as part of Section 4.4.5.

TABLE 4-15 MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE IN THE STUDY AREA

Matter	Relevance to the Proposed Action	Assessment
Regulated Vegetation	1. Category B remnant vegetation – There is a total of 1,657.5 ha of Category B remnant vegetation mapped within the Study Area. 2. Category C high value regrowth – There is a total of 1.9 ha of Category C high value regrowth within the Study Area. Refer to Section 4.4.1.1. 3. Category R GBR riverine regrowth. There is 191.1 ha Category R GBR riverine regrowth within the Study Area. 4. Regulated Vegetation within a distance of a watercourse – There is 1,169.4 ha of Regulated Vegetation within a defined distance of a watercourse mapped within the Study Area. 5. Wetland – no Regulated Vegetation within the Study Area is mapped to occur within 100 m of a wetland. 6. Essential Habitat – 318.3 ha of Regulated Vegetation is mapped as essential habitat for four listed threatened species (fauna) identified to occur within the Study Area. Refer to Section 4.4.1.2. 7. Flora Plant Trigger Areas – There is a total 51 ha of areas mapped as high-risk areas for threatened or near threatened plants within the Study Area. Refer to Section 4.4.3.	Required
Connectivity Areas	The Study Area adjoins State Forests in both the North and South, with occurrence of remnant vegetation and regrowth vegetation throughout. The main connectivity areas within the Locality are therefore expected to be in the North-East and South-East Corners of the Study Area. Impacts within connectivity areas in the Study Area will need to be assessed for an SRI.	Required
Wetlands and Watercourses	In accordance with the Development Assessment Mapping System (DAMS) mapping, there are no wetlands or watercourses mapped as high ecological significance, or high ecological value, within the Study Area.	Not required

Matter	Relevance to the Proposed Action	Assessment
Designated Precincts in Strategic Environmental Areas	In accordance with the DAMS mapping, no Regional Interest areas are recorded over the Study Area. This mapping is in accordance with the *Regional Planning Interests Act 2014* which governs the framework for Strategic Environmental areas.	Not required
Protected Wildlife Habitat	Habitat for seven (7) listed threatened species was identified to occur within the Study Area, including: • Koala, listed as Endangered under the NC Act (known to occur) – 1,618.2 preferred foraging and breeding habitat, 21,067.5 ha general foraging and breeding habitat, 6,808.0 ha dispersal habitat (mapped in Figure 4-4); • Greater glider (central and southern), listed as Endangered under the NC Act (Known to occur) – 1,425.3 ha denning habitat and 20,859.0 ha foraging habitat (mapped in Figure 4-5); • Large-eared pied-bat, listed as Vulnerable under the NC Act (likely to occur) – 21,719.7 ha of foraging habitat (mapped in Figure 4-7); • Squatter pigeon (southern), listed as Vulnerable under the NC Act (known to occur) – 16,267.8 ha of breeding habitat, 8,023.0 ha of foraging and roosting habitat (mapped in Figure 4-6); and • Short-beaked echidna NC Act – Special Least Concern– 46,830 ha habitat (entire Study Area).	Required
Protected Areas	There are no national parks, conservation parks or protected areas under the NC Act within the Study Area, as shown on Figure 1-1.	Not required
Declared Fish Habitat Areas and Highly Protected Zones of State Marine Parks	In accordance with DAMS mapping, there are no declared fish habitat areas within the Study Area.	Not required
Waterways Providing for Fish Passage	In accordance with DAMs mapping, there are some low and moderate risk of impacts on Queensland Waterways with Fish Passages (Streams) within the Study Area. However, no waterway barrier works that prohibit fish movement will be undertaken as part of the Proposed Action.	Not required
Marine Plants	There are no marine plant communities within the Study Area.	Not required
Legally Secured Offset Areas	There are no legally secured offset areas within the Study Area.	Not required

4.6.1 REGIONAL ECOSYSTEMS, REGULATED VEGETATION AND HABITATS

4.6.1.1 REGIONAL ECOSYSTEMS AND REGULATED VEGETATION

The VM Act distinguishes between vegetation that is Endangered, Of Concern (OC), or Least Concern (LC) Res. Res are Queensland vegetation communities found within a particular bioregion that have a consistent combination of geology, landform and soil type, as determined by the Queensland Herbarium.

There are 11 Res mapped by the Queensland Government DoR data as present in the Study Area. The majority of the Study Area is cleared agricultural land with grasslands, and occasional regrowth dominant throughout the middle and the northern portion of the Study Area. The Study Area, particularly the southern section and a pocket in the north section, contains eucalypt woodlands and dominated by narrow leaved ironbark (*E. crebra*) and silver-leaved ironbark (*E. melanophloia*) (Res 11.12.1 and 11.12.2), with the south section also supporting open forest dominated by lemon-scented gum (*Corymbia citriodora*) (RE 11.12.6). Eucalypt woodlands (*E. populnea)* and blue gum (*E. tereticornis, E. camaldulensis*) woodlands (Res 11.12.3 and 11.3.2) are present and occur largely in the southern sections of the Study Area along alluvium associated with ephemeral watercourses. Brigalow open forest (*Acacia harpophylla)* are present mostly in the centre of the Study Area (RE 11.12.21). Small, isolated patches of semi evergreen vine thicket are also present, largely in the south and south-east corner (RE 11.12.4). Some woodland is mapped on Cainozoic lateritic duricrust, with presence of lemon-scented gum (*C. citriodora),* gum-top ironbark *(E. decorticans)* and *Acacia* spp. (Res 11.7.6 and 11.7.4c). A description of the Res is provided below in Table 4-16, and RE mapping is presented in Figure 4-11.

There is 1,657.5 ha of MSES Category B regulated vegetation mapped within the Study Area. The Study Area also contains small areas MSES Category C regulated vegetation – high value regrowth (1.9 ha) and 191.1 ha of MSES Category R regulated vegetation – GBR riverine regrowth. MSES Regulated Vegetation is presented in Figure 4-12.

The Study Area is comprised of 40.04% remnant regulated vegetation, measured as a percentage of the total Study Area. A vegetation clearing permit will be required for any disturbance to Category B Regulated Vegetation. Disturbance to OC REs will also likely require an assessment against the Significant Residual Impact Guideline (2014) with the potential to trigger offsets if impact thresholds are exceeded (DEHP, 2014). The VM Act states that when clearing Category C vegetation, high value regrowth vegetation must be conserved, wetland and watercourse bank stability, water quality and habitats must be maintained, and landscape stability must be maintained. Where disturbance occurs to LC REs that are also regarded as habitat for listed threatened species, the Significant Residual Impact Guideline (2014) will apply (also applies to MSES, regulated under the VM Act and NC Act).

Lots within the Study Area have been identified as having a Property Map of Assessable Vegetation (PMAV) covering the vegetation within those properties. Certified PMAVs replace the regulated vegetation management map for the lot it was applied to, as they can amend the Regulated Vegetation Management Map where there is an inconsistency in the mapping and the on-ground vegetation.

4.6.1.2 ESSENTIAL HABITAT

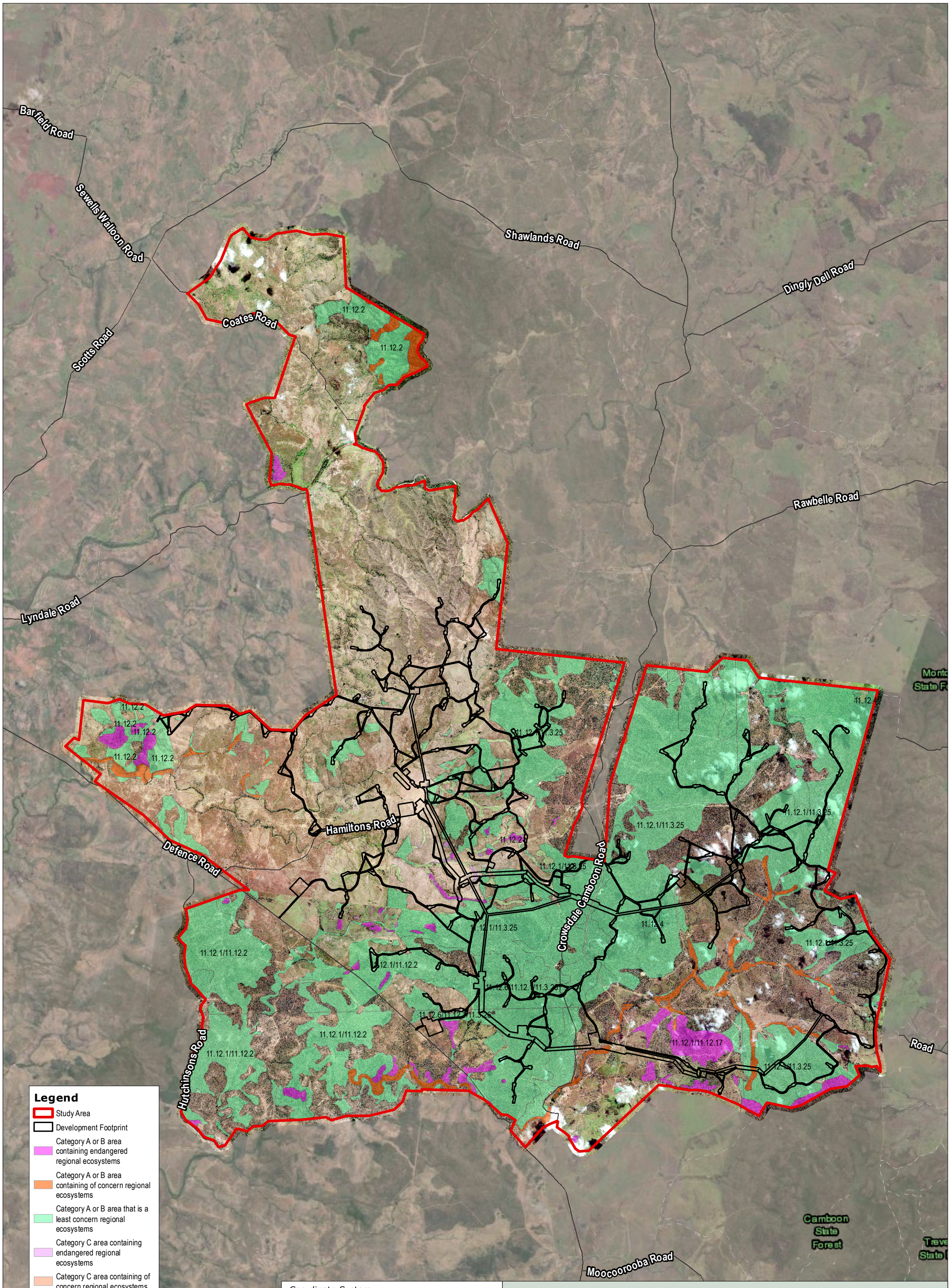
The Study Area has been divided into six broad habitat types. Habitats can be aligned with REs and represent potential habitat for a variety of taxa. The habitats in the Study Area have been observed mostly in moderate to low condition, with signs of degradation due to cattle grazing, dieback, erosion, and the presence of introduced flora species. A summary of these habitat types, along with their vegetation communities' classifications and attributes, is provided in Table 4-1 and mapped in Figure 4-1.

Essential habitat is defined as an area of habitat mapped by the QLD government where threatened fauna and/or flora are predicted to occur. The Queensland Environmental Offsets Policy Significant – Residual Impact Guideline states that essential habitat is mapped in an area that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or in which the protected wildlife, at any stage of its life cycle, is located (Queensland Government 2012).

Essential habitat areas have been mapped within the Study Area, as shown in Figure 4-12. There is a total of 318.3 ha of Regulated Vegetation that is Essential Habitat mapped within the Study Area. Essential habitat for four threatened fauna species has been mapped within the Study Area. These include:

- koala;
- southern squatter pigeon;
- greater glider; and
- yellow bellied glider.

Essential habitat for these species was determined through a Department of Natural Resources – vegetation management report search for Lot 20 on SP100500 within the Study Area.



Coordinate System:
GDA2020 MGA Zone 56

Date: 24/05/2024
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4.11- Regional Ecosystems Mapped in the Study Area

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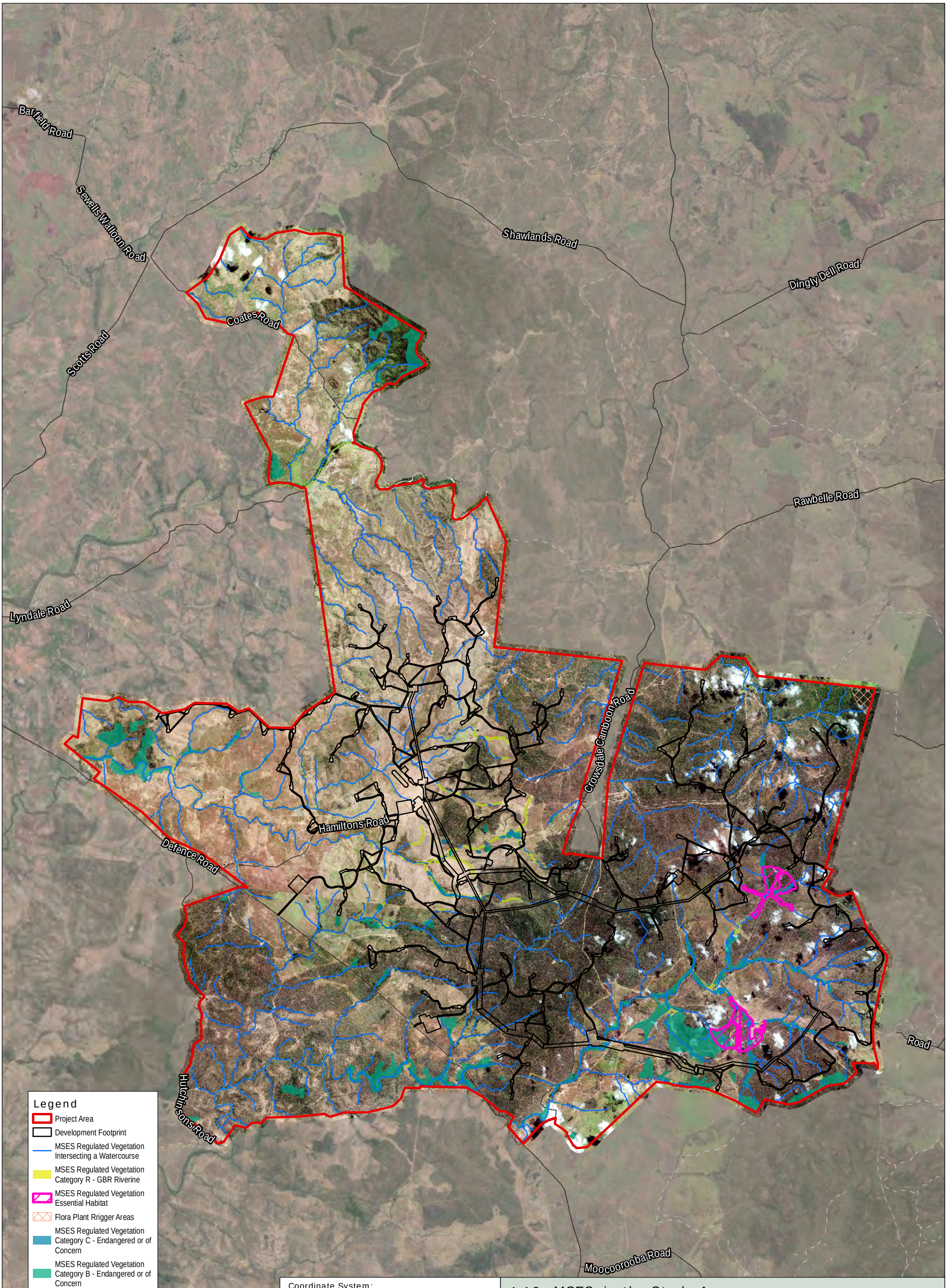
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TABLE 4-16 REGIONAL ECOSYSTEMS WITHIN THE STUDY AREA

RE	Regional Ecosystem Description	Structure Category	VM Act Status	Biodiversity Status	Study Area (ha)	% of Study Area
11.12.1	*Eucalyptus crebra* woodland on igneous rocks	Sparse	LC	NoC	13,448	28.72
11.12.2	*Eucalyptus melanophloia* woodland on igneous rocks	Sparse	LC	NoC	931.8	1.99
11.12.21	*Acacia harpophylla* open forest on igneous rocks. Colluvial lower slopes	Mid-dense	E	E	146.1	0.31
11.12.3	*Eucalyptus crebra, E. tereticornis, Angophora leiocarpa* woodland on igneous rocks especially granite	Sparse	LC	OC	372.3	0.8
11.12.4	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	Dense	LC	NoC	196.1	0.42
11.12.6	*Corymbia citriodora* open forest on igneous rocks (granite)	Mid-dense	LC	NoC	2885.8	6.16
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Sparse	OC	OC	523.9	1.12
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Sparse	LC	OC	47.6	0.1
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus spp.* woodland on alluvial plains	Sparse	OC	OC	166.6	0.36
11.7.4c	*Eucalyptus decorticans +/- Eucalyptus spp. +/- Acacia spp.* Occurs on low hills and ranges with shallow soils. On Cainozoic lateritic duricrust	Sparse	LC	NoC	13.5	0.03
11.7.6	*Corymbia citriodora* or *Eucalyptus crebra* woodland on Cainozoic lateritic duricrust.	Sparse	LC	NoC	0.2	0.0004
Non-remnant/ cleared agricultural areas or grasslands (with occasional regrowth and individual paddock trees)					28,098.10	60.00
Total					**46,830**	**100**

RE listing status:
E = Endangered;
LC = Least Concern;
OC = Of Concern; and
NoC = No concern of present.



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4.6.2 CONNECTIVITY AREAS

Connectivity areas is a MSES matter relating to the change of the ecosystem tract, in the context of both the local and regional landscape.

A development impact on connectivity areas is not relative to a determinant or prescribed MSES layer (such as essential habitat, or watercourses), however, these areas are expressed as areas of remnant vegetation (outside urban areas) containing prescribed regional ecosystems that are necessary for ecosystem functioning.

The Study Area contains Category B (remnant vegetation) (1,657.5 ha), Category C (high value regrowth) (1.9 ha), and Category R (GBR riverine regrowth) (191.1 ha). Connectivity is assessed against the relative change that the Development Footprint will create from removal of Category B, Category C and Category R vegetation, as opposed to the development not occurring. The rate of change to this vegetation is then assessed for significance.

4.6.3 FLORA SPECIES

4.6.3.1 LISTED THREATENED FLORA SPECIES

No threatened flora species listed under the NC Act were recorded during field surveys, and no species were listed as known or likely to occur (Appendix A). Six species have been determined potential.

Listed Threatened Flora Species with Potential to Occur

Threatened species listed under the NC Act and recorded or concluded to be potentially present within and surrounding the Study Area are listed in the EPBC Act PMST and WildNet reports, attached in Appendix B. Threatened species listed under the NC Act and recorded or concluded to be potentially present within and surrounding the Study Area are listed in the EPBC Act PMST and WildNet reports, attached in Appendix B. Six flora species were assessed with potential to occur from the ten identified through desktop analysis, with a summary of these species provided in Table 4-17. Listed species targeted during the field surveys, their survey guideline requirements, as well as whether the survey effort has met guideline requirements, is presented in Table 3-14. Potential habitat within the Study Area for these species is mapped in Figure 4-3.

TABLE 4-17 NC ACT LISTED THREATENED FLORA SPECIES WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Study Area
Cossinia australiana	Cossinia	EN	Potential general habitat present in the form of dry rainforest. There is 232.3 ha of potential habitat, shown on Figure 4-3.
Cadellia pentastylis	Ooline	VU	Potential general habitat present in the form of semi-evergreen vine thicket. There is 232.3 ha of potential habitat, shown on Figure 4-3.

Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Study Area
Solanum dissectum	-	VU	Potential general habitat present in the form of Brigalow woodlands. There is 328.8 ha of potential habitat, shown on Figure 4-3.
Rhaponticum australe	Austral cornflower	VU	Potential preferred habitat in the form of Eucalypt woodlands and open forests dominated by *E. tereticornis.* There is 21,719.7 ha of potential habitat, shown on Figure 4-3.
Solanum johnsonianum	-	EN	Potential general habitat present in the form of Brigalow woodlands. There is 328.8 ha of potential habitat, shown on Figure 4-3.
Xerothamnella herbacea	-	EN	Potential general habitat present in the form of Brigalow woodlands. There is 328.8 ha of potential habitat, shown on Figure 4-3.

Status listing per NC Act: EN = Endangered, VU = Vulnerable and NT = Near Threatened.
For the full reasoning for the potential outcomes for such species, refer to Appendix A.

Flora survey trigger areas identified on the Protected Plants Flora Survey Trigger Map (DESI 2024) are present within the Study Area (Figure 4-12). Protected plant surveys must be undertaken in line with the Flora Survey Guidelines where the impact footprint intersects the Protected Plants Flora Survey Trigger Map. This is to determine the presence or absence of NC Act listed flora within the trigger area. Where threatened flora are not detected a flora survey report must be submitted for assessment and an exempt clearing notification sought prior to clearing. Where threatened flora are detected a protected plant clearing permit must be obtained prior to any clearing activity.

4.6.3.2 INTRODUCED FLORA SPECIES

Weeds of National Significance (WONS) or as Category 3 restricted invasive species under the *Queensland Biosecurity Act 2014* (*Biosecurity Act 2014*) were observed occurring within the Study Area.

WONS and Category 3 restricted invasive plants include:

- lantana – (*Lantana camara*);
- velvet tree pear (*Opuntia tomentosa*);
- parthenium (*Parthenium hysterophorus*); and
- cats claw creeper (Dolichandra unguis-cati).

The Australian Weeds Strategy (2017-2027) provides information on the best practices for management of WONS, including prevention and early detection of weeds and the minimisation of the impact of established weeds (Invasive Plants and Animals Committee, 2016). Such principles from the Australian Weed Strategy should be considered as part the Proposed Action Biosecurity Management Plan.

The Proponent must take reasonable and practical measures to minimise the biosecurity risks associated with dealing with Category 3 restricted matters. Local government biosecurity plans may also need to be consulted to determine any local measures that should be adopted for management and included into the Proposed Action Biosecurity Management Plan. Other introduced species recorded in the Study Area during field surveys, but not listed as WONS or under the *Biosecurity Act 2014* include:

- blue billygoat weed (Ageratum houstonianum);
- balloon cotton bush (Gomphocarpus physocarpus);
- noogoora burr (Xanthium occidentale)
- cobblers' pegs (Bidens pilosa);
- rhodes grass (Chloris gayana);
- red natal grass (Melinis repens); and
- brazilian nightshade (Solanum seathorthianum).

4.6.4 FAUNA SPECIES

4.6.4.1 LISTED THREATENED FAUNA SPECIES

Five NC Act listed species are considered as known or likely to occur within the Study Area and two likely. These species include:

- koala, listed as Endangered under the NC Act (known);
- greater glider, listed as Endangered under the NC Act (known);
- squatter pigeon (southern), listed as Vulnerable under the NC Act (known);
- large-eared pied-bat, listed as Vulnerable under the NC Act (likely);
- satin flycatcher, listed as Special Least Concern under the NC Act (known);
- golden tailed gecko, listed as Near Threatened under the NC Act (likely); and
- short-beaked echidna, listed as Special Least Concern under the NC Act (known).

These species, with exception of short-beaked echidna and golden tailed gecko, have been discussed in detail as part of Section 4.3.3, and habitat for the species mapped as part of Figure 4-4 to Figure 4-7. Short-beaked echidna and golden-tailed gecko are both NC Act listed species only, with additional detail on field-verified habit for these species within the Study Area provided below.

Short-beaked echidna

Short-beaked echidna was confirmed utilising the Study Area during the field investigations. The short-beaked echidna is known to inhabit a range of environments, from arid landscapes to woodlands and agricultural fields (Nicol *et al.,* 2011). Therefore, the entire Study Area of 46,830 ha is considered as suitable habitat for the species, and for this reason, no habitat mapping has been prepared.

Golden tailed gecko (*Strophurus taenicauda albiocularis*) Central

Golden tailed gecko is listed as Near Threatened under the NC Act. This species was concluded as likely to occur within the Study Area as per the likelihood of occurrence assessments (Appendix A). It is worth noting that Near Threatened species listed under the NC Act are not MSES. However, are still conservation significant. As such this species has not been further assessed under the Significant Residual Impact Assessment and in Section 7.2.

Recent records (2012) of the species were identified within 1.5 km of the Study Area's north-western boundary in a heterogenous RE of 11.3.2 and 11.12.21. This subspecies of golden tailed gecko (*Strophurus taenicauda albiocularis*) has been associated with 30 REs (Brown, D et. Al. 2012). Six of these REs are found within the Study Area:

- 11.12.1 – Eucalyptus crebra woodland on igneous rocks;
- 11.12.2 – Eucalyptus melanophloia woodland on igneous rocks;
- 11.12.21 – Acacia harpophylla open forest on igneous rocks. Colluvial lower slopes;
- 11.12.6 – Corymbia citriodora open forest on igneous rocks (granite);
- 11.3.2 – Eucalyptus populnea woodland on alluvial plains; and
- 11.3.25 – Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines.

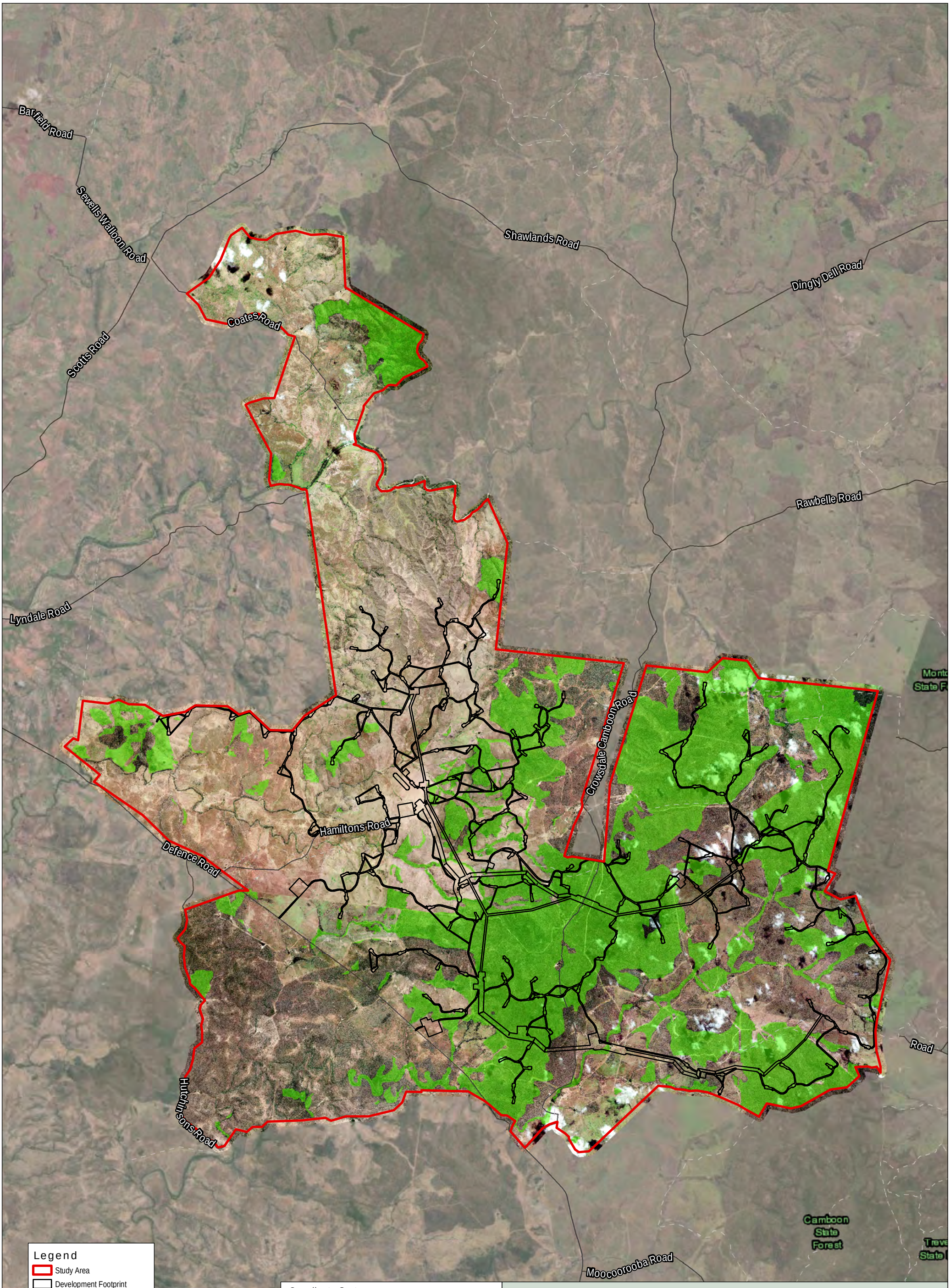
Golden tailed gecko habitat features, with regard to presence of flora species, vary across its range. Studies for this species are largely focused on the Surat basin with particular focus on habitat fragmentation and habitat features. Features which positively correlate with the abundance of this species within this region are focused on patch size (ha) and basal density of trees per ha. It was found in particular that the patch size was not a determination of abundance, grazing negatively impacted abundance and that average basal area of trees (preferentially white cypress – 22.8cm) in negligible or ungrazed areas attributed positively to abundance (Pavey, C, R et. Al.).

As white cypress in this region and locality, Theodore Qld, may not be a definitive indicator of presence and abundance, habitat for the purposes of this assessment has been defined by:

- presence of suitable REs as described above; and
- of remnant status or condition, where grazing is less prevalent.

Habitat for this species within the Study Area has been mapped and calculated on this basis.

Habitat for this species present within the Study Area is 14,720 ha.



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4.6.4.2 LISTED THREATENED FAUNA SPECIES WITH POTENTIAL TO OCCUR

A total of four NC Act listed threatened fauna species have been assessed as having the potential to occur within the Study Area as per the likelihood of occurrence presented in Appendix A. No observations of these species were made within the Study Area across eight field survey events. However, there is presence of suitable habitat and the Study Area is within their respective distributions. Therefore, potential presence within the Study Area cannot be ruled out. These species are further detailed in Table 4-18.

TABLE 4-18 NC ACT LISTED FAUNA SPECIES WITH POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Species Name	Common Name	NC Act Status	Potential Habitat Mapped within the Study Area
Hirundapus caudacutus	white-throated needletail	VU	Species likely to fly aerially over the Study Area, utilising this area for foraging. Potential roosting habitat may be present in the form of tall eucalypt forests, however these areas are not elevated and are therefore unlikely to be utilised by the species. Habitat has not been mapped for this species as roosting habitat is unlikely to occur and the species only forages aerial.
Turnix melanogaster	black-breasted buttonquail	VU	Potential foraging and roosting habitat is present in the Study Area in the form of vine thickets/forests and dry rainforest. However, this habitat lacks key requirements for the species, such as a dense, heterogeneously distributed shrub layer for shelter and breeding, and a deep leaf litter for foraging. • Potential foraging roosting habitat occupies 232.3 ha and is presented in Figure 4-8b.
Rostratula australis	Australian painted snipe	EN	Potential foraging habitat present within the Study Area associated with waterbodies and drainage features (predominantly farm dams). • Potential foraging habitat is 56.9 ha and presented in Figure 4-8b.
Petaurus australis australis	Yellow-bellied glider (south-eastern)	V	There is potential foraging habitat for the species in the form of old growth eucalypt forests present within the Study Area. The locality contains remnant vegetation such as state forests that would make the Study Area a movement corridor, should suitable foraging resources be present. • A total of 3,171.8 ha of foraging habitat and 921.1 ha of denning habitat has been mapped within the Study Area, presented in Figure 4-8.

Status listing per NC Act: CR = Critically Endangered; EN = Endangered; VU= Vulnerable.
For the full reasoning for the potential outcomes for such species, refer to Appendix A.

It is noted that the pre-clearance surveys proposed as part of the micro-siting phase of layout design will survey specific infrastructure locations for listed threatened fauna that have been identified as known, likely or having the potential to occur within the Study Area, to identify and avoid microhabitat features (e.g. hollow bearing trees) during micro-siting.

4.6.4.3 WOODLAND AND OPEN-FOREST SPECIES

The majority of bird species (94 species total) recorded during field surveys were woodland-dwelling, low-flying species found beneath the canopy (< 20m). These habitats often provide necessary foraging and roosting capacity with abundant prey species and hollows for shelter (BirdLife, 2019). Woodland areas are often associated with a large amount of fallen timber and leaf matter on the ground. The woodland bird species require this habitat feature as it allows their food source of insects and small reptiles to be available in sufficient abundance. Additionally, woodlands often are associated with a moderate grass layer which provides another level of habitat complexity for these smaller bird species to use for shelter as well as foraging (BirdLife, 2019). Woodland species were only observed flying to the maximum height of the woodland canopy. A full bird species list of those recorded during the four field surveys can be found in Appendix D.

4.6.4.4 RAPTORS

A total of seven raptor species were observed during field surveys, of which none are listed under the EPBC Act (or NC Act). These species were:

- Brown falcon (*Falco berigora*);
- Black-shouldered kite (*Elanus axillaris*);
- Nankeen kestrel (*Falco cenchroides*);
- Spotted harrier (*Circus assimilis*);
- Whistling kite (*Haliastur sphenurus*);
- Peregrine falcon (*Falco peregrinus*); and
- Wedge-tailed eagle (*Aquila audax*).

Wedge-tailed eagle sightings were restricted mainly to cleared agricultural areas. This species was recorded soaring in pairs most commonly at heights ranging from 150 – 250 m above ground level and is therefore within the RSA. As a result, wedge-tailed eagles have been considered within the risk assessment.

The nankeen kestrel (seen flying up to 50m high), black kite (up to 50 m high), brown falcon (up to 250 m high) and peregrine falcon (up to 60 m high) have also been considered within the risk assessment. Black-shouldered kite was observed below the RSA (at 20m high), however the species is known to fly at heights up to and beyond the RSA and so, has been considered within the risk assessment. These raptor species predominantly prefer woodland and open area habitat (Olsen, 1995) and typically fly at heights to hunt for ground-dwelling prey in open/cleared areas or within woodlands and sparse open forests.

4.6.4.5 INTRODUCED FAUNA SPECIES

Six introduced fauna species were recorded in the Study Area during field surveys, which were the wild pig, (*sus scrofa*), dog (*Canis lupus familiaris*), cat (*Feline catus*), house mouse (*Mus musculus*), rabbit (*Oryctolagus cuniculus*) and cane toad (*Rhinella marina*).

4.6.5 WATERCOURSES AND WETLANDS

The Study Area occurs within the Fitzroy drainage basin. Recognised watercourses (per the Water Act) that occur in the Study Area are Oxtrack Creek, Six Mile Creek, Kable Creek, Boam Creek, South Creek, Nine Mile Creek, and Castle Creek, as well as an unmarked tributary in the South-East corner of the Study Area. DoR provides mapping for 'vegetation management watercourses and drainage features' that are used when assessing MSES. Farm dams also occur throughout the Study Area. These are generally of low quality and impacted by cattle.

The Study Area contains watercourses mapped under the VM Act. The VM Act protects riparian vegetation associated with watercourses (Riparian Protection Zone [RPZ]), with the level or protection afforded dependent on the stream order:

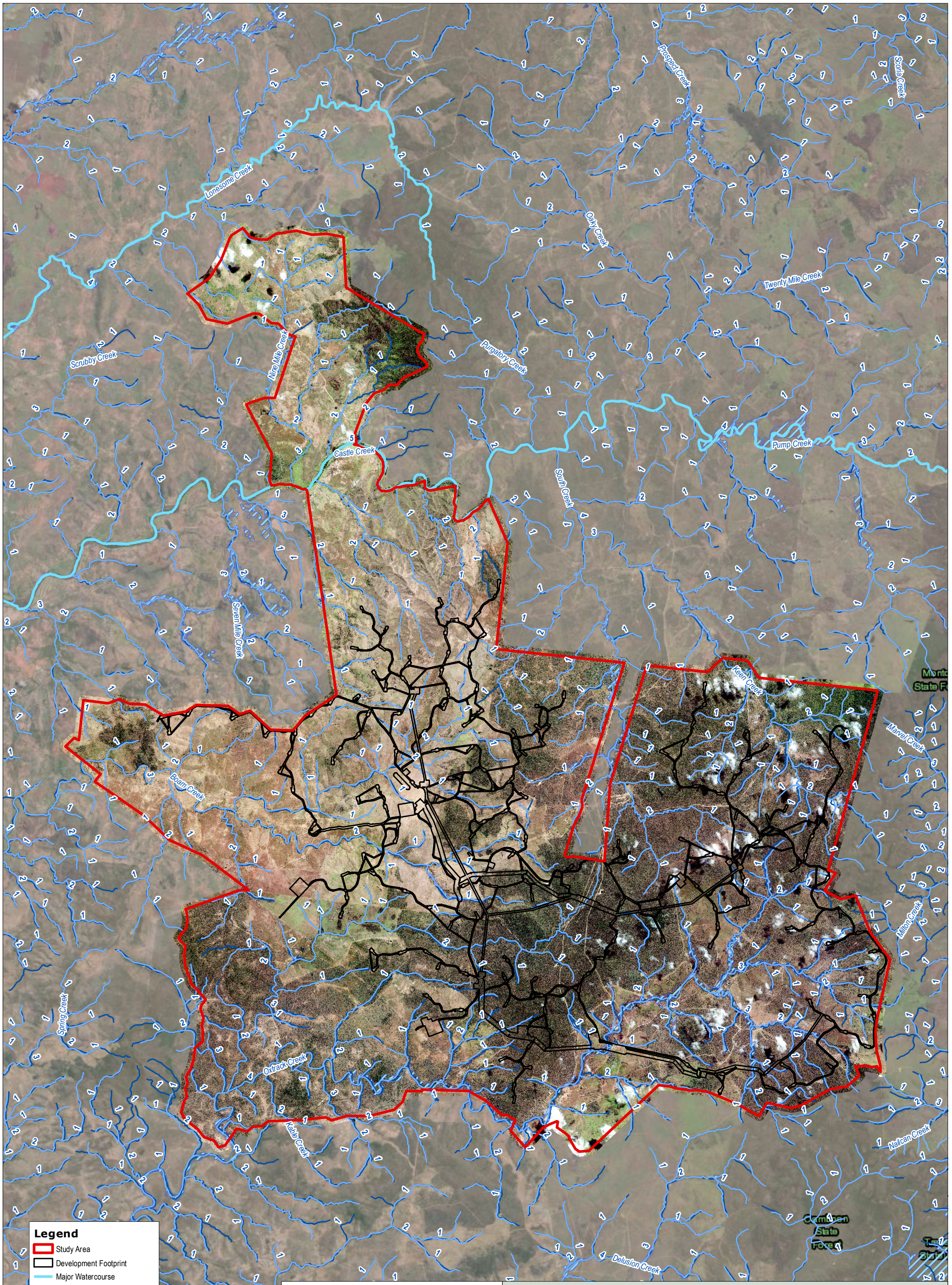
- RPZ includes 10 m from the defining bank of a Stream Order 1 or 2 watercourse or drainage feature;
- RPZ includes 25 m from the defining bank of a Stream Order 3 or 4 watercourse or drainage feature; or
- RPZ includes 50 m from the defining bank of a Stream Order 5 or higher, watercourse of drainage feature.

The Study Area contains watercourses of varying status.

The Study Area contains stream order 1 to 5 watercourses. The RPZ has been considered when designing the turbine layout and associated infrastructure. Based on the current layout, approximately 60 watercourse crossings will be required as part of the access track network, the majority of these are low order watercourses with impacts managed through the waterway barrier works design and approval process. It is noted impacts associated with non-linear infrastructure have been avoided within the RPZ.

There are no Wetland Protection Areas or High Ecological Value (HEV) Wetlands mapped within the Study Area. There are no HEV Waterways that occur in the Study Area. There are some QLD Wetlands mapped within the Study Area.

Figure 4-14 shows the relevant drainage features and wetlands mapped throughout the Study Area.



4.14- Watercourses and Wetlands in the Study Area

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4.7 BANANA SHIRE COUNCIL PLANNING SCHEME

The Banana Shire Council Planning Scheme 2017 incorporates overlay codes and mapping relating to biodiversity, and wetland and waterway corridors. The overlay code refers to overlay mapping consistent with MSES mapping for:

- Protected Areas;
- Wildlife Habitat;
- Regulated Vegetation;
- HES wetlands;
- HEV waters (wetland);
- HEV (watercourse); and

Regulated Vegetation (intersecting a watercourse).

These MSES features have been described in Section 4.4, and impact assessment is provided in Section 7.2.

5. PROPOSED ACTION ACTIVITIES AND POTENTIAL IMPACTS

The Proposed Action has the potential to impact on the ecological values in the Study Area during its construction, operation and decommissioning phases. The activities likely to result in potential ecological impacts are listed below for each phase. The impact assessment considers quantification of all three (3) stages of the Proposed Action.

5.1 CONSTRUCTION PHASE ACTIVITIES

The potential key activities likely to impact ecological values during construction are:

- Vegetation clearing for new access tracks, temporary construction compounds and laydown areas, borrow pits, water storages, batching plants, turbine hardstands, trenches for reticulation and instrumentation cables, electrical substations and overhead powerlines and associated earthworks;
- Excavating trenches;
- Blasting for turbine foundations (if required); and
- Construction traffic movements and plant operation (rock crushing and batching plants).

Construction works are anticipated to have a duration of 24-48 months. Construction activities will result in 1,932.2 ha of disturbance to broad habitat groups across the Study Area throughout the duration of the construction phase. The following disturbance to broad vegetation types and habitat within the Development Footprint are anticipated to occur:

- 1,016.2 ha to Grasslands and cultivated agricultural land;
- 886.3 ha to Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;
- 16.5 ha to Riparian woodland and open forest dominated by *E. populnea, E. tereticornis* often associated with stream channels;
- 3.1 ha to Vine Forest/Thickets and Dry Rainforest;
- 1.3 ha to Waterbodies and drainage features; and
- 8.7 ha to Brigalow woodlands.

Post-construction, a portion of the cleared areas will be maintained as part of the fire management for infrastructure and for the installation of reticulation / overhead lines. However, areas outside the final road formation will undergo progressive restoration of grass species post construction activities. Access corridors will be limited to 40 m in width during the construction phase.

It is anticipated that a significant proportion of the initially cleared 1,932.2 ha will undergo progressive restoration of grass species for up to 50% of the disturbance footprint. As the construction front progresses, natural regeneration will be allowed to occur in areas that were disturbed for construction and not required for operation.

5.2 OPERATIONAL PHASE ACTIVITIES

Operational activities and their potential impacts during the operation phase include:

- Operation of the WTGs for an estimated period of 30-35 years, resulting in potential bird and bat collision risks; and
- Routine maintenance and servicing of WTGs, access tracks, electrical installations, and infrastructure as required, resulting in potential impacts of vehicle mortality and incidents, habitat disturbance (albeit, on a considerably smaller scale than construction phase activities), disturbance and potential hazardous materials exposure.

Operational phase activities, though longer in duration than those of construction phase activities, are anticipated to result in impacts that are of a more indirect nature, of lower frequency and smaller in intensity (such as potential impacts from vehicles, vegetation maintenance, infrequent disturbance and collision impacts).

5.3 DECOMMISSIONING PHASE ACTIVITIES

If a decision was taken to decommission the Proposed Action, this would involve:

- Dismantling and removal of WTGs;
- Removal of electrical reticulation where not part of permanent network infrastructure;
- Responsible disposal/recycling/reuse of infrastructure removed from site according to the waste hierarchy; and
- Rehabilitation of all disturbed land in accordance with good practice at the time and where not required for ongoing grazing or agricultural uses.

Underground cabling would be left *in situ*. Hardstand pads would be left *in situ* or deep ripped where rehabilitation is required. Turbine foundations may be left up to 500 mm below rehabilitated ground level as they do not present a risk to people or livestock. Excavations would be backfilled and rehabilitated. Access tracks could be retained on site for the continued benefit of the landholder, or they could be rehabilitated.

In general, potential impacts as a result of the decommissioning phase relate to habitat loss and disturbance. Decommissioning phase impacts are similar to those that might occur during the construction phase but likely to be of much lower magnitude. At the end of decommissioning, the site would be rehabilitated to the extent agreed upon with the landholder.

A summary of impacts to ecological values is summarised in Table 5-1.

5.4 POTENTIAL IMPACTS TO ECOLOGICAL VALUES

In general, potential impacts from the construction phase relate to habitat loss and disturbance. Operational impacts are largely limited to possible bird and bat collisions with operational WTGs. Decommissioning impacts are similar to those that might occur during the construction phase but likely to be of much lower magnitude as there is no additional vegetation clearing during the decommissioning phase.

Ecological values identified within the Study Area are described in Section 4. A summary of potential impacts to ecological values is summarised in Table 5-1.

Direct disturbance to MSES and MNES will be habitat loss and degradation, which arises from disturbance to native vegetation (predominantly by land clearing) that is regulated vegetation or habitat defined in this EAR. Direct disturbance to MSES and MNES is presented in Section 8.1 and 8.2 of this EAR.

The disturbance footprint of the Proposed Action (that is, the maximum area to be cleared) is 1,932.2 ha and includes a maximum impact of 818.12 ha of regulated vegetation associated with the clearing for infrastructure. The disturbance footprint is 4.1% of the total Study Area. It is anticipated that rehabilitation opportunities post-construction will occur to reduce percentage of total disturbance required to facilitate construction.

TABLE 5-1 SUMMARY OF IMPACTS

Phase	Impact	Relevance to the Proposed Action
Construction	Clearing remnant and regrowth vegetation and the resultant loss of habitat for native fauna	• There is a maximum impact of 820.4 ha to remnant and regrowth vegetation located within the Study Area as a result of the Proposed Action. • It is expected that the loss of this vegetation will negatively impact native species through significantly reducing the species composition and structural diversity of the area to be cleared. • This impact will result in the permanent removal of these vegetation types and the habitat values (foraging, breeding, dispersal etc) they provide for native flora and fauna for the life of the Proposed Action. • Any clearing of vegetation is proposed to occur in small, localised strips or small patches. A such, this loss of habitat is likely to have a greater impact to flora and fauna species with smaller home ranges and specific habitat requirements (e.g. small mammals, amphibians and reptiles) compared to species with larger home ranges and more general habitat preferences (larger mammals and generalist birds).
Construction	Indirect impacts to species behaviour through creating barriers to movement and dispersal	• The construction of the turbines may result in barriers to movement for species accessing and dispersing within the Study Area. • These barriers may be created through the clearing and fragmentation of habitat and/or short-term construction activities and machinery during construction. For example, roads usually have a more open canopy, lack ground cover and have different thermal characteristics than the surrounding habitat (Shine et al., 2004), often creating a microhabitat where predation risk is higher (Sheppard et al., 2008), and potentially resulting in behaviour changes and avoidance of these areas by certain species (Fahrig, 2007). • It is expected that creating barriers to movement and dispersal may impact native species through changing dispersal behaviours, reducing access to resources (water, food, breeding (hollows, mate selection etc)), and depending on the strength of the barrier, disrupt ecosystem function and gene flow throughout the Study Area, in an area that may impede local movement to certain species (Sheppard et al., 2008). • Therefore, it is likely that this impact will have a greater negative effect to native species that are more vulnerable to predation and are unable to disperse through non-remnant habitat than species that have a lower predation threat and have greater dispersal ability (particularly within cleared, non-remnant habitat).
Construction and operation	Indirect impacts to adjacent habitat areas as a result of noise, blasting, dust, runoff and erosion, including impacts to	• Construction traffic movements and plant operations will result in light and noise pollution, vibrations and dust generation that has the potential to negatively impact adjacent vegetation communities and habitats. • Light and noise pollution have the potential to affect the physiology, behaviour and reproduction of a range of animal taxa, with these effects including reduction in animal fitness, increased risk of predation, reduced success or alternations of acoustic communication, increase vigilance and reduced reproductive success (Newport et al., 2014). • In Australia, it has been shown that many species, such as squirrel gliders for example, are negatively affected by noise and light pollution and show a decrease in activity levels as light and noise pollution increase (Francis et al., 2015).

Phase	Impact	Relevance to the Proposed Action
	downstream environments	• Studies suggest that the consistency of noise is more important than volume, with irregular and unpredictable noise being emitted during construction and decommissioning likely to be more disruptive to wildlife (Jones et al., 2015). For the general native fauna communities, individuals may relocate to adjacent areas during times of noise disturbance. • Blasting will result in disturbance to wildlife through vibration, noise and possibly injury from flying rock. Blasting will occur infrequently but has the effect of displacing nearby wildlife from retained foraging and breeding habitat. • Dust generated by vehicle and machinery movements has the potential to smother vegetation directly adjacent to the works and inhibit plant growth and palatability for native fauna. These effects, however, would be localised. There are measures available to limit dust generation and dispersion. • Erosion from construction can alter the physical condition of an environment through the removal of topsoil and potential run off into nearby waterways. This runoff can indirectly cause impacts to aquatic habitats through changing the physical and /or chemical condition of waterways within the Study Area and within downstream environments. • Additionally, there is a potential for the Proposed Action to result in pollution of waterways and aquatic habitats within the Study Area and downstream environments through potential inappropriate vegetation management (herbicides, pesticides etc) or potential fuel, chemical or hazardous material spills.
Construction	Indirect impacts to adjacent habitat areas because of an introduction or spread of weed and pest species	• As a result of the removal of vegetation and introduction of foreign material during the construction phase, there is potential for the introduction and/or spread of weeds and pest species throughout the Study Area. This introduction or spread of weeds and pests could be a result of on-foot movement, vehicular movement and the disruption and movement of vegetation. • Three WONS were recorded throughout the Study Area: velvet prickly pear, parthenium, cats claw creeper and *Lantana camara* (Section 4.6.3.2). Four invasive fauna species were observed in the Study Area which were rabbit, dog, pig, cat, house mouse and cane toad (Section 4.6.4.5). • Such weed and pest species have the potential to negatively impact native flora and fauna communities through competition for resources and/or predation/parasitism. • Specifically, *Lantana camara* has shown to reduce species richness through outcompeting native flora species (particularly tree and shrub species) within Australian vegetation communities, altering species composition and structural diversity, and shifting tall open forests to low, dense lantana-dominated shrubland, potentially decreasing habitat value for certain fauna (Gooden et al., 2009). • In terms of pest species, carnivorous mammal and reptile species are known to be significantly impacted through poisoning from can toads, specific microhabitat features, such as invertebrate diversity, leaf litter cover and fallen log cover, are known to be susceptible to degradation by rabbit and pigs , and a range of mammal and bird species are known to be vulnerable to predation from domesticated dogs and cats. • Construction activities have the potential to exacerbate the likeliness of invasive species establishing in the Study Area.

Phase	Impact	Relevance to the Proposed Action
Construction and Operation	Direct mortality or injury to native fauna during construction and operations	• The peak traffic periods will be during the construction period with operational vehicle movements likely to be minimal. While many fauna groups are highly mobile (e.g. birds) and are likely to move when machinery and vehicles approach, other less mobile groups (e.g. reptile and amphibians) may be more vulnerable to this impact. • Similarly, there will be excavation (construction only) which may provide a trapping hazard for some fauna groups (e.g. amphibians, small reptiles, and small mammals).
Construction	Fragmentation of connectivity areas	• Habitat fragmentation is often defined as a process during which "a large expanse of habitat is transformed into a number of smaller patches of smaller total area, isolated from each other by a matrix of habitats unlike the original" (Wilcove et al. 1986). • Fragmentation has the potential to negatively impact ecological values and native species through habitat loss, habitat patch isolation (disrupting connectivity and reducing dispersal ability and gene flow), reducing patch size (small habitat patches may not be able to sustain local populations or potentially individual territories) and edge effects (more edges increase the probability of individuals leaving the habitat patch, increasing mortality rates and reducing reproduction rates) (Fahrig, 2003). • Specifically, creating more extensive edges through fragmentation increases the colonisation by exotic plant and animal species, and allowing for more effective hunting of predators (Neldner, 2017). • Additionally, certain native species such as noisy miners (*Manorina melanocephala)* and yellow-throated miners (*M. flavigula*) may also benefit from fragmentation and disrupt the ecological functioning within woodland habitat patches by outcompeting insect- and nectar-feeding bird species (Neldner, 2017). • Within the Study Area, greater than half of the area (60 %) is mapped as non-remnant or sparse regrowth vegetation that is impacted by clearing, cattle grazing and crop fields, with several existing cleared vehicle and cattle tracks. The remaining area exists as a somewhat connective stands of remnant vegetation, that if inappropriately worked on, may result in fragmentation of native species connectivity areas. • The disturbance footprint does bisect some of these connected remnant areas and will result in further fragmentation. However, this is expected to be limited based on the narrow linear nature of the proposed clearing which is unlikely to present an obstacle for many species.
Operations	Impacts from turbine collision to birds and bats	• The operation of the WTGs has the potential to cause direct mortality or injury to avian fauna like birds and bats. Risks to birds from wind farm developments are highest in areas where large numbers of birds congregate e.g., Tarifa in Spain or Altamont Pass in the USA. At these locations, millions of birds migrate annually and must pass through large wind farm areas. Wind farm development in areas of lower importance to birds and bats record substantially lower impacts (EPHC, 2010). As discussed in Section 4.3.3.5, the Study Area occurs outside migratory flyways of migratory bird species that have the potential, or are likely, to occur. It is anticipated that the risk to birds and bats in the Study Area will be low compared to wind farm developments in Spain or the USA where intersection of migratory flight paths occurs. • On occasions where birds and bats do not avoid WTGs, it is expected that injury or mortality may occur.

Phase	Impact	Relevance to the Proposed Action
		• Any incidental mortality is linked closely to the turbine Rotor Swept Area (RSA) height. RSA height refers to the between the tips of the rotor blades of a wind turbine generator. The RSA height to be adopted for the Proposed Action is 60-270 m. RSA is important to note as it typically dictates the risk of impacts to birds and bats. Those species found to be flying at or above RSA are typically more at risk from barotrauma and rotor collision than those that fly below the RSA. This has been exhibited within studies and technical reports at other wind farms, such as in Bango Wind Farm's Ecological Assessment (2019) and Dulacca Renewable Energy Proposed Action Fauna Technical Report (2018). Some studies investigating the impact from collision of birds and bats in operating wind farms, indicated there is a risk to local bird and populations, particularly when RSA heights are close to forest and woodland canopys (e.g. 27-125 m) (Hull & Cawthen, 2013). • Given the small area of habitat occupied by the WTGs relative to the entire Study Area, and that the bat species recorded at the Study Area tend to forage within the woodland canopy the risk of bat injury or mortality is regarded as low. However, EPBC Act and NC Act listed large-eared pied bat was recorded as 'probable' to occur at numerous survey locations throughout the Study Area. Impacts to this species are discussed below in Section 7. • It is noted that the identified raptor species are capable and have been observed flying at RSA heights. However, studies committed to raptor species, such as the Wedge-tailed Eagle assessed in the Bango Wind Farm Ecological Assessment (2019), identify collisions to occur with a 99% avoidance rate (or approximately 0.3% of individuals). Studies have also indicated that the level of bird use at the site and behaviour are important factors for assessing risk. Raptor fatalities appear to increase as raptor abundance increases; other species appear to avoid collisions with WTGs (NWCC, 2010). The impact of collision to raptor species would therefore not be considered adverse. • The majority of avian species recorded in the Study Area are woodland-dwelling, low-flying bird species. These species require woodland dominated by Eucalyptus, Callitris and Acacia spp., often with hollows for nesting and roosting habitat (BirdLife, 2019). Most woodland species were only observed flying to the maximum height of the woodland canopy, or below (15 m or below). • While few studies have been conducted to investigate the significant impacts of RSA on collision incidence, it is considered that passerine species, due to their fast flight patterns and high flight, and migratory species, may be more at risk than other species (Erickson et al., 2001). The field surveys identified no passerine species that would be at greater risk to collision. One migratory species, satin flycatcher, was observed during field surveys. • Overall, collision rates are considered to be very low for the majority of Australian bird species, including those recorded at the Study Area and surrounds (Smales & Muir, 2005). Empirical evidence shows that birds have a very high rate (99%), of wind turbine avoidance (Smales & Muir, 2005; Whitfield & Madders, 2005; Pendlebury, 2006). This applies to raptor species as well as smaller birds.
Operations	Impacts from turbine collision to migratory birds and other fauna species	• As with non-migratory species, there is potential for migratory birds to be impacted when flying over the Study Area. While the Study Area does not occur over any known migratory flyways, there is still some potential for migratory species to traverse the Study Area. An example of a migratory species which could be impacted by turbines is the White-throated needletail, which can fly from 1 to 1000 m above the ground (Higgins, 1999). The direct collision with the wind turbines would likely result in serious injury and/or death to individuals.

Phase	Impact	Relevance to the Proposed Action
		• Turbines occur at heights that are unlikely to affect arboreal species who occupy and move within the canopies of woodlands and open forests, some 40 metres below the height of moving turbine blades. Specifically, for the Corben's long-eared bat, the potential for impact is considered to be unlikely due to the mostly low flying height, and high flight manoeuvrability of this species (Churchill, 2008). • One migratory species, satin flycatcher, was observed foraging in the south of the Study Area amongst open eucalypt woodland during field surveys, however the species was not observed flying at the RSA.
Operations	Barotrauma	• Barotrauma is a result of moving turbines creating a drop in atmospheric pressure at the tip of the turbine blades. This can result in rapid or excessive pressure changes that can cause tissue damage to air-containing structures. Species most at risk of barotrauma are often species of microbats. Bat mortality as a result of barotrauma is highly contentious and where data is available it can report drastically varied figures such as 1.6 bats per WTG per year to over 90 bats per turbine per year (Bango, 2019). • It is known that migrating bats have an increased mortality rate near moving turbine blades at wind farms. However, it should also be noted that studies investigating forensic pathology data strongly suggest that the traumatic injuries (collision) sustained at wind farms is the major cause of bat mortality, and that barotrauma is a very minor cause of bat mortality (Grodskey *et al*., 2011; Rollins *et al*., 2012).
Construction and Operation	Disturbance to MNES	Disturbance to MNES has been summarised in the MNES Impact Assessment Section (Section 7.1) • See impact assessments in Appendix E.
Construction and Operation	Disturbance to MSES	Disturbance to MSES has been summarised in the MSES Impact Assessment Section (Section 7.2) • See residual impact assessments in Appendix F.

6. MANAGEMENT AND MITIGATION MEASURES

Potential impacts of the Proposed Action will be managed in a manner consistent with the industry standard management approaches for wind farm activities, and, where relevant, additional measures will be implemented.

The Proposed Action layout will likely consist of widely spaced WTGs and associated linear infrastructure. Given the size of the Study Area, and the widely spaced nature of the Proposed Action, the ecological surveys were undertaken prior to and concurrently with preliminary and early design processes to inform the proposed design and to enable avoidance and minimisation of impacts where possible.

Impact and disturbance mitigation will follow a two-stage process:

- The first design phase is based on refining the infrastructure design through an iterative process including environmental, wind resource, constructability, landowner, traditional owner, and transmission network considerations. The design refinement process focused on the avoidance and minimisation of impacts to important ecological values (vegetation and mapped habitat for listed threatened species), identified from the desktop and field investigations conducted from October 2022 to February 2024, and the coordination of these aspects with engineering design and wind resource restrictions.
- The second design phase will involve on the ground micro-siting at each location proposed for infrastructure. Targeted surveys for known, likely and potentially occurring listed threatened and/or migratory species or micro-habitat features will be conducted at proposed infrastructure locations in the Study Area. Where required and feasible, infrastructure will be micro-sited up to 100 m to avoid large hollow bearing trees, nests, rock falls and other important micro habitat features.

This two-phase design and avoidance process will allow for all planned areas of disturbance to be adequately assessed in accordance with the State Code 23 field survey requirements as well as identification of potential MNES values in accordance with relevant Commonwealth guidance and guidelines.

The management and mitigation measures specific to ecological values identified as a result of this assessment are provided in Table 6-1.

TABLE 6-1 KEY MANAGEMENT AND MITIGATION MEASURES

Impact	Hierarchy	Relevance to the Proposed Action
Refinement of WTG layout	Avoid	Areas of habitat for listed threatened species will be minimised at the design and micro-siting stages to the maximum extent possible. The Development Footprint has been continuously refined throughout the design phase based on the constraints that the preliminary impact assessments have identified. Locating the Development Footprint in areas away from key habitat (higher quality vegetation – such as fringing riparian habitat, brigalow woodlands and *Eucalyptus crebra* dominated woodland and open woodland, as well as well-vegetated gullies) as much as practicable.
Clearing vegetation and the resultant loss of habitat	Avoid	The two-stage impact and disturbance mitigation process will be implemented. Impacts to areas of higher quality native vegetation will be minimised at the design and micro-siting stages. Areas of identified threatened flora and fauna habitat will be avoided at design and micro-siting stages. Additional field surveys will be undertaken of the 90% design Development Footprint to search for those listed flora species with potential to occur, to define locations of populations, and microsighting and propose additional avoidance measures, such as flora species translocation, seed collection and propagation.
	Minimise	Where identified, a pre-clearance assessment of potential habitat values where potential risks to fauna could occur. Where potential risks are identified from pre-clearance assessment, a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna (or important nesting sites for listed threatened fauna) are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts from clearing. A fauna management plan (FMP) will be created and implemented as required under the NC Act. To prevent unnecessary land and vegetation disturbance, vehicles and equipment will be retained within the approved work zone. Workers will be made aware of management requirements during inductions and through regular checks during construction. General site inductions will outline potential risks and impacts to the environment, management strategies and methodologies to avoid, minimise and mitigate the potential risks and impacts relevant to the onboarding workers and contractors. A Vegetation Management Plan will be implemented to ensure that clearing is undertaken in accordance with legislative standards and requirements.

Impact	Hierarchy	Relevance to the Proposed Action
		Preliminary Post Construction Rehabilitation Plan will be implemented to rehabilitate temporary vegetation clearing in mapped regional ecosystems to pre-construction composition, function and structure.
Indirect impacts to species behaviour through creating barriers to movement and dispersal	Avoid	Infrastructure will be located to first avoid, and then minimise the impacts of edge effects or dissecting tracts of native vegetation so that species dispersal is not significantly impeded. Pre-clearance surveys and on ground micro-siting will ensure infrastructure is located in areas which avoid, and subsequently minimise edge effects and the isolation, fragmentation, or dissection of tracts of native vegetation
	Manage	Construction activities and machinery will occur and stay within discrete work zones and not impact adjacent vegetation.
	Mitigate	Progressive restoration of access corridors will occur once construction has been completed.
Indirect impacts to adjacent habitat areas as a result of noise, blasting, dust, runoff and erosion, including impacts to downstream environments	Minimise	Dust will be minimised through engineering controls on machinery and other available dust suppression controls, such as water spraying. Where identified as required, a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing. Staff and contractors will be made aware through general site induction and training of the potential to generate dust emissions and mitigation and management measures that should be implemented. Vehicles, plant and machinery will comply with site-specific speed limits to minimise dust generation. Sediment and erosion control to be managed in accordance with the Queensland Erosion and Sediment Control Plan, the Proposed Action Environmental Sediment and Erosion Control Plan and the Contractor's erosion and sediment control procedures. Where required, watercourse crossing points will be adequately stabilised to prevent erosion. Construction activities must not interfere or block natural drainage (e.g., disturbing channel contours). Water barrier works, will be designed to minimise impact on fish habitats, stock or movements through compliance with relevant design codes. It is noted that all waterways in the Study Area are ephemeral, with variable periods of flow during rainfall events only. During detailed design phase, fish passage elements will need to be considered in all mapped waterways for fish passage, including compliance with the accepted development requirements for waterway barrier works or an operational works permit under the Planning Act.

Impact	Hierarchy	Relevance to the Proposed Action
Indirect impacts to adjacent habitat areas as a result of an introduction or spread or weed and pest species	Avoid	A biosecurity plan will be developed and implemented for the Proposed Action. This will include the requirements of the individual property biosecurity plans, including measures such as vehicle wash downs, weed certification and obligations limit construction traffic to defined access tracks throughout the Study Area. Activities will be planned so that movement of vehicles, plant, machinery and equipment shall be in accordance with the requirements of the individual property biosecurity plans. Access to a landholder's property will not occur unless authorised under a land use agreement. Staff and contractors will be given information on the location and consequences of biosecurity threats in the Study Area.
	Minimise	Weed management and control methods will depend upon the location, weed species identified, the degree of the infestation, relevant landholder agreement, and local, state and national regulatory requirements. Imported material able to transport weed and seed will be assessed to ensure they are free of contamination, disease and invasive weeds. There will be a Weed Hygiene Declaration that will be implemented to ensure no contamination occurs. WONS and Restrictive Invasive species will be identified and monitored in the Study Area. Appropriate weed monitoring will occur to ensure new weed species are identified, recorded and controlled. Staff and contractors will be made aware through general site induction and training of the potential to exacerbate weed and pest related risks, biosecurity site requirements (such as weed certification) and mitigation and management measures that are to be implemented.
Direct mortality or injury to native fauna during construction and operation	Minimise	Where identified as required, a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing. Staff and contractors will be made aware through general site induction and training of the potential to impact native fauna, reporting requirements and mitigation and management measures that are to be implemented. No driving will occur in unauthorised areas and will be carried out at safe speeds that are designated for the Study Area. Injured, sick or dead fauna will be recorded and reported, during and after the construction and operation phases. This can be carried out by a fauna spotter-catcher during periods where disturbance is expected to occur (primarily construction activities). Where injured or sick fauna is detected, individuals will be taken to the nearest wildlife carer or veterinarian if practical.

Impact	Hierarchy	Relevance to the Proposed Action
Fragmentation of connectivity areas	Avoid	Pre-clearance surveys and on ground micro-siting will ensure infrastructure is located in areas which avoid, and subsequently minimise edge effects and the isolation, fragmentation, or dissection of tracts of native vegetation. WTGs will maximise the use of areas that are less vegetated, to avoid and minimise clearing of mature trees. Design has ensured that minimal water crossings are present within the Development Footprint.
	Minimise	Clear marking of areas to be impacted and non-impacted, ensuring that the clearing footprint does not extend further than required to create unnecessary fragmentation.
	Mitigate	Areas that have been cleared and are no longer required will be allowed to naturally revegetate. Revegetation works will generally be limited to encourage natural regrowth.
Impacts from turbine collision (to birds and bats, migratory species)	Avoid	Measures to address potential collision risk include the following which have been successfully applied to avoid bird and bat mortalities in the United States (Arnett, 2010): • Locating WTGs away from key bird and bat habitats (waterways and drainage lines); and • Design of a turbine with a blade sweep area >40 m above ground level to provide a collision-free foraging zone within the canopy and 20 m above the canopy. (Current RSA is approximately 60 - 270 m above ground)
	Minimise	Development of a Bird and Bat Management Plan (BBMP) that considers the impacts that may occur to birds and mitigation measures to address potential impacts to migratory species considered 'potential' to occur within the Study Area.
Barotrauma	Avoid	A BBMP will be designed to assist in mitigating impacts to bats, including additional surveys prior to determining final design. Reducing lights on operating WTGs will help to reduce insect presence and limit potential feeding opportunities for bats close to the WTGs.
	Minimise	Impact mitigation will be largely avoiding microbat habitat, which includes woodlands and open forests.
Disturbance to MNES	Avoid	Areas of identified threatened flora and fauna habitat will be avoided and minimised at design and micro-siting stages. The Development Footprint, comprising the infrastructure, has been continuously refined throughout the design phase based on the constraints that the preliminary impact assessments have identified. Locating the Development Footprint in areas away from key habitat (higher quality fringing riparian habitat – such as Castle Creek and tributaries of South and Keen Creek) as much as practicable.

Impact	Hierarchy	Relevance to the Proposed Action
		The Proposed Action will seek to identify and retain tall riparian trees, and any that contain potential raptor nests that occur near watercourses where possible. Avoidance and retention of greater glider and yellow-bellied glider habitat features that would be suitable for denning (such as large hollow-bearing trees). Species habitat will be outlined and displayed in work programs and management plans where relevant to potential impacts throughout the construction phase and operational phase.
	Minimise	Specific Management Plans will be developed to manage and mitigate impacts to listed threatened species known or likely to occur within the Study Area. Such plans include a Fauna Management Plan and a Vegetation Management Plan which will include commitments on the following: • Wherever practical, signage should be erected to increase awareness of squatter pigeon (southern) in the area, given their nature as a ground dwelling bird; • Speeds on access roads across the Study Area; • All vehicles plant, equipment and machinery will remain within the designated access tracks where appropriate for tasks at hand; • Vegetation will only be removed that has been approved to be cleared; • Micro-siting will occur at all potential turbine locations that are mapped as breeding, denning or foraging habitat for koala, squatter pigeon (southern), greater glider, yellow-bellied glider, large-eared pied bat and satin flycatcher to minimize impacts to such habitats where possible. Clearing within areas of koala habitat will be undertaken under the direction and recommendations from a suitably qualified and registered spotter-catcher; and • Where disturbance to threatened species habitat has to occur, individuals and surrounding micro-habitat features (like logs etc.) will be translocated to suitable areas (if possible).

7. IMPACT ASSESSMENTS

7.1 MNES IMPACT ASSESSMENT

Significance of impacts to MNES are determined against the SIG 1.1 (DoE, 2013), assuming the controls and mitigation measures in Section 6 are implemented. Seven MNES were identified as part of the impact assessment as known or likely to occur in the Study Area, including four threatened species, two TECs and one migratory species.

Additionally, 12 MNES listed threatened or migratory species were identified as potential to occur within the Study Area. The results of the significant impact assessments are summarised below in Table 7-1 and Table 7-2. Note, it is likely that the actual area of disturbance may be lower than that documented in this impact assessment, as a result of further avoidance associated with micro-siting pre-clearance surveys. Detailed significant impact assessments for each MNES, in accordance with SIG 1.1 guidelines, is provided in Appendix E.

TABLE 7-1 MNES (KNOWN SPECIES AND COMMUNITIES) SIGNIFICANT IMPACT ASSESSMENT SUMMARY

Species or Community	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
Brigalow (*Acacia harpophylla* dominant and co-dominant)	326.9 ha	8.5 ha	Brigalow TEC is likely to be present within the Study Area as RE 11.12.21-adjacent *A. harpophylla* dominant or co-dominant vegetation and areas of unmapped regrowth vegetation verified through field survey. RE 11.12.21 patches were assessed during filed survey and were generally considered to be of poor-to-moderate quality. Approximately 326.9 ha of the TEC is mapped within the Study area, 8.5 ha within the Development Footprint. Having undertaken a significant impact assessment in accordance with SIG 1.1 (DoE, 2013), the Proposed Action is likely to reduce the extent of an ecological community and adversely affect habitat critical to the survival of the ecological community based on the definition of critical habitat outlined in the *Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community* (TSSC, 2013). A full significant impact assessment on this TEC is presented in Appendix E.	Likely
Poplar Box Grassy Woodlands on Alluvial Plains	501.1 ha	8.2 ha	Poplar Box TEC is characterised by Queensland RE Land Zones 3 and 4 and occurs mostly in five REs in Queensland, including RE 11.3.2 which occurs within the Study Area. Field surveys confirmed several patches of RE 11.3.2 within the Study Area as correlating to Category B Good Quality poplar box woodlands TEC. Approximately 501.1 ha of this TEC has been mapped to occur within the Study Area. The Proposed Action will impact 8.2 ha of this TEC. Having undertaken a significant impact assessment in accordance with SIG 1.1 (DoE, 2013), the Proposed Action is likely to reduce the extent of an ecological community and fragment or increase fragmentation of an ecological community. A full significant impact assessment on this TEC is presented in Appendix E.	Likely

Species or Community	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
Koala	29,493.7 ha	16.4 ha preferred breeding and foraging habitat 867.9 ha general breeding and foraging habitat 315.7 ha dispersal habitat	Koala is known to occur within the Study Area at very low densities as a result of the positive identification of a single faecal pellet during field surveys and one nearby desktop record of the species located outside the Study Area. Despite targeted surveys across multiple survey events, detection of koala evidence was very low. The Proposed Action is expected to disturb approximately 316.1 ha of Koala dispersal habitat (1% of the total habitat available within the Study Area), however this disturbance will not reduce or remove the function of the habitat, as koalas will still be able to traverse this habitat following the construction due to the narrow width of the linear infrastructure corridors. Due to the nature of the disturbance footprint being linear, and the ability for koalas to maintain dispersal across the Study Area, the disturbance of this dispersal habitat has not been assessed as contributing to the significance of the impacts associated with the Proposed Action. Disturbance to dispersal habitat is considered unlikely to contribute to the significance of the impact due to koala's ability to disperse across the linear infrastructure components of the Proposed Action. As the Proposed Action will not cause a barrier to movement of koalas, and the ability for the species to move across modified landscapes, including areas of cleared ground with isolated trees, disturbance to areas of dispersal habitat will not contribute to the significance of the impact. Based on this assessment, the area of significant residual impact to koala is estimated to be 884.3 ha to foraging and breeding habitat only. The Proposed Action is estimated to clear approximately 884.3 ha of koala breeding and foraging habitat (3% of the total habitat available within the Study Area). This area of impact is comprised of 16.4 ha of impact to preferred foraging and breeding habitat in areas of riparian eucalypt open forest and 867.9 ha of impact to general foraging and breeding habitat in other areas of eucalypt open forest and woodland. The Preliminary Design of the Proposed Action has minimised impacts to areas of preferred foraging and breeding habitat, with only 16.4 ha of impact to this habitat type, which represents 1% of this habitat type in the Study Area. The area of	Likely

Species or Community	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
			estimated impact to general foraging and breeding habitat is also a very small fraction of the available habitat type in the Study Area, with the impact to 867.9 ha representing 4.1% of this habitat type. Management and mitigation measures regarding habitat clearance (pre-clearance surveys, micro-siting) will ensure habitat functions remain intact and connectivity of Koala habitat and locally important trees are preserved. Additionally, a biosecurity management plan will ensure harmful diseases or exotic species are not introduced during construction and operation. However, impacts to koala as a result of the Proposed Action will likely reduce the area of occupancy of the species and adversely affect habitat critical to the survival of the species. Therefore, a significant impact is likely. Please refer to Appendix E for full assessment in accordance with SIG 1.1 (DoE, 2013).	
Squatter pigeon (southern)	24,290.8 ha	437.2 ha foraging habitat 524.0 ha of breeding habitat	Squatter pigeon is known to occur in the Study Area, with 24,290.8 ha of mapped habitat, comprised of 16,267.8 ha of breeding habitat and 8,023ha of foraging and dispersal habitat. The Proposed Action is expected to clear approximately 524.0 ha of breeding habitat and 437.2 ha of foraging habitat (2.1% and 1.8% of the total available habitat within the Study Area respectively). Three individual observations of the species have been made across the Study Area. Additionally, based on a conservative approach, the Study Area falls within the conservation-significant southern extent of the species occurrence south of the Carnarvon Ranges, making the impacted population an 'important sub-population.' Squatter pigeon has an observed tendency to inhabit disturbed and partially disturbed areas, however these areas do not constitute core habitat and have not been mapped as habitat for the species within the Study Area. Therefore, while areas of temporary impact and disturbance are proposed to be rehabilitated, impacts to these areas are not factored into significance impact assessment for squatter pigeon. The Proposed Action will implement appropriate management and mitigation measures, particularly regarding biodiversity (i.e., weeds and pests), disease and	Likely

Species or Community	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
			habitat disturbance (through micro-siting) and the implementation of a robust biosecurity management plan. Based on SIA (Appendix E), and in accordance with SIG 1.1 (DoE, 2013) it was determined that a significant impact to squatter pigeon is likely on the premise of "Adversely affect habitat critical to the survival of a species" and "Reducing the area of occupancy of an important population of the species."	
Greater glider (southern and central)	22,284.3 ha	861.9 ha foraging habitat 15.5 ha of denning habitat	Greater glider is known to occur within the Study Area, with 14 individuals recorded during field surveys. Greater gliders are vulnerable to habitat clearing and disturbance, particularly those with suitable microhabitat features (hollow-bearing trees) and have been known to become locally extinct in small and fragmented habitat patches, due to their reliance on suitable microhabitat (Tyndale-Biscoe & Smith, 1969; DCCEEW, 2022). Microhabitat (i.e., hollow-bearing trees) can take more than 100 years to develop to a size suitable for the species (DCCEEW, 2022). Management and mitigation measures (e.g., micro-siting and pre-clearance surveys) will be implemented throughout the clearing and construction stages. Clearing of 15.5 ha of denning habitat, and 861.9 ha of foraging habitat are proposed (0.07% and 3.9% of available habitat respectively). Based on SIA (Appendix E), and in accordance with SIG 1.1 (DoE, 2013) it was determined that a significant impact to greater glider is likely on the premise of "Adversely affect habitat critical to the survival of a species" and "Reduce the area of occupancy of the species."	Likely
Large-eared pied bat	21,719.7 ha	886.3 ha	Large-eared pied-bat is considered likely to occur within the Study Area, due to 'probable' recordings of the species by Anabats recording devices in four locations during field surveys. A total of 21,719.7 ha foraging habitat is mapped to occur within the Study Area. 886.3 ha of large-eared pied bat foraging habitat (4.1% of this habitat type within the	Likely

Species or Community	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
			Study Area) is expected to be cleared as a result of the Proposed Action. No roosting habitat is mapped to occur within the Study Area. Despite implementation of management and mitigation measures (e.g., pre-clearance surveys, micro-siting and biosecurity measures), a disturbance of 886.3 ha of habitat has the potential to lead to a long-term decrease in the size of a population, reduce the area of occupancy and adversely affect habitat critical to the survival of a species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	
Satin flycatcher	1,964.6 ha	19.6 ha foraging and roosting habitat	Satin flycatcher is known to occur within the Study Area, as a result of direct observations and bird call identification during field surveys. A total of 1,964.6 ha of satin flycatcher foraging habitat is mapped to occur within the Study Area. 19.6 ha foraging and roosting habitat (1% of this habitat type within the Study Area) is expected to be cleared as a result of the Proposed Action. The Proposed Action is unlikely to support an ecologically significant portion of the species' population (17,000 individuals – internationally significant or 1,700 individuals – nationally significant) (DoE, 2015). The Proposed Action is therefore unlikely to cause significant impacts to the species' lifecycle (breeding, feeding, migration or resting). Additionally, the Proposed Action will implement management and mitigation measures regarding biosecurity measures to ensure the Proposed Action will not introduce new invasive species which would adversely impact satin flycatcher within the Study Area. As per DoE, 2015, significant impacts to satin flycatcher habitat occur when 4,400 ha (internationally significant) or 440 ha (nationally significant) occur. As the Proposed Action is estimated to impact 19.6 ha of satin flycatcher habitat, the Proposed Action is unlikely to have a significant impact to the species.	Unlikely

TABLE 7-2 MNES (POTENTIAL SPECIES) SIGNIFICANT IMPACT ASSESSMENT SUMMARY

Species	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
Fauna species				
White-throated needle tail	46,574.9 ha	1,933.2 ha	This species underwent a Significant Impact Assessment as both a vulnerable and migratory species. The species mapped habitat is potential foraging habitat, and if the species were to occur, it is thought to occur as an aerial flyover visitor only. Additionally, an important population or ecologically significant proportion of the species is not considered likely to occur in the Study Area. The proposed action impact to 1,933.2 ha of potential impacts is therefore considered unlikely to result in a significant impact. However, considering the species nature as an aerial species in Australia, and proclivity to fly at RSA heights and above, there is a risk of turbine collision risk should the species occur. Therefore, should the species be observed in the Study Area, adaptive management measures as outlined in a Bird and Bat Management will be undertaken to further avoid any impact to this species. These measures will be informed by operational phase bird monitoring to detect any listed threatened species impacted.	Unlikely
Black-breasted button quail	232.3 ha	3.1 ha	A total of 232.3 ha potential habitat is mapped to occur within the Study Area, which is considered habitat critical to the survival of the species. 3.1 ha of this potential habitat (1.3% of this habitat type within the Study Area) is expected to be cleared as a result of the Proposed Action. Considering the negligible area of impact compared to the extent of available habitat in the Study Area, the impact is unlikely to result in a significant impact to the species, especially considering that there is no important population within the Study Area. Additionally, the management and mitigation measures outlined in Section 6 will	Unlikely

Species	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
			mitigate impacts to the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	
Australian painted snipe	56 ha	1.3 ha	A total of 56 ha potential foraging habitat is mapped to occur within the Study Area, which is not considered habitat critical to the survival of the species. 1.3 ha of this potential foraging habitat (2.3% of this habitat type within the Study Area) is expected to be cleared as a result of the Proposed Action. There is no breeding habitat mapped in the Study Area as it doesn't contain the required habitat features to constitute Australian painted snipe breeding habitat (such as canopy cover in proximity to wetlands, low vegetation, isolated islands in shallow wetlands). The potential foraging habitat subject to impact is a small impact in the greater context of the Study Area. This, the lack of breeding habitat in the Study Area, and the absence of any records of the species in the Study Area means that the Proposed Action is unlikely to result in a significant impact to the species. Additionally, the management and mitigation measures outlined in Section 6 will further mitigate impacts to the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely
Yellow-bellied glider (south-eastern)	4,092.9 ha	291.3 ha Foraging habitat 11.8 ha denning habitat	Yellow-bellied glider is considered potential to occur within the Study Area, with no observation or recent records of the species within the Study Area or Locality. However, several outdated records occur south of the Study Area within Camboon and Trevethan State Forests which have connectivity to the south of the Study Area. A total of 291.3 ha (9.2%) of foraging habitat and 11.8 ha (1.3%) of denning habitat will be impacted as a result of the Proposed Action. This habitat has been considered potential habitat critical to the survival of the species, as defined in the species Approved Conservation Advice (DAWE, 2022). Management and mitigation measures (e.g., micro-siting and pre-clearance surveys) will be implemented throughout the clearing and construction stages.	Unlikely

Species	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
			Based on SIA (Appendix E), and in accordance with SIG 1.1 (DoE, 2013) it was determined that a significant impact to yellow-bellied glider is unlikely.	
Rufous fantail	232.3 ha	3.1 ha	The rufous fantail is listed as Migratory under the EPBC Act and id considered potential to occur within the Study Area. A total of 232.3 ha of potential non-breeding foraging habitat for this species has been identified within the Study Area in the form of vine forest/thicket and dry rainforest' broad habitat type. The Study Area is not within the breeding distribution of the species. The area of impact to rufous fantail habitat that is likely to cause a nationally significant impact is 750 ha (DoE, 2014). As a result of the Proposed Action, only 3.1 ha or 1.3% of the total mapped habitat for this species within the Study Area will be impacted. Based on SIA (Appendix E), and in accordance with SIG 1.1 (DoE, 2013) it was determined that a significant impact to rufous fantail is unlikely.	Unlikely
Fork-tailed swift	46,574.9 ha	1,933.2 ha	The species mapped habitat is potential foraging habitat, and if the species were to occur, it is thought to occur as an aerial flyover visitor only. Additionally, an important population or ecologically significant proportion of the species is not considered likely to occur in the Study Area. The proposed action impact to 1,933.2 ha of potential impacts is therefore considered unlikely to result in a significant impact. However, considering the species nature as an aerial species in Australia, and proclivity to fly at RSA heights and above, there is a risk of turbine collision risk should the species occur. Therefore, should the species be observed in the Study Area, adaptive management measures as outlined in a Bird and Bat Management (BBMP) will be undertaken to further avoid any impact to this species. These measures will be informed by operational phase bird monitoring to detect any listed threatened species impacted.	Unlikely

Species	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
Flora species				
Cossinia	232.3	3.1 ha	A total of 232.3 ha potential habitat is mapped to occur within the Study Area, which is considered potential habitat critical to the survival of the species as there is a 2002 record of the species 1km east of the Study Area (ALA). 3.1 ha of this potential habitat (1.3% of this habitat type within the Study Area) is expected to be impacted because of the Proposed Action. Given the small area of impact to potential habitat, the Proposed Action is unlikely to adversely impact on habitat critical to the survival of the species. The potential impact involves intersecting a patch of potential cossinia habitat, which may result in invasive species that are particularly harmful to cossinia. Management and mitigation measures to control invasive flora in the Study Area will reduce the significance of potential impacts to cossinia habitat. The management and mitigation measures outlined in Section 6 will mitigate impacts to the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely
Ooline	232.3	3.1 ha	A total of 232.3 ha potential habitat is mapped to occur within the Study Area, which is conservatively considered potential habitat critical to the survival of the species. 3.1 ha of this potential habitat (1.3% of this habitat type within the Study Area) is expected to be cleared because of the Proposed Action. Considering this is such a small impact in the greater context of the Study Area, the impact is unlikely to result in a significant impact to the species, especially considering that there is no identified population within the Study Area. Additionally, the management and mitigation measures outlined in Section 6 will mitigate impacts to the species. Specifically, pre-clearance surveys for ooline in areas of suitable habitat will prevent any direct impact to the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely

Species	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
Solanum dissectum	328.8 ha	8.7 ha	A total of 328.8 ha potential habitat is mapped to occur within the Study Area, which is conservatively considered potential habitat critical to the survival of the species. 8.7 ha of this potential habitat (2.6% of this habitat type within the Study Area) is expected to be cleared because of the Proposed Action. Considering the negligible area of impact compared to the extent of available habitat in the Study Area, the impact is unlikely to result in a significant impact to the species, especially considering that there is no identified population within the Study Area. Additionally, the management and mitigation measures outlined in Section 6 will mitigate impacts to the species. Specifically, pre-clearance surveys for *S. dissectum* in areas of suitable habitat will prevent any direct impact to the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely
Solanum johnsonianum	328.8 ha	8.7 ha	A total of 328.8 ha potential habitat is mapped to occur within the Study Area, which is conservatively considered potential habitat critical to the survival of the species. 8.7 ha of this potential habitat (2.6% of this habitat type within the Study Area) is expected to be cleared because of the Proposed Action. Considering this is such a small impact in the greater context of the Study Area, the impact is unlikely to result in a significant impact to the species, especially considering that there is no identified population within the Study Area. Additionally, the management and mitigation measures outlined in Section 6 will mitigate impacts to the species. Specifically, pre-clearance surveys for *S. johnsonianum* in areas of suitable habitat will prevent any direct impact to the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely

Species	Habitat within Study Area	Indicative Development footprint	Comments	Impact Significance
Austral Cornflower	21,719.7 ha	886.3 ha	A total of 21,719.7 ha potential habitat is mapped to occur within the Study Area, which is conservatively considered potential habitat critical to the survival of the species. 886.3 ha of this potential habitat (4.1% of this habitat type within the Study Area) is expected to be cleared because of the Proposed Action. Considering the mitigation measure to undertake targeted surveys, where individuals are considered likely to be present, at the 90% design Development Footprint to identify and avoid populations, the Proposed Action is unlikely to have a significant impact on the species. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely
Xerothamnella herbacea	328.8 ha	8.7 ha	A total of 328.8 ha potential habitat is mapped to occur within the Study Area, which is conservatively considered potential habitat critical to the survival of the species. 8.7 ha of this potential habitat (2.6% of this habitat type within the Study Area) is expected to be cleared because of the Proposed Action. Considering the negligible area of impact compared to the extent of available habitat in the Study Area, the impact is unlikely to result in a significant impact to the species, especially considering that there is no identified population within the Study Area. Additionally, the management and mitigation measures outlined in Section 6 will mitigate impacts to the species. Specifically, pre-clearance surveys for *X. herbacea* in areas of suitable habitat will prevent any direct impact to the species. Due to the cryptic nature of *X. herbacea*, pre-clearance surveys will be carried out when the species is likely to be present. A full significant impact assessment in accordance with SIG 1.1 (DoE, 2013) is presented in Appendix E.	Unlikely

7.2 MSES IMPACT ASSESSMENT

Three (3) MSES within the Study Area have triggered significant residual impact in accordance with the SRI Guideline (DEHP 2014), including impacts to Regulated Vegetation and Connectivity Areas listed under the VM Act and disturbance to Protected Wildlife Habitat listed under the NC Act. Outcomes of the SRI are summarised in Table 7-3, with the full SRI detailed in Appendix F.

Potential impacts to MSES are mapped in Figure 4-12. All NC Act listed Protected Wildlife species (koala, greater glider (southern and central) and large-eared pied-bat) are listed under the EPBC Act. Habitat for these species has been mapped in Figure 4-4, Figure 4-5 and Figure 4-7, respectively.

Note, it is likely that the actual area of disturbance may be lower than that documented in this impact assessment, as a result of further avoidance associated with micro-siting pre-clearance surveys. These outcomes assume the controls and mitigation measures in Section 6 are implemented.

TABLE 7-3 MSES SIGNIFICANT RESIDUAL IMPACT ASSESSMENT SUMMARY

Matter	SRI Test	SRI Triggered?
Regulated vegetation	1. Category B regulated vegetation: 1,657.5 ha of Category B remnant vegetation occurs within the Study Area, with a permanent impact projected to 818.12 ha of regulated vegetation, including 1.68 ha of Endangered REs, 7.20 ha of Of Concern REs and 790.72 ha of Least Concern REs. 2. Category C high value regrowth: There is no disturbance to Category C high value regrowth. 3. Category R watercourse regrowth: 191.1 ha of Category R watercourse regrowth vegetation occurs within the Study Area, with a impact projected to 18.52 ha of Category R vegetation. 4. Defined distance of a watercourse: In accordance with the SRI guideline, no waterway crossings will exceed the 25 m width linear clearing of remnant vegetation within the defined distance of a stream order 1 or 2 watercourse. Additionally, in accordance with the SRI guideline revegetation and sediment control will be implemented and crossing design will not interfere with existing aquatic and terrestrial habitats of the watercourse. Thus, no SRI will result. 5. Regulated vegetation intersecting a watercourse: 6.08 ha of regulated vegetation intersecting a watercourse. 6. Flora Trigger Areas: A total of 51 ha of Flora Survey Trigger Map Area is within the Study Area. No impact is proposed within a flora survey trigger map for protected plants.	1. SRI triggered 2. No SRI triggered 3. No SRI triggered 4. No SRI triggered 5. SRI triggered 6. No SRI triggered

Matter	SRI Test	SRI Triggered?
Connectivity Areas	The Landscape Fragmentation and Connectivity (LFC) tool was used as a decision support tool to assist identification for any significant impact on connectivity from the disturbance footprint. The LFC test was run, and the following test outcomes were obtained: Test 1 – A significant reduction in core remnant ecosystem extent at the local scale – **True** Test 2 – loss or fragmentation of core remnant ecosystem at the site scale - **False**	SRI triggered
Protected wildlife habitat (EN, VU or SLC species)	The residual impact (permanent loss of habitat) for protected wildlife within the indicative Development Footprint, that represents a worst case maximum clearing limit is: • 1,200 ha of koala habitat (884.3 ha preferred habitat and 315.7 ha general habitat – 4% of total habitat available); • 961.2 ha of squatter pigeon (southern subspecies) habitat (524 ha of preferred habitat and 437.2 ha of general habitat – 3.9% of total available habitat) • 877.4 ha of greater glider habitat (15.5 ha of preferred habitat and 861.9 ha of general habitat – 3.9% of total available habitat) • 886.3 ha of Large-eared pied bat (886.3 ha of general habitat – 4% of total available habitat) • Short-beaked echidna (46,830 ha) Impacts to the size of the population, extent of occurrence, connectivity, contribution to threats, interference with recovery and disruption to ecologically significant locations are considered when assessed against the relevant guidelines. The impact assessment, against the *Queensland Environmental Offsets Policy - Significant Residual Impact Guideline* for each species, is contained within Appendix F. Essential Habitat: There is 318.3 ha of essential habitat mapped within the Study Area, of which no impact is proposed.	SRI triggered: koala, greater glider, squatter pigeon and large-eared pied bat.

7.3 STATE CODE 16 REQUIREMENTS

This Proposed Action is assessable under State Code 16: Native Vegetation Clearing (State Code 16). Table 7-4 details the performance and acceptable outcomes of the State Code 16 that relate to regulated vegetation, wetlands, watercourses, essential habitat and connectivity in the Study Area, and whether the Proposed Action complies with such outcomes.

TABLE 7-4 STATE CODE 16 PROVISIONS RELEVANT TO THE STUDY AREA

Performance outcomes	Acceptable outcomes	Response
General		
PO1 Clearing of **vegetation** is consistent with any **notice requiring compliance** on the land subject to the development application, unless a **better environmental outcome** can be achieved.	No acceptable outcome is prescribed.	**PO1 Complies** Relevant permits associated with obtaining a development application for the proposed change of use will be obtained prior to the clearing of vegetation.
PO2 Clearing of **vegetation** is consistent with **vegetation management requirements** for **particular regulated areas** unless a **better environmental outcome** can be achieved.	No acceptable outcome is prescribed.	**PO2 Complies** A Vegetation Management Plan will be prepared and implemented to ensure that clearing is undertaken in accordance with legislative standards and requirements.
PO3 Clearing of **vegetation** in a **legally secured offset area**: 1. Is consistent with the **offset** delivery plan; or 2. Is consistent with an **agreement** for the **offset area** on the land subject to the development application; or **3.** Only occurs if an additional **offset** is provided.	No acceptable outcome is prescribed.	**PO3 Not Applicable** There are no legally secured offsets within the Study Area.

Performance outcomes	Acceptable outcomes	Response
Public safety, relevant infrastructure activities and / or consequential development of IPA approval		
Clearing avoids and minimises impacts		
PO4 Clearing of **vegetation** and **adverse impacts of clearing vegetation** do not occur unless the application has demonstrated that the **clearing** and the **adverse impacts of clearing** have been: 1. reasonably avoided; or **2.** reasonably minimised where it cannot be reasonably avoided.	No acceptable outcome is prescribed.	**PO4 complies against the following performance outcomes assessment items outlined in the state code 16 clearing guide:** 1. **Identify:** All potential adverse impacts of clearing have been identified in Section 5 2. **Demonstrate:** a. Clearing, and the adverse impacts of clearing have demonstrated reasonable avoidance through the design process outlined in Section 6 and b. Where clearing cannot be reasonably avoided, management and mitigation measures to minimise the impacts are outlined in Section 6. 3. **Provide the following:** **a.** Where clearance cannot occur solely in Category X, Category C and Category R vegetation, the Proposed Action has undergone a process to avoid and minimise high sensitivity areas and prioritise design in areas of preference as per the clearing guidance. As such, clearing has sought to limit disturbance to Category B, C and R vegetation as much as possible. Impacts to Category B vegetation are calculated at 818.12 ha. Category R will undergo 18.52 ha of disturbance. Category C area will undergo no disturbance. b. Where clearing is required to occur within regional ecosystems, the Proposed Action has undergone a design process to avoid and minimise disturbance to endangered

Performance outcomes	Acceptable outcomes	Response
		and Of concern REs. As such, clearing has maximised disturbance within 1,114.08 ha of non-remnant vegetation, 790.72 ha of 'least concern' REs, 1.68 ha of 'endangered' REs and 7.20 ha of 'of concern' REs. Any clearing of vegetation is proposed to occur in linear strips or small remnant patches. Clearing will not involve the removal of entire patches of vegetation and will therefore not create an adverse impact.
Clearing associated with wetlands		
PO5 Clearing of vegetation within a natural **wetland** and/or within 100 metres of the **defining bank** of a natural **wetland** maintains the composition, structure and function of any **regional ecosystem** associated with any natural **wetland** to protect all of the following: 1. bank stability by protecting against bank erosion; 2. water quality by filtering sediments, nutrients and other pollutants; 3. aquatic habitat; **4.** terrestrial habitat.	**AO5.1 Clearing** does not occur in a natural **wetland** or within 100 metres of the **defining bank** of any natural **wetland**. OR **AO5.2 Clearing** within 100 metres of the **defining bank** of any natural **wetland**: 1. does not occur within 10 metres of the defining bank of any natural wetland; and 2. does not exceed widths in reference table 1 in this code.	**P05 Not Applicable** There are no mapped wetlands within the Study Area.
PO6 Where **clearing** of **vegetation** in a **regional ecosystem** associated with a natural **wetland** does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, an **offset**	No acceptable outcome is prescribed.	**PO6 Not Applicable** There are no mapped wetlands within the Study Area.

Performance outcomes	Acceptable outcomes	Response
is provided for any acceptable **significant residual impact**.		
Clearing associated with watercourses and drainage features		
PO7 Clearing of **vegetation** within a **watercourse** and/or **drainage feature** and/or within the relevant distance (listed in reference table 2) of a **watercourse** and/or **drainage feature**, maintains the composition, structure and function of the **regional ecosystem** associated with the **watercourse** and/or **drainage feature** to protect all of the following: 1. bank stability by protecting against bank erosion; 2. water quality by filtering sediments, nutrients and other pollutants; 3. aquatic habitat; **4.** terrestrial habitat.	**AO7.1 Clearing** does not occur in any of the following areas: 1. inside the **defining bank** of a **watercourse** or **drainage feature**; and 2. within the relevant distance of the **defining bank** of any **watercourse** or **drainage feature** in reference table 2 of this code. OR **AO7.2 Clearing** within any **watercourse** or **drainage feature**, or within the relevant distance of the **defining bank** of any **watercourse** or **drainage feature** in reference table 2 of this code: 1. does not exceed the widths in reference table 1 of this code; and 2. does not occur within 10 metres of the **defining bank**, unless **clearing** is required into or across the **watercourse** or **drainage feature**.	**PO7 Complies** 1. **Identify** a. All watercourse or drainage features within or near the Development Footprint have been identified in Section 4.4.5 2. **Demonstrate relevance to the defining bank** a. Clearing limits for linear infrastructure will comply with the clearing limits per regional ecosystem structure category (table 1 of the State Code); however b. Any clearing that will occur within 10 metres of the defining bank will be required to do so for the purposes of crossing the watercourse or drainage feature. In accordance with the SRI guideline revegetation and sediment control will occur and crossing design will not interfere with existing aquatic and terrestrial habitats of the watercourse.
PO8 Where **clearing** of **vegetation** in a **regional ecosystem** associated with a **watercourse** and/or **drainage feature**	No acceptable outcome is prescribed.	**PO8 Complies** In accordance with the SRI guideline the design of the Proposed Action will not interfere with existing aquatic and terrestrial

Performance outcomes	Acceptable outcomes	Response
does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, an **offset** is provided for any acceptable **significant residual impact**.		habitats of any watercourse within the Study Area and therefore no offset is required as it is not considered an SRI.
Connectivity		
PO9 Regional ecosystems on the subject land and any adjacent land retain sufficient **vegetation** to: 1. maintain **ecological processes**; and 2. ensure the **regional ecosystem** remains in the landscape despite **threatening processes**.	**AO9.1 Clearing** occurs in accordance with reference table 3 in this code.	**PO9 Complies with the below see 7.3.1.** 1. Identify the location and extent of the development footprint including all areas of clearing to be assessed under the development application. 2. Details of the location and extent of remnant vegetation to be retained within the development footprint and adjacent land. 3. Identify all of the regional ecosystems within the development footprint and adjacent land. See Part 1 'Vegetation Management mapping' for further information on and access to vegetation management maps and data. 4. Identify and provide desktop and field data on all ecological processes occurring within remnant vegetation within the development footprint and on adjacent land. 5. Provide an analysis of how the remnant vegetation with its altered extent and configuration will maintain the ecological processes currently occurring. 6. Identify and provide desktop and field data on any known and likely threatening processes, natural or human induced, that may adversely affect the retained vegetation. 7. Provide an analysis of how the remnant vegetation with its altered extent and configuration will remain in the landscape despite threatening processes.

Performance outcomes	Acceptable outcomes	Response
		8. Demonstrate how regional ecosystems on the subject land and any adjacent land retain sufficient vegetation to: a. maintain ecological processes; and Guide to State Development Assessment Provisions – State code 16: Native vegetation clearing, Department of Resources 217 b. ensure the regional ecosystem remains in the landscape despite threatening processes (addressed in Table 7-5). *See Appendix 2 - https://www.qld.gov.au/__data/assets/pdf_file/0024/374523/sdap-guide-state-code-16.pdf* *'Composition, structure and function of regional ecosystems' for further guidance on: maintaining the structure, composition and function of a regional ecosystem; BioCondition assessments to assist with functionality / dysfunctionality of regional ecosystems.*
Soil erosion if the local government is not the assessment manager for the development application		
PO10 Clearing of **vegetation** does not result in **accelerated soil erosion** within or outside the land the subject of the development application.	**AO10.1 Clearing** only occurs if an erosion and **sediment control plan** is developed and implemented to prevent increased **soil erosion and instability** resulting from the **clearing**.	**AO10.1 Complies** Sediment and erosion control to be managed in accordance with the Queensland Erosion and Sediment Control Plan, the Proposed Action Environmental Sediment and Erosion Control Plan and the Contractor's erosion and sediment control procedures**.**

Performance outcomes	Acceptable outcomes	Response
Salinity		
PO11 Clearing of **vegetation** within 100 metres of a **salinity expression area** does not contribute to or accelerate **land degradation** through either of the following: 1. **waterlogging**; 2. the **salinisation** of **groundwater**, surface water or soil.	**AO11.1 Clearing** does not occur within 100 metres of a **salinity expression area**.	**PO11 Complies:** At a landscape scale the region is within a Low - Moderate and Moderate - High Hazard Area for salinity. However, the nature of Proposed Action, construction and operation, will not attribute to waterlogging as may be observed in other rationales for vegetation clearing such as turf production with high intensity water use and crop flooding; Equally the Proposed Action does not proposed to contribute to the **salinisation** of **groundwater**, surface water or soil such as may be observed in other assessable developments which utilise agricultural chemicals or herbicides which may affect these values.
Conserving least concern regional ecosystems – Minimising clearing of areas temporarily required to enable construction of the infrastructure		
PO12 Clearing of **vegetation** in areas to construct necessary infrastructure, such as temporary use roads or access tracks, maintains the composition, structure and function of **least concern regional ecosystems**.	**AO12.1 Clearing** for temporary use areas to construct necessary infrastructure does not occur in a **least concern regional ecosystem**. OR **AO12.2** Total **clearing** for temporary use areas to construct necessary infrastructure in any **regional ecosystem** combined does not exceed the widths prescribed in table reference table 1 of this code.	**PO12 Compliant** Preliminary Post Construction Rehabilitation Plan has been prepared which identifies areas of temporary use required for construction that will be rehabilitated to pre-development RE status (composition, structure and function).

Performance outcomes	Acceptable outcomes	Response
	OR **AO12.3** Total **clearing** for temporary use areas to construct necessary infrastructure in any **regional ecosystem** combined does not exceed areas prescribed in table reference table 1 of this code.	
PO13 Where **clearing** of **vegetation** in a **regional ecosystem** for temporary use areas to construct necessary infrastructure does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, the **cleared** area is **rehabilitated**.	No acceptable outcome is prescribed.	**PO13 Complies** Preliminary Post Construction Rehabilitation Plan has been prepared which identifies areas of temporary use required for construction that will be rehabilitated to pre development RE status (composition, structure and function).
Conserving endangered and of concern regional ecosystems		
PO14 Clearing of **vegetation** maintains the composition, structure and function of **endangered regional ecosystems** and/or of **concern regional ecosystems**.	**AO14.1 Clearing** does not occur in an **endangered regional ecosystem** or **an of concern regional ecosystem**. OR **AO14.2** Total **clearing** of **endangered regional ecosystems** and **of concern regional ecosystems** combined does not exceed the widths prescribed in table reference table 1 of this code.	**PO14 Complies** AO14.1, AO14.2, AO14.3 cannot be met and assessment against the performance criteria is outlined below: The Proposed Action will clear 1.68 ha of Endangered and 7.20 ha of Of Concern REs. As per reference Table 1 of the State Code 16, there is clearing of Of Concern RE classified as very sparse that exceeds 2 ha.

Performance outcomes	Acceptable outcomes	Response
	OR **AO14.3** Total **clearing** of **endangered regional ecosystems** and **of concern regional ecosystems** combined does not exceed areas prescribed in table reference table 1 of this code.	1. Identification of all Endangered and Of Concern regional ecosystems has been undertaken and provided for in Section 4.4.1 2. Demonstrate how clearing of vegetation will maintain the current extent of any endangered regional ecosystems and of concern regional ecosystems. Maintenance of extent of vegetation will be achieved through rehabilitation, further outlined in PO15 3. The current process of avoiding outlined in Section 6 has been undertaken to reduce the current Development Footprint occurring within Endangered and Of Concern regional ecosystems 4. Any temporary infrastructure will be located to avoid impacts to REs. Note, it is likely that the actual area of disturbance may be lower than that documented in this impact assessment as a result of further avoidance associated with micro-siting pre-clearance surveys. PO14 and PO15 are corresponding POs. If the application adequately demonstrates that the proposal cannot meet the first corresponding PO (PO14), only then is the application able to address the second corresponding PO (PO15). *It has been deemed that further assessment may be required for this PO, and therefore PO 15 has been addressed.*
PO15 Where **clearing** of **vegetation** in an **endangered regional ecosystem** or an **of concern regional ecosystems** does	No acceptable outcome is prescribed.	**PO15 Complies** An impact assessment is provided in Section 7 of this report.

Performance outcomes	Acceptable outcomes	Response
not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, the cleared area: 1. is **rehabilitated**; or 2. where the **cleared** area cannot reasonably be **rehabilitated**, an **offset** is provided for any acceptable **significant residual impact**.		Areas of the Development Footprint will be subject to rehabilitation as they are no longer required for construction or operation (e.g., excess access track widths, construction laydown areas and construction compounds). The Development Footprint will be subject to rehabilitation post decommissioning with the intention to rehabilitate the entire Development Footprint. Offsets will be provided for any triggers of significant residual impacts (as outlined in Section 7.1 and Section 7.2). It is likely that the actual area of disturbance may be lower than that documented in this impact assessment as a result of further avoidance associated with micro-siting pre-clearance surveys.
Essential habitat excluding essential habitat for Phascolarctos cinereus (koalas) if development is assessable under Schedule 10, Part 10 of the Planning Regulation 2017		
PO16 Clearing of **vegetation** in a **regional ecosystem** that is an area of **essential habitat** maintains the composition, structure and function of the **regional ecosystem** for each **protected wildlife** species individually.	**AO16.1 Clearing** does not occur in **essential habitat**. OR **AO16.2 Clearing** in **essential habitat** does not exceed the widths prescribed in reference table 1 of this code. OR	**PO16 Not Applicable** There is essential habitat regulated vegetation within the Study Area, however this is absent from Disturbance Footprint and therefore, no clearing will occur in this habitat.

Performance outcomes	Acceptable outcomes	Response
	AO16.3 Clearing in **essential habitat** does not exceed the areas prescribed in table reference table 1 of this code.	
PO17 Where **clearing** of **vegetation** in a **regional ecosystem** that is an area of **essential habitat** does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, an **offset** is provided for any acceptable **significant residual impact** for each **protected wildlife** species individually.	No acceptable outcome is prescribed.	**PO17 Not Applicable** There is essential habitat regulated vegetation within the Study Area, however this is absent from Disturbance Footprint and therefore, no clearing will occur in this habitat.
Acid sulfate soils if local government is not the assessment manager for the development application		
PO18 Clearing of **vegetation** does not result in, or accelerate, disturbance of acid sulfate soils or changes to the hydrology of the location that will result in either of the following: 1. aeration of horizons containing iron sulphides; **2.** mobilisation of acid or metals.	**AO18.1 Clearing** does not occur in **land zone 1**, **land zone 2** or **land zone 3**. OR **AO18.2 Clearing** in **land zone 1**, **land zone 2** or **land zone 3** in areas below the five metre Australian Height Datum only occurs where: 1. **mechanical clearing** does not disturb the soil to a depth greater than 30 centimetres; and 2. acid sulfate soils are managed consistent with the soil management guidelines in the Queensland Acid Sulfate Soil Technical Manual.	**PO18 Complies** The Study Area does not contain acid sulphate soils (mapped) and is not within a trigger area under the State Planning Policy Acid Sulphate Soils Trigger Areas.

Performance outcomes	Acceptable outcomes	Response
Material change of use and / or reconfiguring a lot for all other purposes		
Clearing avoids and minimises impacts		
PO80 Clearing of **vegetation** and **adverse impacts of clearing vegetation** do not occur unless the application has demonstrated that the **clearing** and the **adverse impacts of clearing** have been: 1. Reasonably avoided; or 2. Reasonably minimised where it cannot be reasonably avoided.	No acceptable outcome is prescribed.	**PO80 complies against the following performance outcomes assessment items outlined in the state code 16 clearing guide:** 1. **Identify:** All potential adverse impacts of clearing have been identified in Section 5. 2. **Demonstrate:** a. Clearing, and the adverse impacts of clearing have demonstrated reasonable avoidance through the design process outlined in Section 6 and b. Where clearing cannot be reasonably avoided, management and mitigation measures to minimise the impacts are outlined in Section 6. 3. **Provide the following:** **c.** Where clearance cannot occur solely in Category X, Category C and Category R vegetation, the Proposed Action has undergone a process to avoid and minimise high sensitivity areas and prioritise design in areas of preference as per the clearing guidance. As such, clearing has sought to limit disturbance to Category B, C and R vegetation as much as possible. Impacts to Category B vegetation are calculated at 818.12 ha. Category R will undergo 18.52 ha of disturbance. Category C area will undergo no disturbance. d. Where clearing is required to occur within regional ecosystems, the Proposed Action has undergone a design

Performance outcomes	Acceptable outcomes	Response
		process to avoid and minimise disturbance to endangered and Of concern REs. e. Any clearing of vegetation is proposed to occur in linear strips or small remnant patches. Clearing will not involve the removal of entire patches of vegetation and will therefore not create an adverse impact.
Clearing associated with wetlands		
PO81 Clearing of **vegetation** within a natural **wetland** and/or within 100 metres of the **defining bank** of a natural **wetland** maintains the composition, structure and function of any **regional ecosystem** associated with any natural **wetland** to protect all of the following: 1. Bank stability by protecting against bank erosion; 2. Water quality by filtering sediments, nutrients and other pollutants; 3. Aquatic habitat; 4. Terrestrial habitat.	**AO81.1 Clearing** does not occur in a natural **wetland** or within 100 metres of the **defining bank** of any natural **wetland**. OR **AO81.2 Clearing** within 100 metres of the **defining bank** of any natural **wetland**: 1. Does not occur within 10 metres of the **defining bank** of any natural **wetland**; and 2. Does not exceed widths in reference table 1 in this code.	**PO81 Not Applicable** There are no mapped wetlands within the Study Area.

Performance outcomes	Acceptable outcomes	Response
PO82 Where **clearing** of **vegetation** in a **regional ecosystem** associated with a natural **wetland** does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, an **offset** is provided for any acceptable **significant residual impact**.	No acceptable outcome is prescribed.	**PO82 Not Applicable** There are no mapped wetlands within the Study Area.
Clearing associated with watercourses and drainage features		
PO83 Clearing of **vegetation** within a **watercourse** and /or **drainage feature** and/or within the relevant distance (listed in reference table 2) of a **watercourse** and/or **drainage feature,** maintains the composition, structure and function of the **regional ecosystem** associated with the **watercourse** and/or **drainage feature** to protect all of the following: 1. Bank stability by protecting against bank erosion; 2. Water quality by filtering sediments, nutrients and other pollutants; 3. Aquatic habitat; 4. Terrestrial habitat.	**AO83.1 Clearing** does not occur in any of the following areas: 1. Inside the defining bank of a watercourse or drainage feature; and 2. Within the relevant distance of the **defining bank** of any **watercourse** or **drainage feature** in reference table 2 of this code. OR **AO83.2 Clearing** within any **watercourse** or **drainage feature**, or within the relevant distance of the **defining bank** of any **watercourse** or **drainage feature** in reference table 2 of this code: 1. Does not exceed the widths in table reference table 1 of this code; and	**PO83 complies:** 1. Identify a. All watercourse or drainage features within or near the Development Footprint have been identified in Section 4.4.5 2. Demonstrate relevance to the defining bank a. Clearing limits for linear infrastructure will comply with the clearing limits per regional ecosystem structure category (table 1 of the State Code); however b. Any clearing that will occur within 10 metres of the defining bank will be required to do so for the purposes of crossing the watercourse or drainage feature. In accordance with the SRI guideline revegetation and sediment control will occur and crossing design will not interfere with existing aquatic and terrestrial habitats of the watercourse.

Performance outcomes	Acceptable outcomes	Response
	2. Does not occur within 10 metres of the **defining bank**, unless **clearing** is required into or across the **watercourse** or **drainage feature**.	
PO84 Where **clearing** of **vegetation** in a **regional ecosystem** associated with a **watercourse** and/or **drainage feature** does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, an **offset** is provided for any acceptable **significant residual impact**.	No acceptable outcome is prescribed.	**PO84 Complies** In accordance with the SRI guideline the design of the Proposed Action will not interfere with existing aquatic and terrestrial habitats of any watercourse within the Study Area and therefore no offset is required as it is not considered an SRI.
Connectivity		
PO85 Regional ecosystems on the subject land and any adjacent land, retain sufficient **vegetation** to maintain: 1. Ecological processes; and 2. Ensure the regional ecosystem remains in the landscape despite threatening processes.	**AO85.1 Clearing** occurs in accordance with reference table 3 in this code**.**	**PO85 Complies with below – See 7.3.1 and figures 4-11 and 4-12.** 1. Identify the location and extent of the development footprint including all areas of clearing to be assessed under the development application. 2. Details of the location and extent of remnant vegetation to be retained within the development footprint and adjacent land. 3. Identify all of the regional ecosystems within the development footprint and adjacent land. See Part 1 'Vegetation Management mapping' for further information on and access to vegetation management maps and data. 4. Identify and provide desktop and field data on all ecological processes occurring within remnant vegetation within the development footprint and on adjacent land.

Performance outcomes	Acceptable outcomes	Response
		5. Provide an analysis of how the remnant vegetation with its altered extent and configuration will maintain the ecological processes currently occurring. 6. Identify and provide desktop and field data on any known and likely threatening processes, natural or human induced, that may adversely affect the retained vegetation. 7. Provide an analysis of how the remnant vegetation with its altered extent and configuration will remain in the landscape despite threatening processes. 8. Demonstrate how regional ecosystems on the subject land and any adjacent land retain sufficient vegetation to: a. maintain ecological processes; and Guide to State Development Assessment Provisions – State code 16: Native vegetation clearing, Department of Resources 217 b. ensure the regional ecosystem remains in the landscape despite threatening processes (addressed in Table 7-5). *See Appendix 2 - https://www.qld.gov.au/__data/assets/pdf_file/0024/374523/sdap-guide-state-code-16.pdf* *'Composition, structure and function of regional ecosystems' for further guidance on: maintaining the structure, composition and function of a regional ecosystem; BioCondition assessments to assist with functionality / dysfunctionality of regional ecosystems.*
Soil erosion if the local government is not the assessment manager for the development application		
PO86 Clearing does not result in **accelerated soil erosion** within or outside the land the subject of the development application.	**AO86.1 Clearing** only occurs if an **erosion and sediment control plan** is developed and implemented to prevent	**AO86.1 Complies** Sediment and erosion control to be managed in accordance with the Queensland Erosion and Sediment Control Plan, the Proposed Action Environmental Sediment and Erosion

Performance outcomes	Acceptable outcomes	Response
	soil erosion and instability resulting from the **clearing**.	Control Plan and the Contractor's erosion and sediment control procedures.
Salinity		
PO87 Clearing within 100 metres of a **salinity expression area** does not contribute to or accelerate **land degradation** through either of the following: 1. waterlogging; 2. the salinisation of groundwater, surface water or soil.	**AO87.1 Clearing** does not occur within 100 metres of a **salinity expression area**.	**AO87.1 Complies** At a landscape scale the region is within a Low - Moderate and Moderate - High Hazard Area for salinity. However, the nature of the Proposed Action, construction and operation of a wind farm, will not attribute to **waterlogging** as may be observed in other rationales for vegetation clearing such as turf production with high intensity water use and crop flooding; Equally the Proposed Action does not proposed to contribute to the **salinisation** of **groundwater**, surface water or soil such as may be obersved in other assessable developments which utilise agricultural chemicals or herbicides which may affect these values.
Conserving endangered and of concern regional ecosystems		
PO88 Clearing of vegetation maintains the composition, structure and function of **endangered regional ecosystems** and/or **of concern regional ecosystems.**	**AO88.1 Clearing** does not occur in an **endangered regional ecosystem** or an **of concern regional ecosystem.** OR **AO88.2** Total **clearing** of **endangered regional ecosystems** and **of concern regional ecosystems** combined does	**PO88 Complies** AO88.1, AO88.2, AO88.3 cannot be met and assessment against the performance criteria is made: The Proposed Action will clear 1.68 ha of Endangered and 7.20 ha of Of Concern Res within Category B Regulated Vegetation. As per reference table 3 of the code, there is clearing of Of Concern RE classified as very sparse that exceeds 2 ha.

Performance outcomes	Acceptable outcomes	Response
	not exceed the widths prescribed in reference table 1 of this code. OR **AO88.3** Total **clearing** of **endangered regional ecosystems** and **of concern regional ecosystems** combined does not exceed areas prescribed in reference table 1 of this code.	1. Identification of all Endangered and Of Concern regional ecosystems has been undertaken and provided for in Section 4.4.1 2. Demonstrate how clearing of vegetation will maintain the current extent of any endangered regional ecosystems and of concern regional ecosystems. 3. The current process of avoiding outlined in Section 6 has been undertaken to reduce the current Development Footprint occurring over areas of large amounts of Endangered and Of Concern regional ecosystems 4. Any temporary infrastructure will be located to avoid impacts to Least Concern REs. Note, it is likely that the actual area of disturbance may be lower than that documented in this impact assessment as a result of further avoidance associated with micro-siting pre-clearance surveys. Overall the Proposed Action is not likely to impact on population of MNES given the small portions of clearing, and highly modified nature of the Study Area.
PO89 Where **clearing** of **vegetation** in an **endangered regional ecosystem** or an **of concern regional ecosystems** does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, the cleared area: 1. Is rehabilitated; or 2. Where the cleared area cannot be rehabilitated, an offset is provided for	No acceptable outcome is prescribed.	**PO89 Complies** An impact assessment is provided in Section 7 of this report. Areas of the Development Footprint will be subject to rehabilitation as they are no longer required for construction or operation (e.g., excess access track widths, construction laydown areas and construction compounds). The Development Footprint will be subject to rehabilitation post decommissioning with the intention to rehabilitate the entire Development Footprint.

Performance outcomes	Acceptable outcomes	Response
any acceptable significant residual impact.		Offsets will be provided for any triggers of significant residual impacts (as outlined in Section 7.1 and Section 7.2). It is likely that the actual area of disturbance may be lower than that documented in this impact assessment as a result of further avoidance associated with micro-siting pre-clearance surveys.
Essential habitat excluding essential habitat for *Phascolarctos cinereus* (koalas) if development is assessable under Schedule 10, Part 10 of the Planning Regulation 2017		
PO90 Clearing of **vegetation** in a **regional ecosystem** that is an area of **essential habitat** maintains the composition, structure and function of the **regional ecosystem** for each **protected wildlife** species individually.	**AO90.1 Clearing** does not occur in **essential habitat**. OR **AO90.2 Clearing** in **essential habitat** does not exceed the widths prescribed in reference table 1 of this code. OR **AO90.3 Clearing** in **essential habitat** does not exceed the areas prescribed in reference table 1 of this code.	**PO90 Not Applicable** There is essential habitat regulated vegetation within the Study Area, however this is absent from Disturbance Footprint and therefore, no clearing will occur in this habitat.
PO91 Where **clearing** of **vegetation** in a **regional ecosystem** that is an area of **essential habitat** does not maintain the composition, structure and function of the **regional ecosystem**, and cannot be avoided and has been mitigated, an **offset**	No acceptable outcome is prescribed.	**PO91 Not Applicable** There is essential habitat regulated vegetation within the Study Area, however this is absent from Disturbance Footprint and therefore, no clearing will occur in this habitat.

Performance outcomes	Acceptable outcomes	Response
is provided for any acceptable **significant residual impact for** each **protected wildlife** species individually.		
Acid sulfate soils if the local government is not the assessment manager for the development application		
PO92 Clearing does not result in, or accelerate, disturbance of acid sulfate soils or changes to the hydrology of the location that will result in either of the following: 1. Aeration of horizons containing iron sulphides; and/or 2. Mobilisation of acid or metals.	**AO92.1 Clearing** does not occur in **land zone 1**, **land zone 2** or **land zone 3**. OR **AO92.2 Clearing** in **land zone 1**, **land zone 2** or **land zone 3** in areas below the five metre Australian Height Datum only occurs where: 1. **mechanical clearing** does not disturb the soil to a depth greater than 30 centimetres; and 2. acid sulfate soils are managed consistent with the Queensland Acid Sulfate Soil Technical Manual.	**PO92 Complies** The Study Area does not contain acid sulphate soils (mapped) and is not within a trigger area under the State Planning Policy Acid Sulphate Soils Trigger Areas.

7.3.1 RESPONSE TO PO9 AND PO85

In order to achieve compliance with Performance Outcome PO85 of State code 16, REs on the subject land and any adjacent land must:

> *"retain sufficient vegetation to:*
>
> *1. maintain ecological processes; and*
>
> *2. ensure the RE remains in the landscape despite threatening processes."*

As demonstrated in Table 4-16, no RE will be entirely removed from the Study Area, with the highest percentage of clearance being 0.2% of the RE.

Ecological processes are defined under State Code 16 to mean processes including, but not limited to, the following:

1. hydrological processes; or
2. soil development; or
3. nutrient cycling; or
4. chemical processes including storage of nutrients; or
5. decomposition and cycling of organic matter; or
6. pollination and seed production; or
7. seed dispersal; or
8. predator-prey relationships; or
9. germination and recruitment of species; or
10. the carbon cycle and stability of atmospheric carbon; or
11. habitats for flora and fauna (such as particular regional ecosystems, logs, rocks, debris, leaf litter, nectar, hollow bearing trees, food and shelter).

Table 7-5 provides justification for how all eleven ecological processes, listed above, will be maintained within the Study Area and adjacent land.

TABLE 7-5 RESPONSE TO PO9 AND PO85

Ecological Processes	Level of Maintenance
Hydrological processes	A review of the proposed layout of the Proposed Action identified the following post-development areas considered to be impervious to water: • WTG foundations and hardstands; • BESS; • Auxiliary electrical substation; • Electrical collector stations; • Maintenance compound; and • The O&M facility. The proportion of the total 46,830 ha Study Area that will be comprised by these impervious structures is considered to be negligible. Given such a negligible increase in the proportion of impervious land throughout the post-development landscape, it is anticipated that no significant changes to post-development peak flow rates will occur, and thus no specific mitigation measures will be required. Review of the Study Area indicates that turbine footings and the footprint of large impervious infrastructures do not impede upon any identified waterways and therefore no significant impact on the natural drainage flows is anticipated to occur. To further ensure potential impacts to hydrology, stream flow, and natural drainage patterns are minimised, the corridor of disturbance across the Study Area will be further refined in the detailed design stage. Where access tracks and roadways are anticipated to intersect with natural drainage lines, vegetated table drains, and diversion drains will be fitted to maintain natural drainage flow paths. Areas around turbines are proposed to be graded to maintain sheet flow, as a means of ensuring natural drainage flow paths are maintained. The greatest extent of impact to hydrological processes is expected to be confined to the construction phase of the development, notably throughout the disturbance of watercourses for the construction of linear infrastructure. However, all assessments completed indicate that impacts to hydrology and natural drainage flows throughout the operational phase of the development are anticipated to be negligible, and hydrological processes are expected to be maintained.

Ecological Processes	Level of Maintenance
Soil development	Soil development is the ecological process through which soil forms and evolves over time. This process relies on geological, biological, climatic and topographic interactions. Within the Study Area, there are three identified land zones, as defined by REs. These include: • Recent Quaternary alluvial systems - alluvial river and creek flats (land zone 3); • Cainozoic duricrusts – ironstone jump ups (land zone 7); and • Mesozoic to Proterozoic igneous rocks - hills and lowlands on granitic rocks (land zone 12). An Erosion and Sediment Control Plan (ESCP) will be developed, in accordance with the Queensland Erosion and Sediment Control Plan, as part of the Construction Environmental Management Plan (CEMP) prior to construction. Sediment and erosion control within the Study Area will be managed in accordance with this plan, as well as contractor's erosion and sediment control procedures. In addition, where access tracks and roadways are anticipated to intersect with natural drainage lines, vegetated table drains, and diversion drains will be fitted to maintain natural drainage flow paths. As a result, the ecological process of soil development is unlikely to be significantly impacted by erosion as a result of the Proposed Action, and will therefore be maintained. Additionally, as described below, the nutrient cycling and decomposition of organic matter will be maintained after the construction the Proposed Action, and therefore these factors are also unlikely to disrupt soil development within the Study Area.
Nutrient cycling	Nutrient cycling is the process in which essential elements (such as nitrogen, phosphorus, potassium, calcium, magnesium and suffer) are transferred between soil, water, plants and animals within an ecosystem. This process ensures the availability of nutrients that are essential for the growth and metabolism of organism. The cycle is completed through producers (plants) absorbing available nutrients from soils, consumers (animals) gaining nutrients through consumption of producers and other consumers and, decomposers (fungi and bacteria) breaking down the producers and consumers and releasing nutrients back into soils. When the nutrient cycle is not maintained within an ecosystem, concentrations of nutrients become either too high or too low, which can impact the ecosystem in a variety of ways (e.g. decreased soil fertility and plant growth (low amounts of nutrients in soils), and cause eutrophication of waterways (high amounts of nutrients in water)). As discussed below, the Proposed Action is unlikely to impact decomposition, predator-prey relationships or flora and fauna habitat to the point where these ecological processes are not maintained within the Study Area or adjacent land. The Proposed Action will result a maximum impact to 818.12 of regulated vegetation, that will impact the nutrient cycling within these localised areas, however this area is only 1.8% of the total Study Area and is unlikely to result in detrimental effects of a disrupted nutrient cycle.

Ecological Processes	Level of Maintenance
Chemical processes including storage of nutrients	Chemical process within the Study Area that have the potential to be impacted by the Proposed Action include photosynthesis, decomposition, nutrient cycling and weathering. Decomposition, nutrient cycling and the weathering of rock and soil development have been discussed within other ecological process sections of this table, and are expected to be maintained after the construction of the Proposed Action. There is the potential for the photosynthesis ability of vegetation adjacent to construction areas to be impacted by dust, creating a layer of dust over the plants that decreases access to sunlight. However, with proper dust mitigation measures (Table 6-1), this impact is expected to be negligible. Clearing of vegetation is known to disrupt nutrient cycles and increase the vulnerability of soils to acidification. However, as the Study Area does not contain acid sulphate soils and is not within a trigger area under the State Planning Policy Acid Sulphate Soils Trigger Areas, it is unlikely that the clearing of vegetation associated with the Proposed Action will lead to acid acidification within the Study Area or surrounding environments. Additionally, there is the potential for the Proposed Action to impact waterways and aquatic habitats through eutrophication and pollution from chemicals, such as fertilisers, herbicides and pesticides. Although fertilisers are unlikely to be utilised, there is the potential that herbicides and pesticides may be utilised for weed and pest management during the construction and operation of the Proposed Action. However, weed and pest management will involve multiple management measures outside of chemical treatment (integrated weed and pest management), and will also be highly targeted with species specific management plans opposed to generalised treatments. It is therefore unlikely that these chemicals will be applied to the extent where they result in pollution to waterways.
Decomposition and cycling of organic matter	The construction of the Proposed Action is expected to have minimal direct impact on decomposition and cycling of organic matter within the Study Area. To assess this, three main factors have been considered as necessary to maintain this ecological process: • Soil structure; • Microbial communities; and • Organic inputs. During construction soil structure is likely to be subject to compaction from heavy machinery and potential erosion. However, an erosion and sediment control plan will be adopted and followed and where these impacts cannot be avoided or mitigated, they will be limited to the immediate area surrounding the turbine bases and access roads

Ecological Processes	Level of Maintenance
	With the health and composition of microbial communities within the Study Area being currently unknown, we are assuming that these communities are healthy and functioning to a level adequate for the vegetation and habitat types present within the Study Area. As concrete footings will be developed at the base of the turbines, microbial activity will not be able to occur on these footings, however, it is unlikely that the Proposed Action will impact the composition or abundance of microbial communities surrounding these footings and thus decomposition is likely to be maintained. Decomposition and cycling of organic matter can only occur when there is a constant input of organic matter into a system. After construction, the Proposed Action is unlikely to negatively impact input of organic matter, with potential to increase accessible vegetation for microbial communities through vegetation management practices (outlined in the VMP). Ultimately, it is not expected that the Proposed Action will directly impact microbial communities responsible for decomposition in the soil within the Study Area, and this ecological process will be maintained as long as soil disturbance is minimal and organic inputs remain consistent.
Pollination and seed production	Flora species in Australia utilise a combination of wind, birds, flying and non-flying mammals and insects for pollination and ultimately seed production of native flora species (Armstrong, 1979). Although the Proposed Action is unlikely to alter the wind patterns within the Study Area, the Proposed Action has the potential to impact pollination and seed production indirectly through altering the abundance and/or behaviour of bird, mammals (particularly bats) and insects within the Study Area. Firstly, bird and bat species within the Study Area have the potential to be impacted by collision risk and barotrauma by wind turbines within the Study Area. This has the potential to result in the reduction in the abundance of pollinator species/ avoidance of the area by these species. However, common pollinating species within the Study Area (such as honeyeaters and lorikeets (most persistent flower-feeders) (Ford et al., 1979), and mega-bats) are unlikely to be flying at heights where collision and barotrauma are considered to be a high risk, with most of these species occupying habitat below the RSA. Additionally, mitigation and management measures will be put in place to reduce the risk of these impacts (Table 6-1). Secondly, evidence is accumulating that insects are frequently killed by operating wind turbines. For example, the annual loss of insect by onshore wind turbines in Germany was recently estimated at about 1.2 trillion killed insects per year (Voigt, 2021). This potential decline of insect populations may also diminish their ecosystem function, including services like pollination. Currently, there is a lack of data on how the siting of wind turbines affect insect fatalities, and thus, how turbine siting may impact local insect diversity and associated ecosystem functions (Voigt, 2021). Although there is the potential for the Proposed Action to reduce the abundance of insects within the Study Area, and the associated pollination function that they provide, it is unlikely that the Proposed Action will impact this ecological process to an extent that it is unable to be maintained within the Study Area and the surrounding environments.

Ecological Processes	Level of Maintenance
	In terms of pollinator behaviour, it has been shown, for example, that the visitation rates to eucalyptus flowers (pollination) by birds, bats and insects is correlated with canopy structure, flowering effort, tree height and the number of trees simultaneously flowering (Bacles et al., 2009). Other than directly removing vegetation through clearing, these factors will not be directly impacted as a result of the Proposed Action and the pollination and seed production ecological process will be maintained.
Seed dispersal	Seed dispersal is important for the genetic diversity and population maintenance/recovery of native species, as well as colonization of and habitat expansion into of disturbed areas. Additionally, seed dispersal contributes to the food source of certain animal species, including birds, mammals and insects. In general, the construction of wind turbines often results in the fragmentation of habitats and the creation of barriers that can impede seed dispersal. Certain species of animals that disperse seeds may avoid crossing open areas that leave the animal more susceptible to predation, leading to reduced seed dispersal across cleared areas. However, specifically for the Proposed Action, these cleared areas will be narrow and linear in nature, and will be additionally reduced through natural regeneration during the operation of the Proposed Action. This distanced between habitat patches is considered unlikely to create a barrier to dispersal to the species considered known to occur within the Study Area, and therefore seed dispersal through animal movement. Additionally, the Proposed Action is unlikely to impact wind patterns and hydrological processes (discussed above) which would also contribute to seed dispersal within the Study Area and the wider locality.
Predator-prey relationships	A full list of species identified within the Study Area are provided in Appendix H. There are multiple examples of predator-prey relationships between these species, including both native and introduced species. Two main impacts from the Proposed Action have been identified as having the potential to disrupt the predator-prey relationships within the Study Area. These include: • Bird and bat mortality from collision risk; and • Habitat loss and fragmentation and the indirect impacts to animal behaviours. A study focusing on native bird populations did not find any evidence suggesting that mortality due to collision risk disrupt the predator-prey relationships of these species within the broader ecosystem. Specifically, they found that there was no evidence of significant population level impacts on bird species that are preyed on by raptors (Marques et al., 2014). Secondly, habitat loss and fragmentation has the potential to impact predator prey relationships through increasing predator behaviour and success due to increased areas with low canopy cover and greater edge effects (see Table 5-1 for further

Ecological Processes	Level of Maintenance
	description) (Marques et al., 2014; Neldner, 2017). However, these changes are localised so the Study Area and are not considered drastic enough to disrupt predator-prey relationships. Additionally, mitigation measures, such as avoidance of important ecological values, habitat restoration and monitoring, that will be implemented through the planning of the Proposed Action and/ or management plans (BBMP, VMP, FMP etc.) will minimise potential impacts and help maintain ecological processes associated with wildlife, including predator-prey relationships. Therefore, while there can be localised effects on wildlife due to the construction and operation of the Proposed Action, with proper design and management, these impacts should not significantly disrupt predator-prey relations and this ecological process should be maintain within the broader community.
Germination and recruitment of species	While the construction of the Proposed Action will initial disturb vegetation through clearing for turbine foundations, access roads, and other infrastructure, and potentially impact soil structure, and the germination and recruitment of species, the area to be impacted is small relative to the wider Study Area (4.1 %) and these impacts are likely to be localised to the disturbance footprint. Additionally, a reduction in vegetation management of the temporary disturbance footprint has been proposed and will result in the natural regeneration of native species within areas not required for the operation of the Proposed Action. This process will allow for the germination and recruitment of species in cleared, non-permanent areas within the Study Area. Germination and recruitment of species is likely to be unimpacted and maintained in areas outside the disturbance footprint and throughout the wider landscape during all phases of the Proposed Action.
The carbon cycle and stability of atmospheric carbon	The construction and operation of the Proposed Action is anticipated to maintain or even have a positive implication for carbon cycle and atmospheric stability due to its ability to generate renewable energy and reduce reliance on fossil fuels. Although vegetation clearing associated with the Proposed Action will contribution to an increase in atmospheric carbon and impact to carbon sequestration ability, the area required to be cleared for the Proposed Action (1,932.2 ha) is a much smaller areas compared to other forms of energy production, such as coal. Additionally, these carbon emissions are expected to be offset during operation of the Proposed Action due to the emissions saved from displacing fossil fuel use.
Habitats for flora and fauna (such as particular regional ecosystems, logs, rocks, debris, leaf litter,	Broad habitat types (BHT) within the Study Area have been identified and avoided where possible during the Proposed Actions design. The area of each BHT within the permanent footprint of the Proposed Action to be impacted are: • Grasslands and cultivated agricultural land - 1,016.2 ha; • Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey - 886.3 ha;

Ecological Processes	Level of Maintenance
nectar, hollow bearing trees, food and shelter).	• Riparian woodland and open forest dominated by *E. populnea, E. tereticornis* often associated with stream channels - 16.5 ha; • Vine Forest/Thickets and Dry Rainforest - 3.1 ha; • Waterbodies and drainage features - 1.3 ha; and • Brigalow woodlands - 8.7 ha. As these impacts are narrow and linear in nature, entire habitat patches will not be removed and the habitat functions that these habitat types provide (foraging, dispersal and breeding) are likely to be maintained. Additionally, although the Proposed Action's development footprint will bisect certain patches of identified habitat, and a certain level of fragmentation will occur, this clearing will be reduced in width through natural regeneration during the operation of the Proposed Action. This distanced between habitat patches is considered unlikely to create a barrier to dispersal to the species identified as known to occur within the Study Area. Finally, the second stage of impact mitigation will entail on the ground micro-siting at each location proposed for infrastructure to determine if any ecological values (i.e. species microhabitat features such as hollow-bearing trees and rocky outcrops) occur in that area to influence the re-siting of infrastructure. Habitat features such as logs, leaflitter and nectar are unlikely to result in the re-sighting of infrastructure, however these habitat features are common throughout the Study Area and will not be impacted in areas outside of the disturbance footprint. It is important to note that although the overall ecosystem process of habitat for flora and fauna is likely to be maintained, the area of habitat and impacts to habitat function may be significant for species. An impact assessment has been completed for species listed under the NC Act and EPBC act, summarized within Section 7.

7.4 STATE CODE 23 REQUIREMENTS

The Proposed Action is assessable under State Code 23, and as such, the environmental PO's of Table 23.1 of State Code 23 require assessment. Table 7-6 details how the Proposed Action complies with the PO relevant to flora and fauna. All other POs are assessed against the relevant Development Application documentation for this Proposed Action.

TABLE 7-6 STATE CODE 23 – ENVIRONMENTAL REQUIREMENTS AND COMPLIANCE

Performance outcome	Acceptable outcome	Proponent response
Table 23.1 Material change of use		
Flora and fauna		
PO5 Development is designed, sited and operated to ensure that flora, fauna and associated ecological processes are protected from adverse impacts.	No acceptable outcome is prescribed.	**PO5 complies** Compliance with PO5 is met through the provision of an ecological assessment report. Through this report, the following information has been included to ensure that PO5 is met: Bird flight paths have been outlined (such as the absence of the migratory flyways for migratory species in Section 4.3.3.5 and information surrounding bats is provided in Section 4.3.3.3 and Appendix C; Fauna habitat and corridors, particularly functionality, structure, connectivity and value are outlined throughout Section 4; Regulated vegetation has been identified and mapped with the disturbance footprint. On ground micro-siting will ensure infrastructure is located in areas which avoid, and subsequently minimise edge effects and the isolation, fragmentation, or dissection of tracts of native vegetation as well as areas of identified threatened flora and fauna habitat; Where risks have been identified to flora and fauna, evaluation and consideration of the Proposed Action design has undergone changes to minimise the risk to ecological values outlined in Section 4; Progressive rehabilitation works will be undertaken in areas required for the construction phase only. The areas to be cleared for operation and maintenance will require a smaller footprint and will ultimately be subject to upon decommissioning of the Proposed Action, in accordance with a Decommissioning and Rehabilitation Plan. A suite of management plans including a vegetation management plan, fauna management plan and bird and bat management plan have been developed as part of the approvals package for the Proposed Action; and All relevant approval under other Acts and legislation will be obtained or have been obtained in tandem with this primary approval.

7.5 BIRD AND BAT RISK ASSESSMENT MODELLING

7.5.1 BIRD AND BAT RISK ASSESSMENT

Wind farms are known to impact birds and bats through collision with operating turbines. This section provides a detailed risk assessment for listed threatened and migratory birds and bats, using field data from surveys, desktop sources of historical records and literature on the ecology and characteristics of the species, to assess collision risk during the operational phase of the Proposed Action. This risk assessment has considered the likelihood of impact, and potential consequences of events including collision with wind turbines, as well as the impact of construction and operation on the Proposed Action causing changes in site utilisation by bird and bat species.

The risk assessment was based on the Risk Evaluation Matrix Model which complies within the *AS/NZS ISO 31000 Risk Assessment Standard: 2018*. This risk assessment considers the likelihood of an event (collision with WTGs and impact to site utilisation) (Table 7-7), and the consequences should the event occur (Table 7-8). Through calculating the likelihood and the consequence, an overall risk rating is assigned to each species and the risk of potential impact to a species because of the operation of the proposed action (Table 7-9). Such impacts include the direct collisions with WTGs as well as indirect impacts such as the deterrence of migratory flightpaths.

TABLE 7-7 LIKELIHOOD OF EVENT CRITERIA

Likelihood	Description
Certain	It is expected to occur in most circumstances. The risk event could occur in any year (>95%).
Almost Certain	It will probably occur in most circumstances. The risk event could occur in any year (>50%).
Likely	It may occur at some time. It is equally probable that the risk event could or could not occur in any year (50%).
Unlikely	It could occur at some time. It is probable than not that the risk event could occur in any year (<50%).
Rare	It may occur in exceptional circumstances. It is improbable that the risk event could occur in any year (<5%).

TABLE 7-8 CONSEQUENCE OF EVENT CRITERIA

Negligible	Low	Moderate	High	Severe
Occasional individuals lost but no reduction in local or regional population viability.	Repeated loss of small numbers of individuals but no reduction in local or regional population viability.	Moderate loss in numbers of individuals, leading to minor reduction in localised or regional population viability for between one and five years.	Major loss in numbers of individuals, leading to reduction in regional or state population viability for between five and 10 years.	Extreme loss in numbers of individuals, leading to reduction in regional or state population viability for a period of at least 10 years.

TABLE 7-9 RISK MATRIX OF RISK LEVEL BASED ON LIKELIHOOD AND CONSEQUENCE

Likelihood	Consequence				
	Negligible	**Low**	**Moderate**	**High**	**Severe**
Certain	Negligible	Low	High	Severe	Severe
Almost Certain	Negligible	Low	Moderate	High	Severe
Likely	Negligible	Low	Moderate	High	High
Unlikely	Negligible	Negligible	Low	Moderate	High
Rare	Negligible	Negligible	Negligible	Low	Low

Only two listed species bird or bat species, the satin flycatcher and squatter pigeon (southern), were recorded within the Study Area, with large-eared pied bat considered likely due to a 'probable' occurrence in the Study Area via Anabat detection equipment. None of these species were recorded within the assessed RSA (60 – 270 m) for the Proposed Action.

Nonetheless, this risk assessment took a conservative approach to determine the risk level for each listed threatened and/or migratory species that is considered 'known', 'likely' or has the 'potential' to occur within the Study Area by considering hypothetical risks to the species if they were to occur. Least concern species observed in the Study Area that are known to fly at typical RSAs also had their potential risk assessed.

This approach considered profiling species based on information obtained from the published literature and the following factors when considering the risk level:

- Whether species were, based on the LoO criteria, known, likely, potential or unlikely to occur within the Study Area;
- Existence of records in the Study Area and Locality;
- Existence of records in a broader Locality (with this broader Locality being a 100 km radius search area of the Study Area);
- Flight heights inside or outside of RSA, based on literature and realistic observations for the Locality; and
- Amount of known or potential habitat in the Study Area.

Full detail of this approach, as well as the limitations and assumptions of the approach, are included as part of a draft bird and bat management plan (BBMP). The results of this approach are considered to provide a risk result as a 'worst-case' scenario, based on the use of literature due to the lack of on-ground field observations during the field surveys.

7.5.1.1 RISK ASSESSMENT RESULTS

As a result of the risk assessment, six listed threatened species and 21 non-listed species were assessed as having a low or moderate risk of collision (Table 7-10). All other listed bird and bat species were considered to have 'negligible' risk of impact from collision with WTGs and any indirect impacts associated with the Proposed Action (e.g. barrier effects from WTGs). It is emphasised that this risk assessment assumes a worst-case scenario for most of the species, based upon literature and realistic observational expectations. Therefore, the final risk ratings assigned to species that have the potential to occur within the Study Area are conservative and enable this worst-case scenario to be considered.

A full detailed risk assessment with conclusions can be found in Appendix G.

TABLE 7-10 BIRD AND BAT RISK ASSESSMENT

Species	Threatened Species Status (EPBC Act, NC Act)	Likelihood of Event	Consequence of Event	Risk Rating
Threatened or Migratory Bird Species				
Grey falcon (*Falco hypoleucos*)	V, VU	Rare	High	**Low**
Red Goshawk (*Erythrotriorchis radiatus*)	V, VU	Rare	High	**Low**
White-throated needletail (*Hirundapus caudacutus*)	V and Mi, VU	Likely	Moderate	**Moderate**
Fork-tailed swift (*Apus pacificus*)	Mi, -	Unlikely	Moderate	**Low**
Curlew sandpiper (*Calidris ferruginea*)	CE and Mi,	Rare	High	**Low**
Non-threatened Bird Species				
Australian Magpie (*Gymnorhina tibicen*)	-, LC	Likely	Low	**Low**
Black Kite (*Milvus migrans*)	-, LC	Likely	Low	**Low**
Black-faced woodswallow (*Artamus cinereus*)	-, LC	Likely	Low	**Low**
Black-shouldered kite (*Elanus axillaris*)	-, LC	Likely	Low	**Low**
Brown falcon (*Falco berigora*)	-, LC	Almost certain	Low	**Low**
Brown Goshawk (*Accipiter fasciatus*)	-, LC	Likely	Low	**Low**
Galah (*Eolophus roseicapilla*)	-, LC	Almost Certain	Low	**Low**

Species	Threatened Species Status (EPBC Act, NC Act)	Likelihood of Event	Consequence of Event	Risk Rating
Nankeen kestrel (*Falco cenchroides*)	-, LC	Almost certain	Low	**Low**
Pacific baza (*Aviceda subcristata*)	-, LC	Almost certain	Low	**Low**
Peregrine falcon (*Falco peregrinus*)	-, LC	Almost Certain	Low	**Low**
Pink-eared Duck (*Malacorhynchus membranaceus*)	-, LC	Likely	Low	**Low**
Rainbow Bee-eater (*Merops ornatus*)	-, LC	Likely	Low	**Low**
Rainbow Lorikeet (*Trichoglossus moluccanus*)	-, LC	Likely	Low	**Low**
Spotted harrier (*Circus assimilis*)	-, LC	Likely	Low	**Low**
Sulphur-crested Cockatoo (*Cacatua galerita*)	-, LC	Likely	Low	**Low**
Torresian Crow (*Corvus orru*)	-, LC	Likely	Low	**Low**
Tree Martin (*Petrochelidon nigricans*)	-, LC	Likely	Low	**Low**
Wedge-tailed eagle (*Aquila audax*)	-, LC	Almost certain	Low	**Low**
Whistling kite (*Haliastur sphenurus*)	-, LC	Almost certain	Low	**Low**
White-Breasted Woodswallow (*Artamus leucorynchus*)	-, LC	Likely	Low	**Low**
Yellow-tailed black-cockatoo (*Zanda funereal*)	-, LC	Likely	Low	**Low**
Threatened Bat Species				
Large-eared Pied-bat (*Chalinolobus dwyeri*)	E, EN	Unlikely	Moderate	**Low**
Status listing per EPBC Act, NC Act: CE, CR = Critically Endangered; E, EN= Endangered; V, VU = Vulnerable; Mi = Migratory, LC=Least Concern, - = no listing				

7.5.2 BIRD COLLISION RISK MODELLING

The Band Collision Risk Model (Band, 2007) has been used to predict the total number of bird and bat collisions that may result from the development of the Proposed Action. The Band Model is routinely used in wind farm assessment studies across the world. This method of collision risk modelling (CRM) requires the input of parameters that describe species-specific biometrics, flight speeds and characteristics and the expected amount of flight activity in the Study Area. Furthermore, the model requires the input of wind turbine specific information

such as the turbine blade size and pitch, turbine height and rotor rotation period as well as the proportion of time the turbines will be operational (Band, 2007).

The CRM uses BUS data to determine the flight heights, frequency and flock size of a species known to occur within the RSA. This follows the process of determining:

- Stage 1: the number of birds or bats colliding per annum equals the number of birds or bats flying through the RSA (Band, Madders & Whitfield 2007); and
- Stage 2: the probability of the bird or bats flying through the RSA being hit (Band, Madders & Whitfield 2007).

Stage 1 depends on bird surveys at vantage points used to gather information on frequency of bird and bat flights in the RSA (Band, Madders & Whitfield 2007) and has been informed from data across five survey periods and a dry and wet season, as well as literature where field data is not present.

Stage 2 depends on the characteristics of the bird and bat such as length and wingspan, as well as the breadth and pitch of the turbine blades, rotation speed of the turbine and average flight speed of birds and bats identified as flying in the rotor swept height (Band, Madders & Whitfield 2007).

The CRM model utilised has been developed to consider only the known species. As species considered as likely or potentially occurring in the Study Area have not been observed in the RSA, the species cannot have their collision risk modelled.

The updated draft *Onshore Wind Farm Guidance* (DCCEEW, 2024) and State Code 23 (SDAP version 3.0, February 2022) have listed that CRM only be undertaken for listed threatened and/or migratory species, or raptors, that occur within the RSA and that are identified as at risk from the Proposed Action. Therefore, the risk assessment has identified species at risk of collision with turbines, and those which occur within the RSA (Rotor Swept Area) have been included in the CRM. The following Sections detail the turbine and bird and bat species parameters relevant to the Study Area and the CRM.

7.5.2.1 COLLISION RISK MODEL INCLUSION CRITERIA

The species that were assessed as having a low and moderate risk of impact from the Proposed Action, as determined by the risk assessment (Section 7.5.1 and Appendix G) and were recorded in the RSA during BUS's on at least three occasions, were considered for the CRM. Only species with at least three observation within the RSA have been included within the model to reduce the impact of low sample size on the accuracy of the model. With this inclusion criteria, eight species were included within the model including:

- Wedge-tailed eagle (*Aquila audax*);
- nankeen kestrel (*Falco cenchroides*);
- brown falcon (*Falco berigora*);
- whistling kite (*Haliastur sphenurus*);
- galah (*Eolophus roseicapilla*);
- rainbow lorikeet (*Trichoglossus moluccanus*);
- sulphur-crested cockatoo (*Cacatua galerita*); and
- torresian crow (*Corvus orru*).

Species not included within the model may still be at risk of collision throughout the life of the Proposed Action and will be monitored during further bird surveys. Additionally, such species will be considered for any potential impacts in the future if they are to occur within the RSA for the Proposed Action.

7.5.2.2 PROPOSED ACTION AND WTG PARAMETERS

The Proposed Action is a utility-scale wind farm of up to 1,152 MW output. In order to facilitate connection to the electricity grid, The Proponent is working with Powerlink to determine the optimal connection point to the existing network. The Proposed Action consists of up to 170 wind turbines, with specifications as outlined in Table 7-11. The Proposed Action will include ancillary infrastructure including, but not limited to, access tracks, substations, overhead and underground electrical cabling, hardstands, and an operation and maintenance compound.

TABLE 7-11 TURBINE PARAMETERS FOR THE PROPOSED ACTION

Turbine Parameter	General Turbine Specifications
Number of turbines	170 wind turbines
Hub height	Up to 185 metres
Turbine tip height	Up to 270 metres
Turbine rotor diameter	Up to 175 metres
Turbine blade length	84.5 metres
Depth of rotor blade from front to back	3.4 metres
Max chord	4.4 metres
Chord at 90% radius	~1.7 metres
Rotor tilt	6º
Hub coning	6º
Maximum RPM	9.5 rpm
Tip speed ratio	9.01
Rotor swept area range (noting that these heights will be determined by the hub height of the turbine, they may become lower)	60 – 270 metres
Number of blades	3 blades
Average pitch angle of rotor	Approximately 14.5 º – dependent on conditions
Rotation period of turbine	Approximately 6.3 seconds – dependent on conditions

7.5.2.3 SPECIES PARAMETERS

Seasonal monitoring of 38-point locations were undertaken and have been used in the calculations for the CRM. In total there were 3,580 minutes (or 60 hours) of bird survey time undertaken throughout the eight field investigation periods. A total of 13 species were recorded within the RSA during BUSs, however only eight had three or more observations within the RSA over the eight field surveys. The parameters required for the CRM for each of these eight species is presented in Table 7-12.

TABLE 7-12 BIOMETRIC PARAMETERS OF SPECIES INCLUDED WITHIN THE CRM

Species	Wingspan (cm)	Length (cm)	Flight Speed (m/s)
Wedge-tailed eagle (*Aquila audax*)	230	110	16.7
Nankeen Kestrel (*Falco cenchroides*)	80	35	17.4
Brown falcon (*Falco berigora*)	115	45	13.6
Whistling kite (*Haliastur sphenurus*)	146	55	30
Galah (*Eolophus roseicapilla*)	75	37	19.4
Rainbow Lorikeet (*Trichoglossus moluccanus*)	46	31	14
Sulphur-crested cockatoo (*Cacatua galerita*)	103	48	19.4*
Torresian Crow (*Corvus orru*)	100	50	20.1

Sources for measurements are: Smales et al. (2015); DCCEEW (2023); Cochran et al. (1986); Menkhorst et al. (2017); DES (2022); Marchant, S. et al (eds) (1990-2006); Cameron (2007).
**Galah speed used as sulphur-crested cockatoo speed could not be sourced.*

7.5.2.4 COLLISION RISK MODELLING RESULTS

For the eight species included in the model, collision risk has been calculated as the number of collisions per species per annum in Table 7-13. It is expected that birds in practice show a high level of avoidance of wind turbines (Band, 2007). However, avoidance rates have not been calculated for all species and research is necessary to determine each species-specific avoidance rates. For this CRM, 95% 98% and 99% avoidance rates have been used to calculate collision numbers per annum for the given species. These avoidance rates are typically used in CRM exercises (Smales, 2005; SNH, 2000).

TABLE 7-13 CRM RESULTS FOR RAPTORS OBSERVED IN RSA IN THE STUDY AREA

Species	Avoidance Rate		
	95%	98%	99%
Wedge-tailed eagle (*Aquila audax*)	0.01590	0.00636	0.00318
Nankeen Kestrel (*Falco cenchroides*)	0.00232	0.00093	0.00046
Brown falcon (*Falco berigora*)	0.00088	0.00035	0.00018
Whistling kite (*Haliastur sphenurus*)	0.00085	0.00034	0.00017
Galah (*Eolophus roseicapilla*)	0.00163	0.00065	0.00033
Rainbow Lorikeet (*Trichoglossus moluccanus*)	0.00047	0.00019	0.00009
Sulphur-crested cockatoo (*Cacatua galerita*)	0.00230	0.00092	0.00046
Torresian Crow (*Corvus orru*)	0.00531	0.00212	0.00106
Total	**0.02967**	**0.01187**	**0.00593**

In total, this CRM Model indicates <1 bird colliding with the turbines per year, or one collision approximately every 30 years as the worst-case scenario. This is based on the maximum specifications available and modelling approach as described. In the instance that final design delivers smaller WTG specifications, potential collision risk impacts will be lower than the above worst-case scenario.

7.5.2.5 POLICIES AND GUIDELINES

WTGs are preferentially located in areas for best wind resources, however based on the field surveys that have been conducted, and further pre-clearance micro-siting surveys that will be conducted prior to commissioning, final layout will consider at risk species habitat presence and addressed so far as reasonably practicable. With respect to individual species, the following documents were considered:

- Consultation of SPRAT profiles to identify species distribution, behavioural characteristics and habitat information, which was then mapped for all potential, likely and known to occur species within the Study Area;
- Scientific literature to understand further parameters of bird and bat species of interest, including size, flight speed, average flock sizes; and

- Survey guidelines which determined relevant methodology for BUS and BACI monitoring principles.

The consultation of these policies and guidelines where then able to inform the bird and bat studies, which were:

- A risk assessment based on species characteristics and behaviours; and
- A CRM which considers such species characteristics and factors these into how they would be impacted by the WTG parameters relevant to the Proposed Action.

This Proposed Action has gone further to consider species which have not been located in the Study Area or broader locality, to determine the 'potential impact' that would result from construction and operational activities.

The Proposed Action emphasises the importance of ongoing monitoring and as such, the BBMP has considered all relevant principles of BACI survey monitoring, and Adaptive Management to ensure that if any threatened species are to be found in future surveys, they are adequately considered, and impacts mitigated.

8. OFFSET REQUIREMENTS

A SIA was undertaken for relevant MNES against the SIG 1.1 (DoE, 2013). The SIA concluded that there is likely to be a significant impact to:

- Brigalow (*Acacia harpophylla* dominated and co dominated) TEC;
- Poplar Box Grassy Woodland on Alluvial Plains TEC;
- Breeding habitat for squatter pigeon (southern);
- Foraging and denning habitat for greater glider (southern and central); and
- Foraging and breeding habitat for koala.

With the potential for a significant impact to:

- Foraging habitat for Large-eared pied-bat.

For more information on the SIA, refer to Appendix E.

Where significant impacts to MNES cannot be avoided, the Proponent is committed to offsetting these impacts. An Offset Management Strategy (OMS) will be prepared, that specifically outlines the requirements to deliver and manage appropriate land-based offsets, in accordance with the conditions of approvals for the Proposed Action. The Proposed Action will also offset the "actual" area of habitat impacted that will be further defined at the detailed design phase. This incentivises the minimisation of impacts to habitats so as to reduce the offset requirement and ecological burden on MNES. The disturbance area for species with likely or potential significant impacts, as described in Appendix E, are outlined in Table 8-1 below. Offset requirements for these species will be calculated in accordance with the EPBC Act *Environmental Offsets Policy* (DSEWPC, 2012).

There is a preference for offsets to be located within the Study Area, avoiding areas of Proposed Action infrastructure. Once an offset area has been selected, and adequate surveys undertaken to confirm species habitat and habitat quality, an Offsets Area Management Plan (OAMP) will be prepared for the implementation and ongoing management of the selected offset areas.

TABLE 8-1 OFFSET REQUIREMENTS

Species	EPBC Act Status	Impact (ha)
Likely Significant Impact		
Brigalow (*Acacia harpophylla* dominated and co dominated)	E	8.5 ha
Poplar Box Grassy Woodland on Alluvial Plains	E	8.2 ha
Southern squatter pigeon (*Geophaps scripta scripta*)	V	524.0 ha breeding habitat
Greater glider (central and southern) (*Petauroides volans*)	E	15.5 denning habitat 861.9 foraging habitat
Koala (*Phascolarctos cinereus*)	E	885.5 ha foraging and breeding habitat
Large-eared pied-bat (*Chalinolobus dwyeri*)	E	886.3 ha foraging habitat
Status listing per EPBC Act: CE = Critically Endangered; E= Endangered; V = Vulnerable; Mi = Migratory.		

9. CONCLUSION

To identify the values associated with the Proposed Action, an Ecological Assessment was undertaken to determine the ecological values within the Study Area. The Ecological Assessment is underpinned by a comprehensive desktop analysis and eight field investigations undertaken between October 2022 to June 2024. The desktop and field assessments involved a review of both State and Commonwealth databases as well as targeted field surveys, to determine species presence/absence and habitat availability for differing species within the Study Area.

This assessment concluded three known EPBC Act and NC Act threatened fauna species, koala, greater glider and squatter pigeon due to their presence in the Study Area. One EPBC Act migratory species, satin flycatcher, was also concluded as known within the Study Area. One further NC Act listed Near Threatened species, golden tailed gecko, was determined likely to occur.

The proposed impacts associated with the Proposed Action within the Study Area include:

- Clearing of native vegetation and habitat for threatened and migratory species;
- disturbance or displacement of fauna species from foraging or roosting habitat, or breeding places;
- degradation of threatened species habitats as a result of dust, erosion or accidental release of hazardous materials;
- habitat fragmentation; and
- fauna injury during construction activities and movement of machinery/vehicles.

The impact to MNES and MSES associated with the Proposed Action have been assessed against both the EPBC Act *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* and the *Queensland Environmental Offsets Policy - Significant Residual Impact Guideline*. A summary of determined MNES and MSES in relation to SIA and SRIA respectively is presented below:

Matters of National Environmental Significance (Known and Likely Species and Communities)

- Brigalow (Acacia harpophylla dominated and co dominated) TEC – 8.5 ha of impact to mapped TEC. Significant Impact – **Likely**;
- Poplar Box Grassy Woodland on Alluvial Plains TEC – 8.2 ha of impact to mapped TEC. Significant Impact – **Likely**;
- Koala – impact of 16.4 ha to preferred foraging and breeding habitat, 867.9 ha general foraging and breeding habitat and 315.7 ha dispersal habitat. Significant Impact – **Likely**;
- Squatter pigeon (southern) – impact of 437.2 ha to foraging and roosting habitat and 524.0 ha of breeding habitat. Significant Impact – **Likely**;
- Greater glider (southern and central) – impact of 861.9 ha to foraging habitat and 15.5 ha of denning and breeding habitat. Significant Impact – **Likely**;
- Large-eared pied-bat – impact of 886.3 ha to foraging habitat. Significant Impact –**Likely**; and
- Satin flycatcher – impact of 19.6 ha to foraging and roosting habitat. Significant Impact – **Unlikely**.

Matters of National Environmental Significance (Potential Species)

- White-throated needle tail – impact is aerial only – no clearing impact. Significant Impact – **Unlikely**;
- Black-breasted button quail – impact of 3.1 ha to foraging and breeding habitat. Significant Impact – **Unlikely**;
- Australian painted snipe – impact of 1.3 ha to foraging habitat. Significant Impact – **Unlikely**;
- Yellow-bellied glider – impact 303.1 ha to foraging and breeding habitat. Significant Impact – **Unlikely**;
- *Cossinia australiana* – impact of 3.1 ha. Significant Impact – **Unlikely**;
- *Cadelia pentastylis* – impact of 3.1 ha. Significant Impact – **Unlikely**;
- *Solanum dissectum* – impact of 8.7 ha. Significant Impact – **Unlikely**;
- *Rhaponticum australe* –impact of 886.3 ha. Significant Impact – **Unlikely**;
- Solanum johnsonianum – impact of 8.7 ha. Significant Impact – **Unlikely**; and
- Xerothamnella herbacea – impact of 8.7 ha. Significant Impact – **Unlikely**.

Matters of State Environmental Significance

Field surveys determined a total of 11 REs as present within the Study Area. These include Category B remnant vegetation with RE types classed (under the VM Act) as Endangered or Of Concern (1,657.5 ha). Other vegetation within the Study Area is mapped as Category C high value regrowth Endangered or Of Concern (1.9 ha), Category R vegetation (191.1 ha), Essential Habitat (318.3 ha), Vegetation Intersecting a Watercourse (1,169.4) and Flora Survey Trigger Areas (51 ha). Significant Residual Impact (SRI) relative to MSES are:

- SRI triggered for Category B regulated vegetation Endangered or Of Concern (8.88 ha) and Regulated Vegetation intersecting a watercourse (6.08ha).
- SRI is triggered for Connectivity Areas Test 1 – A significant reduction in core remnant ecosystem extent at the local scale – True.
- SRI is triggered for Protected wildlife habitat (EN, VU or SLC species) koala, greater glider, large-eared pied bat and squatter pigeon. Impacts in terms of area are detailed above under "Matters of National Environmental Significance (Known and Likely Species and Communities)".

Full SIA and SRIA are presented in Appendix E and F respectively. For significant residual impacts an Offset Management Strategy will be prepared to compensate for impacts to MNES and MSES.

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APPENDIX A LIKELIHOOD OF OCCURRENCE

APPENDIX A LIKELIHOOD OF OCCURRENCE

A total of 52 MNES and MSES were considered in the LoO Assessment, including 47 threatened or migratory species and five threatened ecological communities (TECs). Of these, four threatened species and one migratory species are considered known or likely to occur in the Study Area, with TECs considered known or likely to occur. 21 threatened or migratory species are considered as having the potential to occur (six flora, eight fauna and seven migratory species). The remaining species are considered unlikely to occur in the Study Area. Species that are MNES considered as known, likely or as having the potential to occur in the Study Area are presented in Table 1 below.

Of the five ecological communities considered under the LoO Assessment, two are known or likely to occur in the Study Area:

- Brigalow (Acacia harpophylla dominant and co-dominant) (likely); and
- Poplar Box Grassy Woodland on Alluvial Plains (known).

The remaining **three** TECs are considered unlikely to occur based on ground-truthing completed within the Study Area:

- Semi-evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions; and
- Weeping Myall Woodlands.

TABLE 1 THREATENED OR MIGRATORY SPECIES AND TECS THAT ARE KNOWN OR LIKELY OCCUR WITH THE STUDY AREA

Scientific Name	Common name	NC Act	Comm. EPBC Act
Known			
Poplar Box Grassy Woodlands on Alluvial Plains TEC		-	E
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V
Petauroides volans	Greater Glider (southern and central)	E	E
Phascolarctos cinereus	Koala	E	E
Tachyglossus aculeatus	Short-beaked Echidna	SLC	-
Myiagra cyanoleuca	Satin Flycatcher	SLC	Mi
Likely			
Brigalow *(Acacia harpophylla* dominant and co-dominant*) TEC*		-	E
Chalinolobus dwyeri	Large-eared pied-bat	E	E

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Birds (including listed and migratory species)					
Curlew sandpiper (*Calidris ferruginea*)	CE and Mi, CR	This species is recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Breeding habitat:** This species does not breed in Australia. **Foraging habitat:** potential marginal foraging habitat exists in the Study Area in the form of dams. **Roosting habitat:** this species roost in open situations with damp substrate, especially on bare shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. Low quality foraging and roosting habitat associated with farm dams. Non coastal environment.	Yes	No	Unlikely to occur • Study Area is within the distribution for the species (may occur). • Marginal foraging habitat in the form of farm dams present. • Area is non-coastal. • No records within the Study Area/locality (closest record is approximately 116 km to the west of the Study Area). • No habitat critical to the survival of the species was identified from field surveys within the Study Area.
Red goshawk (*Erythrotriorchis radiatus*)	V, VU	This species prefers wooded and forested lands of tropical and warm-temperate Australia. Forests of intermediate density, with tall stands or individual trees so that nests are supported, are favoured, or ecotones between habitats of differing densities, e.g. between rainforest and eucalypt forest, between gallery forest and woodland, or on edges of woodland and	Yes	No	Unlikely to occur • Study Area is within the distribution for the species (may occur). • No preferred ecotones are present within the Study Area as the plateaus and plains are dominated by stunted ironbark. • No records within the Study Area/locality.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		forest where they meet grassland, cleared land, roads or watercourses. This species avoids very dense and very open habitats. This species has a large home range. **Breeding and roosting habitat:** This species rarely breeds in areas with fragmented vegetation. Breeding habitat is restricted to trees that are taller than 20m and within 1km of a watercourse or wetland. **Foraging habitat**: Habitat must be open enough for fast hunting and manoeuvring in flight, but with enough cover for ambushing of prey. No preferred ecotones are present within the Study Area as the plateaus and plains are dominated by stunted ironbark.			• No habitat critical to the survival of the species identified from field surveys within the Study Area
Grey falcon (*Falco hypoleucos*)	V, VU	This species prefers arid and semi-arid Australia and frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined watercourses. This species has also been observed in treeless areas, frequenting tussock grassland and open woodland for foraging. **Breeding habitat**: Nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*) **Foraging habitat:** timbered lowland plains, acacia shrubland crossed by tree-line watercourses, as well as	Yes	No	Unlikely to occur • Study Area is within the distribution for the species (likely to occur). • Study Area lacks preferred breeding, roosting and foraging habitat in the form of riverine Eucalypt communities, open woodlands, grasslands, and acacia shrublands near tree-lined watercourses. • No records within the Study Area/locality.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		treeless areas, tussock grasslands and open woodlands. **Roosting habitat**: this species is likely to roost in both its breeding and foraging habitat. This species has also been observed roosting on the ground. Study Area lacks preferred breeding, roosting and foraging habitat in the form of riverine Eucalypt communities, open woodlands, grasslands, and acacia shrublands near tree-lined watercourses.			
Southern squatter pigeon (*Geophaps scripta scripta*)	V, VU	Squatter pigeon (southern) habitat is generally defined as open-forests to sparse, open-woodlands and scrub that are mostly dominated by *Eucalyptus, Corymbia* or *Callitris* species. Additionally, they also favour remnant regrowth or partly modified vegetation communities that are within 3 km of water bodies. **Breeding habitat**: Breeding habitat occurs on stony rises on sandy, gravelly soils, within 1 km of a suitable, permanent waterbody (including farm dams and watercourses). **Foraging habitat**: Natural foraging habitat for the species is any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species, on sandy or gravelly soils, within 3 km of a suitable, permanent or seasonal waterbody **Dispersal habitat**: Dispersal habitat is any forest or woodland occurring	Yes	Yes	Known to occur • Study Area is within the species distribution (likely to occur). • General habitat exists as areas close to bodies of water, remnant grasslands and remnant *Eucalypt* vegetation within the Study Area. • One observation of the species was made during field surveys in October 2022. The species was observed at a farm dam located by the homestead in the northern section of the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		between patches of foraging or breeding habitat, and suitable waterbodies Habitat within the Study Area is defined as areas close to bodies of water, remnant grasslands and remnant *Eucalypt* vegetation.			
Painted honeyeater (*Grantiella picta*)	V, VU	The painted honeyeater is a 4pecialized mistletoe honeyeater. This species inhabits dry, open forests and woodlands with a preference of high numbers of mature trees, as these host larger quantities of mistletoe. The species usually occurs in areas with flowering and fruiting mistletoe and flowering Eucalypts. **Breeding habitat**: breeding habitat is typically mature trees in remnant vegetation with high quantities of mistletoe. **Foraging and roosting habitat:** Associated with woodlands and forests with mistletoe. There is a lack of preferred mistletoe present throughout the riverine eucalypt communities, however potential breeding and foraging habitat does exist in these communities.	Yes	No	Unlikely to occur: • Study Area is within the distribution for the species (may occur). • A distinct lack of mistletoe in woodlands, or associated with tall eucalypts in riverine communities, and so the habitat is generally unsuitable for the species. • There are no records in the Study Area or locality. • No habitat critical to the survival of the species identified from field surveys within the Study Area

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
White-throated needletail (*Hirundapus caudacutus*)	V and Mi, VU	According to Higgins (1999), this species occurs over most types of habitat, but are recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (as cited in DSEWPC, 2019b). Whilst rare, they have been recorded on wooded ends of ridges, roosting after dark high in the eucalypt tree canopies (Tarburton, 1993). **Breeding habitat;** this species does not breed in Australia. **Roosting habitat**: the species is noted to roost in tall mature forests and woodlands amongst dense foliage and in hollows often associated with ridgelines. **Foraging habitat**: the species almost always will fly aerially at 'cloud level' and forage over farmland, heathland and mudflats. Species likely to fly aerially over the Study Area. The Study Area does contain potential roosting and foraging habitat in the form of eucalypt forests, specifically on elevated areas with ridges.	Yes	Yes	Potential to occur • Study Area is within the distribution of the species (likely to occur). • Species likely to fly aerially over the Study Area, which also contains potential foraging and roosting habitat in the form of tall eucalypt forests likely in elevated areas. • There are records within the locality in 2009 (ALA, 2022).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Star finch (eastern) (*Neochmia ruficauda ruficauda*)	E, EN	This species occurs mainly in grasslands and grassy woodlands that are located close to bodies of freshwater. Habitats can be habitats dominated by trees typically associated with permeant water or areas regularly inundated; with the most common species being *Eucalyptus Coolabah, E. tereticornis, E. tessellaris, Melaleuca leucadendra, E. camaldulensis and Casuarina cunninghamii.* Records that are more recent indicate that preferred habitat is areas dominated by grasses or have been in areas where the native vegetation has been partially cleared. Breeding, foraging and roosting habitat is not clearly delineated for this species; however, all habitat types are expected to be close to water and comprising of grasslands and grassy woodlands. Potential foraging and breeding habitat occurs in the Study Area present as Eucalypt dominated habitat associated with riparian areas.	Yes	No	Unlikely to occur • Study Area is within the distribution for the species (may occur). • Potential foraging and breeding habitat of Eucalypt dominated habitat adjacent to the riparian areas (*E crebra and E. melanophloia*), and partially cleared grasslands/grassy woodlands are located throughout the Study Area. • There are no records within the Study Area/locality. • No habitat critical to the survival of the species identified from field surveys within the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
• Australian painted snipe (*Rostratula australis*)	E, EN	This species prefers shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. That also utilise inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia* or canegrass or sometimes tea-tree (*Melaleuca*) **Breeding habitat:** may be specific for this species, shallow wetlands with bare mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands. **Foraging habitat**: Terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Farm dams occur in the Study Area and regarded as potential foraging habitat for the species.	Yes	No	Potential to occur • Study Area is within the distribution for the species (likely to occur). • Potential foraging and roosting habitat in the form of farm dams present. • No records exist within the Study Area or locality. • No habitat critical to the survival of the species identified from field surveys within the Study Area

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Black-breasted button-quail (*Turnix melanogaster*)	V, VU	The black-breasted button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. In south-eastern Queensland, they are recorded on rare occasions in open eucalypt forest. It also occurs within semi-evergreen vine thicket habitats. Habitat considered critical to the survival of the black-breasted button-quail includes: • Vine thickets and rainforest vegetation types that are periodically water-stressed. These include: semi-evergreen vine thicket, low microphyll vine forest, Araucarian microphyll vine forest, Araucarian notophyll vine forest and *Brachychiton* scrubs that may incorporate bottle trees (*Brachychiton sp.*), brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*); • Low thickets or woodlands with a dense understorey but little ground cover, typically dominated by *Acacia* spp.; and • In littoral situations, dry vine scrubs, acacia thickets and areas densely covered in shrubs, particularly midgen berry *Austromyrtus dulcis*. Small areas of potential foraging and roosting habitat with rainforest vegetation types do occur within the Study Area. There is a lack of good quality habitat and connectivity in the Study Area.	Yes	No	Potential to occur • Study Area is within the distribution for the species (likely to occur). • Low density of suitable quality habitat in the Study Area. • No records within the Study Area/locality. Nearest exists from Coominglah State Forest 20km to the east in 2021 (ALA, 2022). • No habitat critical to the survival of the species identified from field surveys within the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Birds (Migratory)					
Oriental cuckoo (*Cuculus optatus*)	Mi, SLC	The species is found in forest canopy, open wooded areas and orchards, often in hill country, also in coniferous forest and in birch (*Betula*) above the treeline. The species may occur in association with remnant and regrowth RE types 11.3.2, 11.3.25, 11.9.4, 11.9.5, 11.9.10, 11.3.19, 11.5.1. The species winters in many different countries, including the coastal parts of northern and eastern Australia (BirdLife International, 2015). **Breeding habitat**: Does not breed in Australia. **Foraging and roosting habitat**: Monsoonal rainforest, vine thickets, wet sclerophyll forest or open *Casuarina, Acacia,* or *Eucalyptus* woodlands. Frequently at the edges or ecotones between habitat types. There is limited potential roosting and foraging habitat of monsoonal rainforest or vine thickets present within the Study Area.	Yes	No	Unlikely to occur • Study Area is within the species distribution (may occur). • There is limited potential roosting and foraging habitat of monsoonal rainforest or vine thickets present within the Study Area. • No records for the species exist within the Study Area/locality. • No important habitat for this migratory species was detected in the Study Area during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
• Fork-tailed swift (*Apus pacificus*)	Mi, SLC	In Australia, they occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. **Breeding habitat**: Does not breed in Australia. **Foraging and roosting habitat**: exclusively aerial and found across a range of habitats. Potential aerial foraging habitat over dry open habitats present. There is a lack of preferred coastal and riparian heathland or swamp habitat.	Yes	Yes	Potential to occur • Study Area is within the distribution for this species (likely to occur). • Potential aerial foraging habitat over dry open habitats present. There is a lack of preferred coastal and riparian heathland or swamp habitat. • One record for the species exist within the locality from 2002 (ALA, 2022). • No important habitat for this migratory species was detected in the Study Area during field surveys.
Common sandpiper (*Actitis hypoleucos*)	Mi, SLC	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The common sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. **Breeding habitat**: Does not breed in Australia.	Yes	No	Unlikely to occur • Study Area is within the distribution for this species (may occur). • Potential marginal to low quality foraging and roosting habitat present within the Study Area associated with farm dams non-coastal area. Coastal environments preferred. • No records for the species exist within the Study Area/locality. The closest record from 1997 is approx. 23km west of the Study Area (ALA, 2022). • No important habitat for this migratory species was detected in the Study Area during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		Foraging habitat: this species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands. **Roosting habitat:** Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks Potential foraging and roosting habitat present within the Study Area associated with farm dams.			
Sharp-tailed sandpiper (*Calidris acuminata*)	V and Mi, SLC	Prefers habitat on muddy edges of freshwater wetlands or brackish wetlands. Can be found at dams inland. Will often occupy coastal mudflats when ephemeral terrestrial wetlands have dried out. **Breeding habitat**: Does not breed in Australia. **Foraging habitat**: foraging habitat is at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. Also among inundated vegetation of saltmarsh, grass or sedges. They forage in sewage ponds, and often in	Yes	No	Unlikely to occur • Study Area is within the distribution for this species (may occur). • Marginal foraging and roosting habitat present within the Study Area associated with farm dams, Study Area is non-coastal. Species prefers coastal environments. • No records for the species exist within the Study Area/locality. The closest historic record (2000) is 11pprox.. 30km south-west (ALA, 2022). • No important habitat for this migratory species was detected in the Study Area during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		hypersaline environments. After rain, they may forage in paddocks of short grass, well away from water. They may forage on coastal mudflats at low tide, and move to freshwater wetlands near the coast to feed at high tide. **Roosting habitat:** Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water, or in short sparse vegetation, such as grass or saltmarsh. Occasionally, they roost on sandy beaches, stony shores or on rocks in water Potential foraging and roosting habitat present within the Study Area associated with farm dams.			
Pectoral sandpiper (*Calidris melanotos*)	Mi, SLC	In Australasia, the pectoral sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. **Breeding habitat**: Does not breed in Australia. **Foraging habitat**: forages in shallow water or soft mud at the edge of wetlands **Roosting habitat:** prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools,	Yes	No	Unlikely to occur • Study Area is within the distribution for this species (may occur). • No wetland habitats, however, potential foraging and roosting habitat present within the Study Area associated with farm dams. • No records for the species exist within the Study Area/locality. The closest records are over 120km east (ALA, 2022). • No important habitat for this migratory species was detected in the Study Area during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		creeks, floodplains and artificial wetlands No wetland habitats, however, potential foraging and roosting habitat present within the Study Area associated with farm dams.			
Latham's snipe (*Gallinago hardwickii*)	Vulnerable and Mi, SLC	They usually occur in open, freshwater wetlands that have some form of shelter (usually low and dense vegetation) nearby. They generally occupy flooded meadows, seasonal or semi-permanent swamps, or open waters, but various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains. This species has been said to occur very rarely in small patches of habitat such as roadside ditches and alpine bogs (Higgins & Davies, 1996). **Breeding habitat**: Does not breed in Australia. **Foraging habitat**: characterized by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation) **Roosting habitat:** on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or	Yes	No	Unlikely to occur • Study Area is within the distribution for this species. • Marginal foraging and roosting habitat present within the Study Area associated with farm dams. • No records for the species exist within the Study Area or locality. • No important habitat for this migratory species was detected in the Study Area during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		plough marks, among boulders, or in shallow water if cover is unavailable. Potential foraging and roosting habitat present within the Study Area associated with farm dams.			
Osprey (*Pandion haliaetus*)	Mi, SLC	This species occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are found in lakes, large waterholes, beaches, coastal cliffs as well as inshore waters, bays and reefs. **Breeding habitat**: Nests are constructed in a variety of natural and artificial sites, including in dead or partly dead trees or bushes on cliffs, rocks, rock stacks or islets; on the ground on rocky headlands, coral cays, deserted beaches, sandhills or saltmarshes; and on artificial nest platforms, pylons, jetties, lighthouses, navigation towers, cranes, exposed shipwrecks and offshore drilling rigs **Foraging habitat**: They require extensive areas of open fresh, brackish or saline water for foraging **Roosting habitat:** Various, typically similar to breeding habitat. No habitat associated with coastal or wetland areas is present within the Study Area where this species is commonly found.	Yes	No	Unlikely to occur • Study Area is within the distribution for this species (likely to occur). • No habitat associated with coastal or wetland areas is present within the Study Area where this species is commonly found. • No records for the species exist within the Study Area/locality. • No important habitat for this migratory species was detected in the Study Area during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Satin flycatcher (*Myiagra cyanoleuca*)	Mi, SLC	Satin flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in drier woodlands and open forests. **Roosting habitat:** there is no information on the roosting behaviour for the species. **Foraging habitat:** the species is known to forage in the canopy and subcanopy of trees **Breeding habitat:** breeding occurs in south-east Australia, but no other information is provided on the specifics of such locations. Suitable foraging habitat of densely vegetated wet eucalypt gullies occur within the Study Area.	Yes	No	Known to occur • Study Area is within the species distribution (likely to occur). • There is low abundance of suitable foraging habitat of densely vegetated wet eucalypt gullies within the Study Area. • Species was detected during field surveys through both sight and call. • The closest record is 15pprox.. 19km east of the Study Area in Biloela, QLD (ALA, 2022).
Rufous fantail (*Rhipidura rufifrons)*	Mi, SLC	In east and south-east Australia, the rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as tallow-wood (*Eucalyptus microcorys*) and mountain grey gum (*E. cypellocarpa*). When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including spotted gum (*E. maculata*), yellow box (*E. melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey. **Breeding habitat:** breeding occurs in south-east Australia but no other information is provided on the specifics of such locations.	Yes	No	Potential to occur • Study Area is within the species distribution (likely to occur). • There is a lack of preferred species in the tree canopy of eucalypt forests present, and an absence of wet sclerophyll forests for roosting and foraging habitat. General movement habitat exists along densely vegetated gully lines within the Study Area. • One out-of-date record for the species occur within the locality and no observations were made during field surveys. The closest recent record is approx. 40 km north-east of the Study Area (ALA, 2022).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		Foraging and roosting habitat: There is no information concerning feeding or roosting sites during species migration. • • There is a lack of preferred species in the tree canopy of eucalypt forests present, and an absence of wet sclerophyll forests for roosting and foraging habitat. General movement habitat exists along densely vegetated gully lines within the Study Area.			
Black-faced monarch (*Monarcha melanopsis*)	Mi, SLC	The black-faced monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest. It is also sometimes found in nearby open eucalypt forests (mainly wet sclerophyll forests), especially in gullies with a dense, shrubby understorey as well as in dry sclerophyll forests and woodlands, often with a patchy understorey. The species especially occurs in 'marginal' habitats during winter or during passage (migration). **Breeding habitat:** this species breeds in specific locations including the Atherton Region in Queensland, Julatten south to the Paluma Range and inland to the Atherton Tableland.	Yes	No	Unlikely to occur • Study Area is within the species distribution (may occur). • There is a lack of suitable foraging and roosting habitat in the Study Area. • The closest historic record (2002) is approximately 40km east of the Study Area in Coominglah State Forest (ALA, 2022). No records for the species occur within the Study Area/ locality and no observations were made during field surveys. • Habitat present is marginal with limited patches of vine thickets. The fragmentation and small size of these habitat patches in the landscape mean they are unlikely to be utilised by black-faced monarch.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		Roosting and foraging habitat: this species feeds in mostly rainforest ecosystems, at all vertical levels of the forest. There is limited suitable foraging and roosting habitat in the Study Area.			
Yellow wagtail (*Motacilla flava*)	Mi, SLC	Habitat requirements for the yellow wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves (Garnett et al., 2010). This species may occur in association with non-remnant vegetation. **Breeding habitat**: Does not breed in Australia. **Foraging and roosting habitat**: Not clearly defined however will be in line with habitat requirements stated above. Potential breeding and foraging habitat of open grasslands associated with farm dams present within the Study Area.	Yes	No	Unlikely to occur • Study Area is within the distribution for this species (may occur). • No records for the species exist within the Study Area/locality. Closest historic record exists approximately 40 km away at Torrens Creek from 2009. • Records do not meet recency criteria nor locality criteria. • Open grasslands associated with farm dams are present within the Study Area however these dams are small in size and lack dense vegetation for roosting. • However, no important habitat for this migratory species was detected in the Study Area during field surveys, with a lack of well-watered open grasslands or fringes of wetlands surrounded by dense vegetation (DoE, 2014).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Gastropods					
Boggomoss snail, Dawson River snail *(Adclarkia dawsonensis)*	CE, E	The snail appears to be restricted to alluvial flats and riparian environments between Mt Rose and south of Theodore. They are considered to occur as a single population connected by the Dawson River. The preferred habitat is the floodplain of the Dawson River in places where there is good canopy cover, a moist environment, fallen logs and deep leaf litter. This habitat once formed as an extensive archipelago of suitable patches connected by riparian vegetation, but most of the snail's habitat has been cleared for farming and little original vegetation remains (Clarke and Spier-Ashcroft 2003, cited in Queensland Department of Environment and Heritage Protection 2017). **Foraging habitat:** Foraging habitat is the floodplain of the Dawson River in places where there is good canopy cover, a moist environment, fallen logs and deep leaf litter. **Breeding habitat:** Breeding habitat is the floodplain of the Dawson River in places where there is good canopy cover, a moist environment, fallen logs and deep leaf litter. The species is unlikely as the Study Area is outside the preferred habitat of the floodplain of the Dawson River.	No	No	Unlikely to occur • The Study Area does not occur within the distribution for this species (unlikely to occur). • The species may forage in the Study Area in ironbark woodlands however there is a lack of suitable cypress pine and bulloak vegetation for suitable roosting habitat. • No records occur within the Study Area/locality.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Mammals					
Large-eared pied-bat (*Chalinolobus dwyeri*)	E, EN	This microbat species is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland, down south to Bungonia in the NSW Southern Highlands. The species has close association with the presence of sandstone escarpment (for roosts) and fertile valleys (for foraging). **Foraging habitat:** Foraging tends to occur in riverine and riparian corridors however eucalypt dominated patches of vegetation are also suitable. **Roosting and bredong habitat:** The large-eared pied bat requires the presence of diurnal roosts in order to shelter. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. Foraging habitat for the species is likely to occur within the Study Area in eucalypt open and riparian woodland however there is a lack of suitable roosting habitat.	Yes	No	Likely to occur • The Study Area occurs within the distribution for this species (may occur). • The species may forage in the Study Area in ironbark woodlands however there is a lack of suitable roosting habitat. • 'Probable' recordings of the species via Anabat Detection Equipment were recorded in four locations within the Study Area/locality.
Ghost bat (*Macroderma gigas*)	V, EN	This species occupies habitats ranging from the arid Pilbara to tropical savannah woodlands and rainforests. Ghost bats roost in caves or crevices that are generally deep with relatively stable temperatures and moderate to high relative humidity roosting cave dependency.	Yes	No	Unlikely to occur • Study Area is within the distribution for this species (may occur). • Suitable breeding, roosting and foraging habitat of deep crevices with stable temperatures and relatively high humidity were not observed within the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		Breeding habitat: breeding habitat is within their roosting sites and is confined to caves with multiple entrances. **Foraging habitat**: Foraging habitat is comprised of tropical savanna woodlands and rainforests approximately 2km away from roosting sites. **Roosting habitat:** Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23-28 degrees C and a moderate to high relative humidity of 50-100 percent. Suitable breeding, roosting and foraging habitat of deep crevices with stable temperatures and relatively high humidity were not observed within the Study Area.			• No records for the species exist within the Study Area/locality. • No habitat critical to the survival of the species was observed during fieldwork within the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Corben's long-eared bat (*Nyctophilus corbeni*)	V, VU	This microbat species has a scattered distribution mostly within the Murray-Darling Basin, but with some records outside of this area. It is more common in box, ironbark and cypress pine woodland on the western slopes and plains. Its stronghold seems to be the Pilliga scrub. It roosts in tree hollows, crevices and under loose bark. **Foraging habitat:** Foraging tends to be located around patches of trees in the landscape. **Breeding habitat:** Little information is available on the breeding behaviour for the species. **Roosting habitat:** Roosting behaviour is located within dead trees including ironbark's, cypress and bulloak. Potential foraging and roosting habitat of ironbark woodland is present in areas within the Study Area.	Marginally	No	Unlikely to occur: • Potential foraging and roosting habitat of ironbark woodland is present in areas within the Study Area. • No records for the species exist within the Study Area/locality. The closest record is approx. 40km south-west of the Study Area from 2000 (ALA, 2022). • Anabat analysis indicates that distribution in the Study Area is more consistent with two unlisted species of *Nyctophilus*.
Greater glider (*Petauroides volans*)	V, VU	The greater glider is an arboreal, nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is more common in taller, montane older forests which have an abundance of hollows. There is no information available that differentiates foraging, breeding and roosting habitat for the species however, for roosting it prefers tall	Yes	Yes	Known to occur • The Study Area occurs within the distribution for the species (likely to occur). • Potential foraging and roosting habitat of tall, mature eucalypt forests present within some areas of the Study Area, with large hollow bearing trees present at low densities. • There is one ALA record (2020) within the locality, and one Wildnet record from the Study Area (n.d.).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		mature forests with hollow bearing trees. Potential foraging and roosting habitat of tall, mature eucalypt forests present within the Study Area, although large trees with large hollows are present at low densities.			
Northern quoll (*Dasyurus hallucatus*)	E, -	The northern quoll occurs in a range of habitats, including open dry sclerophyll forest and woodland, riparian woodland, low dry vine thicket, the margins of notophyll vineforest, sugarcane farms and in urban areas. They are most abundant in hilly or rocky areas close to permanent water. **Breeding habitat**: generally requires habitat encompassing some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal, as well as connection to permanent water. Dens are made in rock crevices, tree holes or occasionally termite mounds. **Foraging and dispersal habitat:** this species more likely to be present in Queensland where there are high relief areas that have shallower soils, greater cover of boulders, less fire impact and closer to permanent water.	Yes	Yes	Unlikely to occur • Study Area is within the distribution of the species. • Habitat within the Study Area was observed as generally unsuitable for northern quoll. • There is one historic ALA record within the locality from 1966 (ALA, 2022). Does not meet recency criteria (within 20 years) • No habitat critical to the survival of the species was observed during fieldwork within the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
• Koala (*Phascolarctos cinereus*)	E, EN	Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species as explained by Martin & Handasyde 1999 (as cited in, DoE, 2019h). **Breeding and foraging habitat**: Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. **Dispersal habitat**: Dispersal habitat is recognised as habitat that the koala can disperse into and is typically open woodland, paddock trees, riparian habitat and habitat where there are koala food trees. Foraging and breeding habitat associated with eucalypt dominated communities occurs within the Study Area, and potential dispersal habitat associated with *E. crebra* and *E. tereticornis* woodlands and forests.	Yes	Yes	Known to occur • Study Area is within the distribution of the species (likely to occur). • Foraging and breeding habitat associated with eucalypt dominated communities occurs within the Study Area, and potential dispersal habitat associated with *E. crebra* woodlands. Potential dispersal habitat present in the form of open grassy areas and cleared agricultural with occasional standalone koala food trees. • There is one historic ALA record (1996) within the locality, and one Wildnet record from the Study Area (n.d.).
Grey-headed flying fox (*Pteropus poliocephalus*)	V, -	It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. Ebv (1998) explained that the primary food source is blossom from Eucalyptus and related genera but in some areas it also utilises	Yes	No	Unlikely to occur • The Study Area is within the distribution of the species (likely to occur). • The Study Area is approximately 190 km north-west from the closest active colony with recent grey-headed flying fox activity (per the interactive flying-fox viewer of the Department of Environment). This colony is located near Woocoo National Park.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		a wide range of rainforest fruits (as cited in, DoE, 2019i). **Breeding habitat:** no specific information is available for breeding habitat requirements however it is said that roosting camps contain breeding habitat. **Foraging and roosting habitat**: The listing advice for this species says that individuals can travel up to 50 km from their known roosting camps, in order to forage. They generally roost within 20 km of food sources which include the nectar and pollen of Eucalyptus, Melaleuca and Banksia native trees.			• No records in the locality, closest record approx. 25km west of the Study Area (ALA, n.d.).
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	V, VU	This species is found in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Kavanagh et al. 1995; Rees et al. 2007). **Breeding habitat:** no specific information is available on breeding habitat for the species **Foraging and roosting habitat:** The species shows a preference for larger patches of mature growth forests that contain suitable trees that they require for foraging and roosting. The Study Area does contain some old growth eucalypt forests that could be used as suitable habitat for the species. Larger remnant forests, which have records for the species, occur in the	Yes	Yes	Potential to occur: • The Study Area is within the distribution for the species. • There is potential foraging habitat for the species in the form of old growth eucalypt forests present within the Study Area. The locality contains remnant vegetation such as state forests that would make the Study Area a movement corridor, should suitable foraging resources be present. • There are historic records within the Locality from 1997 (Wildnet, 2022) and seven in locality from 1998 (ALA, 2022).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		locality and are likely more favourable for the species in terms of foraging and denning. It is noted that 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 (DCCEEW 2022). Study Area may be a corridor for movement.			
Short-beaked echidna (*Tachyglossus aculeatus)*	-, SLC	This species is widespread in Australia, including Tasmania and offshore islands. Found in most habitat types, from deserts to rainforests, open woodland, eucalypt forests, alpine mountains, grasslands, and coastal shorelines. Echidnas burrow into the soil, hide under vegetation and shelter in hollow logs, rock crevices and in burrows created by wombats or rabbits (Nicol 2015b; Alpin et al. 2016). **Breeding habitat:** Courtship groups observed in a variety of habitats (Morrow et al. 2009) including; under rocks or rocky overhangs, grass tussocks, hollows at the base of trees, rotten tree stumps, hollow logs, in burrows and depressions in the soil. **Foraging habitat:** Echidnas spend a lot of time in areas with vegetation that provides cover (Nicol 2015a). The Study Area does contain suitable habitat for the species.	Yes	Yes	Known to occur • The Study Area is within the distribution for the species (likely to occur). • There is potential foraging and breeding habitat for the species within the Study Area. • There is one record within the Study Area (Wildnet, 2022) and five in locality from 2002 (ALA, 2022).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Reptiles					
Yakka skink (*Egernia rugosa*)	V, VU	The yakka skink is known to occur in open dry sclerophyll forest, woodland and scrub. The core habitat of this species is within the Mulga lands and Brigalow belt south bioregions. It is known from rocky outcrops and sand plain areas with dense ground vegetation. This species will often take refuge among dense ground vegetation, large hollow logs, cavities in soil-bound root systems of fallen trees and beneath rocks. There is no delineation between breeding, dispersal and foraging habitat for this species. There is potential habitat occurs throughout the Study Area, as there are open woodlands associated with ironbark (*Eucalyptus* spp.)	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • There is potential habitat occurs throughout the Study Area, as there are open woodlands associated with ironbark (Eucalyptus spp.) • No records exist for this species within the Study Area/locality. • No habitat critical to the survival of the species was observed during fieldwork within the Study Area.
Adorned delma (*Delma torquata*)	V, VU	This species normally inhabits eucalypt-dominated woodlands and open-forests in Queensland Regional Ecosystem Land Zones (LZ). The regional ecosystems it prefers are ones dominated by poplar box (*Eucalyptus populnea*) on alluvial plains, lemon-scented gum (*Corymbia citriodora*) open forest on coarse-grained sedimentary rocks and poplar box/brigalow (*Acacia harpophylla*) open forests on fine-grained sedimentary rocks. There is no delineation between breeding, dispersal and foraging habitat	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • Potential habitat of Poplar Box, Brigalow woodlands and open forests are present within the Study Area. However, there is a lack of the required microhabitat features such as thick matts of leaf litter. • There is a lack of preferred canopy species occur, such as poplar box and brigalow trees, there is generally a lack of microhabitat features due to

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		for this species. However, microhabitat requirements include presence of rocks, logs and specific mats of leaf litter typically 30-100 mm thick. There is some preferred canopy species, such as poplar box and brigalow trees, but there is generally a lack of microhabitat features due to heavy grazing throughout the Study Area.			heavy grazing throughout the Study Area. • No records for this species occur within the Study Area/locality and no observations were made during field surveys. The closest record from 2010 is in Kroombit Tops National Park, approx. 60km from the Study Area (ALA, 2022).
Dunmall's snake (*Furina dunmalli*)	V, VU	This species is found in forests and woodlands on black alluvial cracking clay and clay loams dominated by Brigalow (*Acacia harpophylla*), other Wattles (*A. burowii, A. deanii, A. leioclyx*), native Cypress (Callitris spp.) or Bull-oak (*Allocasuarina luehmannii)*. There is no delineation between breeding, dispersal and foraging habitat for this species. Microhabitat features preferred includes fallen timber and ground litter. There is potential habitat on the Study Area associated with cracking clay soils, however due to the presence of cane toads and quality of soils being degraded due to grazing, suitable habitat would be considered low.	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • There is some black cracking clay necessary for this species, but there is generally a lack of good quality habitat features due to heavy grazing throughout the Study Area. • No records for this species occur within the Study Area/locality and no observations were made during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Golden-tailed gecko (*Strophurus taenicauda)*	-, NT	The Golden-tailed gecko is endemic to inland southern and central Queensland, where it inhabits a variety of dry woodland and open forest habitats within the Brigalow Belt. It is predominantly arboreal, often sheltering during the day beneath loose bark in standing dead or alive trees, such as Brigalow, Casuarina sp., ironbark and Callitris sp.. There is no delineation between breeding, dispersal, and foraging habitat for this species. There is likely habitat in the study area associated with dry woodland and open forest which supports tree hollows, splits, and loose bark.	Yes	Yes	Likely to occur • The Study Area does occur within the distribution for this species (may occur). • There is likely habitat in the Study Area associated with tree hollows and splits, and loosely barked trees. • There is one recorded species in the locality, recorded in 2012, +/- 1.5km from the Study Area (ALA, 2024). • No habitat critical to the survival of the species was observed during fieldwork within the Study Area.
Ornamental snake (*Denisonia maculata*)	V, VU	The Ornamental Snake's preferred habitat is within, or close to, habitat that is favoured by its prey - frogs. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4, but also lake margins and wetlands There is no delineation between breeding, dispersal and foraging habitat for this species. There is potential habitat in the Study Area associated with cracking clay soils, however due to the presence of cane toads and quality of soils being	Yes	Yes	Unlikely to occur • The Study Area does occur within the distribution for this species. • There is potential habitat within the Study Area associated brigalow communities. Deep cracking clay soils were not observed and due to the notable presence of cane toads and soil degradation resultant of historic land clearing and pastoral use suitable habitat is generally absent. • There is one record with unknown date in the locality, +/- 500m from the Study Area (ALA, 2022). • No habitat critical to the survival of the species was observed during fieldwork within the Study Area.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		degraded due to grazing, suitable habitat would be considered low.			
Grey snake (*Hemiaspis damelii)*	E, EN	The distribution and ecology of *H. damelii* is poorly known. It tends to favour dry sclerophyll forests and woodlands on clay soils where water bodies or gullies are present. It shelters under rocks, logs and other debris, as well as in cracks in soil. There is no delineation between breeding, dispersal and foraging habitat for this species. There is potential habitat in the Study Area associated with clay soils, however due to the presence of cane toads and quality of soils being degraded due to grazing, suitable habitat would be considered low.	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • There is some clay soils necessary for this species, but there is generally a lack of good quality habitat features due to heavy grazing throughout the Study Area. • No records for this species occur within the Study Area/locality and no observations were made during field surveys.
Southern snapping turtle (*Elseya albagula*)	CE, CE	Habitat preferences of the white-throated snapping turtle are somewhat unclear. The species is considered by some to be a habitat specialist (Todd et al., 2013) **Breeding habitat and foraging habitat:** Prefer clear, flowing, well-oxygenated waters (Hamann et al., 2007). This preference is associated with its physiological adaptation to extract oxygen from water via cloacal (aquatic) respiration (Mathie & Franklin, 2006; Clark et al., 2008).	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • There is potential habitat in the Study Area when ephemeral waterways are holding water. Likelihood is low with quality of water, when flowing, reduced due to livestock grazing. • No records for this species occur within the Study Area/locality and no observations were made during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		There is potential habitat in the Study Area when ephemeral waterways are holding water. Likelihood is low with quality of water, when flowing, reduced due to livestock grazing.			
Fitzroy River turtle (*Rheodytes leukops)*	V, VU	The Fitzroy River Turtle is found in rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles. **Breeding habitat and foraging habitat:** Preferred areas have high water clarity, and are often associated with Ribbonweed (*Vallisneria sp*.) beds (Cogger et al. 1993). Common riparian vegetation associated with the Fitzroy River Turtle includes Blue Gums (*Eucalyptus tereticornis*), River Oaks (*Casuarina cunninghamiana*), Weeping Bottlebrushes (*Callistemon viminalis*) and Paperbarks (*Melaleuca linariifolia*) (Tucker et al. 2001). There is potential habitat in the Study Area when ephemeral waterways are holding water. Likelihood is low with quality of water, when flowing, reduced due to livestock grazing	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • There is potential habitat in the Study Area when ephemeral waterways are holding water. Likelihood is low with quality of water, when flowing, reduced due to livestock grazing. • No records for this species occur within the Study Area/locality and no observations were made during field surveys.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
Salt-water crocodile, estuarine crocodile (*Crocodylus porosus)*	Mi, VU	Studies from Arnhem Land (Northern Territory) indicated that the Salt-water Crocodile mostly occurs in tidal rivers, coastal floodplains and channels, billabongs and swamps (Webb et al. 1987) up to 150 km inland from the coast (Webb et al. 1983f). In Queensland, the species is usually restricted to coastal waterways and floodplain wetlands. Populations may also be found hundreds of kilometres upstream, such as in the Fitzroy River and the waterways of the southern Gulf of Carpentaria (Read et al. 2004). **Breeding habitat and foraging habitat:** The salt-water crocodile usually inhabits the lower (estuarine) reaches of rivers, while the upper reaches are inhabited by *Crocodylus johnstoni* (Fresh-water Crocodile); although, areas of overlap occur in some rivers (Webb et al. 1983a).	Yes	No	Unlikely to occur • The Study Area occurs within the distribution for this species (may occur). • There is potential habitat in the Study Area when ephemeral waterways are holding water. Likelihood is low with quality of water, when flowing, reduced due to livestock grazing. • No records for this species occur within the Study Area/locality and no observations were made during field surveys.
Flora					
Xerothamnella herbacea	E, EN	*Xerothamnella herbacea* occurs in brigalow (*Acacia harpophylla*) dominated communities in shaded situations, often in leaf litter and is associated with gilgais (shallow ground depressions). Soils are heavy, grey to dark brown clays. This species is not known to occur in any conservation reserves. Three of the four known populations occur in cleared areas or non-remnant vegetation that are not	Yes	No	Potential to occur • The Study Area is within the distribution for the species (may occur). • There is potential habitat of brigalow woodlands within the Study Area. • There are no records within the Study Area/locality. The nearest record exist from Moura and Biloela, beyond the 10 km locality radius. However, it should

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		protected under the Vegetation Management Act 1999 (Queensland Herbarium 2012).			be noted that this is a very cryptic and under-collected species.
Solanum johnsonianum	E, EN	*Solanum johnsonianum* is endemic to Queensland, and found within a region bounded by the towns of Rolleston to Theodore to Biloela to Dululu, which is centred about 160 km due west of Gladstone (Bean 2004; ALA 2016). However, it is restricted to very small localised areas where stands of the species exist (ALA 2016). The speciesd is almost always found in open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils (Bean 2004). Other associated species include lapunyah (*Eucalyptus thozetiana)* with an understory of wilga *(Geijera parviflora*) (Queensland Herbarium 2012, cited in DEHP 2015).	Yes	No	Potential to occur • The Study Area is within the distribution for the species (may occur). • There is potential habitat of eucalypt woodlands and brigalow woodlands present within the Study Area. • There are no records within the Study Area/locality. The nearest record exist from Moura and Biloela, beyond the 10 km locality radius.
Solanum dissectum	E, EN	*Solanum dissectum* is a Queensland-endemic species and found within a region bounded by the towns of Blackwater to Bauhinia to Thangool to Dululu, which is centred about 150 km due west of Gladstone (Bean 2004; ALA 2016). However, it is restricted to very small localised areas where populations exist (ALA 2016). In these areas, it may be found in open forest and woodland habitats where brigalow (*Acacia harpophylla*) and potentially lapunyah (*Eucalyptus thozetiana*) characterise the dominant vegetation types on solodic	Yes	No	Potential to occur • The Study Area is within the distribution for the species (may occur). • There is potential habitat of eucalypt woodlands present within the Study Area. • There are no records within the Study Area/locality. The nearest record exist from Moura and Biloela, beyond the 10 km locality radius.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		clay soils (Bean 2004; Queensland Herbarium 2012, cited in DEHP 2015).			
Austral cornflower *(Rhaponticum australe)*	V, VU	The Austral cornflower usually grows on heavy black or red-brown clay, or clay loams derived from basalt. Populations are often confined to roadsides and cultivation headlands and is often found in woodland and grassland and in association with *Eucalyptus crebra* (Narrow-leaved Ironbark*), E. orgadophila* (Mountain Coolibah), E. populnea (Poplar Box), *E. tereticornis* (Forest Red Gum), *E. melanophloia* (Silver-leaved Ironbark), *Angophora subvelutina* (Broad-leaved Apple), *A. floribunda* (Rough-barked Apple), *Cirsium vulgare* (Spear Thistle - introduced species), *Dichanthium sericeum* (Queensland Bluegrass) and Themeda triandra (Kangaroo Grass). The Austral cornflower is considered to be a poor competitor and prefers habitat where grass competition has been reduced by fire or other forms of disturbance. However, the species is unlikely to benefit from disturbance that allows the development of a dense cover of exotic grasses such as Chloris gayana (Rhodes Grass)	Yes	No	Potential to occur • The Study Area is within the distribution for the species (may occur). • There is potential habitat of eucalypt woodlands and open forests present within the Study Area. • There are no records within the Study Area/locality. The nearest records (3) exist 20 km east of the Study Area, from 1996.
Cossinia *(Cossinia australiana)*	E, EN	Cossinia is found only in restricted habitat areas of central-eastern to south-eastern Queensland. It grows naturally in habitats of seasonal–drought adapted rainforests and associated vegetation types not adapted to fire, typically on nutrient–	Yes	Yes (Locality, 2002)	Potential to occur • The Study Area is within the distribution for the species (may occur). • There is potential habitat of drought adapted rainforests and associated

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		rich soils derived from basalt parent materials. Study Area is connected to the Montour State Forest to the South-East where the sighting occurred. With some potentially suitable drought adapted rainforests and associated vegetation types present.			vegetation types within the Study Area. • There is one record within the locality from 2002 bordering the Study Area in the Montour State Forest (ALA, 2022).
Ooline *(Cadellia pentastylis)*	V, VU	Ooline grows in semi-evergreen vine thickets and sclerophyll vegetation on undulating terrain of various geology, including sandstone, conglomerate and claystone. Soils generally have low to medium nutrient content and are normally associated with upper and mid-slopes in the landscape. The altitude is generally 300-460 m above sea level, with some stands known to occur at 600 m above sea level. The species forms a closed or open canopy, as a dominant or commonly with White box (*Eucalyptus albens*) and White cypress pine (*Callitris glaucophylla*), with an open understorey and leaf litter dominating the forest floor. There is some uniformity in the understorey, with Native olive (*Notelaea microcarpa*), Pinkwood (*Beyeria viscosa*), Bitterbark (Alstonia constricta), Wilga (*Geijera parviflora*), Berry saltbush (*Einadia hastata*), Stipa spp. and Aristida spp., abundant at many locations. Small areas of potential habitat with semi-evergreen vine thickets and	Yes	No	Potential to occur • The Study Area is within the distribution for the species (may occur). • There is potential habitat within semi-evergreen vine thickets and sclerophyll vegetation types present within the Study Area. • There are no records within the Study Area/locality. The nearest record exist from Taroom.

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		sclerophyll vegetation types do occur within the Study Area. There is a lack of good quality habitat and connectivity in the Study Area.			
Polianthion minutiflorum	V, V	*Polianthion minutiflorum* grows in forests and woodlands on sandstone slopes and gullies with skeletal soil, or deeper soils adjacent to deeply weathered laterite. The distribution of this species overlaps with semi-evergreen vine thicket TEC. It is a one-meter-high shrub, with densely covered hairy leaves, and hairy minute white flowers. Flowering throughout the year, fruits observed in August and November. No associated species or vegetation was observed during field surveys.	Yes	No	Unlikely to occur • The study area is within the distribution for the species (may occur.) • No records within the Study Area locality. Closest record is approximately 40km east of the Study Area, from 1995. • No associated species or vegetation was observed during field surveys.
Hairy-joint grass *(Arthraxon hispidus)*	V, VU	Hairy-joint grass is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps as well as woodland.	Yes	No	Unlikely to occur • The Study Area is within the distribution for the species (may occur). • No potential habitat in the Study Area in the form of rainforest, wet eucalypt forest or sedgelands. • There are no records within the Study Area/locality. The closest record is 50 km south of the Study Area, from 1995.
King blue-grass *(Dichanthium queenslandicum)*	E, VU	*Dichanthium queenslandicum* occurs on black cracking clay in tussock grasslands mainly in association with other species of blue grasses, but also with other grasses restricted to this soil	Yes	No	Unlikely to occur • The Study Area is within the distribution for the species (may occur).

Species name	Status (EPBC and NC Act)	Habitat requirements	Study Area within species distribution	Records in the Study Area/ locality	Comment on likelihood of occurrence in Study Area
		type. *Dichanthium queenslandicum* is mostly confined to natural grassland on the heavy black clay soils (basalt downs, basalt cracking clay, open downs) on undulating plains. There is potential habitat in the Study Area associated with clay soils, however due to poor quality of soils being degraded due to grazing, suitable habitat would be considered low.			• There is potential habitat in the Study Area associated with clay soils, however due to poor quality of soils being degraded due to grazing, suitable habitat would be considered low. • There are no records within the Study Area/locality. The nearest record is approximately 17 km east of the Study Area, from 2012 (ALA, 2022).
Bluegrass *(Dichanthium setosum)*	V, LC	Associated with heavy basaltic black soils and red-brown loams with clay subsoils. Often found in moderately disturbed areas. Threats relate to heavy grazing, clearing for pasture improvement and cropping, fire, introduced grasses and road widening. Associated species include White Box (*Eucalyptus albens*), Silver-leaved Ironbark (*E. melanophloia*), Yellow Box (*E. melliodora*), Manna Gum (*E. viminalis*), Amulla (*Myoporum debile*), Purple Wire-grass (*Aristida ramosa*), Kangaroo Grass (*Themeda triandra*). Due to poor quality of soils being degraded due to grazing, clearing for pasture improvement and cropping and introduced grasses suitable habitat would be considered low. No individuals were observed during field surveys	Yes	No	Unlikely to occur • The Study Area is within the distribution for the species (may occur). • Habitat is generally unsuitable, and no individuals were observed during field surveys. • There are no records within the Study Area/locality. The nearest record is approximately 250 km east of the Study Area (ALA, 2022)

Status listing per EPBC Act, NC Act: CE, CR = Critically Endangered; E, EN= Endangered; V, VU = Vulnerable; LC = Least Concern; Mi = Migratory, - = no listing

APPENDIX B PMST AND WILDNET RESULTS

Department of Climate Change, Energy, the Environment and Water

Protected Matters Search Tool

Report Generated - 4:24PM - 19 March 2024

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	0
Listed Threatened Ecological Communities	4
Listed Threatened Species	35
Listed Migratory Species	13

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	19
Whales and Other Cetaceans	0
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	4
Key Ecological Features	0
Biologically Important Areas	0
Bioregional Assessments	0
Geological and Bioregional Assessments	0

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected and is accurate at the time of generation. Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

Back to Summary

Listed Threatened Ecological Communities

[Resource Information]

				Presence	
Community ID	**Community Name**	**Threatened Category**	**Website**	**Rank**	**Text**
28	Brigalow (Acacia	Endangered	Species Profile and	Known	Community known to
66	Coolibah - Black Box	Endangered	Species Profile and	May	Community may occur
141	Poplar Box Grassy	Endangered	Species Profile and	Likely	Community likely to
98	Weeping Myall	Endangered	Species Profile and	Likely	Community likely to

Back to Summary

Listed Threatened Species [Resource Information]

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and
81648	*Elseya albagula*	Southern Snapping	Reptile	May	Species or species	Critically Endangered					Species Profile and
5481	*Dichanthium*	King Blue-grass	Plant	Likely	Species or species	Endangered					Species Profile and
942	*Erythrotriorchis*	Red Goshawk	Bird	May	Species or species	Endangered					Species Profile and
3066	*Cossinia australiana*	Cossinia	Plant	Known	Species or species	Endangered					Species Profile and
331	*Dasyurus hallucatus*	Northern Quoll, Digul	Mammal	Likely	Species or species	Endangered					Species Profile and
1179	*Hemiaspis damelii*	Grey Snake	Reptile	May	Species or species	Endangered					Species Profile and
77037	*Rostratula australis*	Australian Painted	Bird	Likely	Species or species	Endangered			Listed - overfly marine		Species Profile and
254	*Petauroides volans*	Greater Glider	Mammal	Known	Species or species	Endangered					Species Profile and
183	*Chalinolobus dwyeri*	Large-eared Pied Bat,	Mammal	May	Species or species	Endangered					Species Profile and
4146	*Xerothamnella*	null	Plant	May	Species or species	Endangered					Species Profile and
26027	*Neochmia ruficauda*	Star Finch (eastern),	Bird	Likely	Species or species	Endangered					Species Profile and
85104	*Phascolarctos cinereus*	Koala (combined	Mammal	Likely	Species or species	Endangered					Species Profile and
82772	*Polianthion*	null	Plant	May	Species or species	Vulnerable					Species Profile and
59398	*Stagonopleura guttata*	Diamond Firetail	Bird	May	Species or species	Vulnerable					Species Profile and
9828	*Cadellia pentastylis*	Ooline	Plant	Likely	Species or species	Vulnerable					Species Profile and
863	*Gallinago hardwickii*	Latham's Snipe,	Bird	May	Species or species	Vulnerable	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and
470	*Grantiella picta*	Painted Honeyeater	Bird	May	Species or species	Vulnerable					Species Profile and
929	*Falco hypoleucos*	Grey Falcon	Bird	May	Species or species	Vulnerable					Species Profile and
59254	*Furina dunmalli*	Dunmall's Snake	Reptile	May	Species or species	Vulnerable					Species Profile and
83395	*Nyctophilus corbeni*	Corben's Long-eared	Mammal	May	Species or species	Vulnerable					Species Profile and
186	*Pteropus poliocephalus*	Grey-headed Flying-fox	Mammal	May	Foraging, feeding or	Vulnerable					Species Profile and
1656	*Delma torquata*	Adorned Delma,	Reptile	May	Species or species	Vulnerable					Species Profile and
1420	*Egernia rugosa*	Yakka Skink	Reptile	May	Species or species	Vulnerable					Species Profile and
9338	*Arthraxon hispidus*	Hairy-joint Grass	Plant	Likely	Species or species	Vulnerable					Species Profile and
923	*Turnix melanogaster*	Black-breasted Button-	Bird	May	Species or species	Vulnerable					Species Profile and
22647	*Rhaponticum australe*	Austral Cornflower,	Plant	May	Species or species	Vulnerable					Species Profile and
174	*Macroderma gigas*	Ghost Bat	Mammal	May	Species or species	Vulnerable					Species Profile and
14159	*Dichanthium setosum*	bluegrass	Plant	Likely	Species or species	Vulnerable					Species Profile and
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species	Vulnerable	Migratory	Migratory Wetlands	Listed		Species Profile and
87600	*Petaurus australis*	Yellow-bellied Glider	Mammal	May	Species or species	Vulnerable					Species Profile and
64440	*Geophaps scripta*	Squatter Pigeon	Bird	May	Species or species	Vulnerable					Species Profile and
682	*Hirundapus*	White-throated	Bird	May	Species or species	Vulnerable	Migratory	Migratory Terrestrial	Listed - overfly marine		Species Profile and
1193	*Denisonia maculata*	Ornamental Snake	Reptile	Known	Species or species	Vulnerable					Species Profile and
1761	*Rheodytes leukops*	Fitzroy River Turtle,	Reptile	May	Species or species	Vulnerable					Species Profile and

Back to Summary

Listed Migratory Species [Resource Information]

				Presence							
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website
863	*Gallinago hardwickii*	Latham's Snipe,	Bird	May	Species or species	Vulnerable	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and
86651	*Cuculus optatus*	Oriental Cuckoo,	Bird	May	Species or species		Migratory	Migratory Terrestrial			Species Profile and
678	*Apus pacificus*	Fork-tailed Swift	Bird	Likely	Species or species		Migratory	Migratory Marine Birds	Listed - overfly marine		Species Profile and
612	*Myiagra cyanoleuca*	Satin Flycatcher	Bird	Likely	Species or species		Migratory	Migratory Terrestrial	Listed - overfly marine		Species Profile and
609	*Monarcha melanopsis*	Black-faced Monarch	Bird	May	Species or species		Migratory	Migratory Terrestrial	Listed - overfly marine		Species Profile and
592	*Rhipidura rufifrons*	Rufous Fantail	Bird	May	Species or species		Migratory	Migratory Terrestrial	Listed - overfly marine		Species Profile and
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species	Vulnerable	Migratory	Migratory Wetlands	Listed		Species Profile and
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species		Migratory	Migratory Wetlands	Listed		Species Profile and
682	*Hirundapus*	White-throated	Bird	May	Species or species	Vulnerable	Migratory	Migratory Terrestrial	Listed - overfly marine		Species Profile and
644	*Motacilla flava*	Yellow Wagtail	Bird	May	Species or species		Migratory	Migratory Terrestrial	Listed - overfly marine		Species Profile and
1774	*Crocodylus porosus*	Salt-water Crocodile,	Reptile	Likely	Species or species		Migratory	Migratory Marine	Listed		Species Profile and

APPENDIX C ECHOLOCATION BAT ANALYSIS RESULTS

Bat Call Analysis Report

Theodore Project

Prepared for ERM

Prepared by:

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Document Records - Quality

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FILED AS	ME23006_Theodore Wind Farm

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1.0 Introduction

1.1 Background

Green Tape Solutions were commissioned to undertake bat call analysis for a Project Area in Theodore, Queensland.

1.2 Scope of Work

The specific scope of works for this report includes the following:

- Outline the methodology used to analyse the microbat call within the subject site; and,
- Present the findings of all of the bat call surveys conducted at the project site.

2.0 Methodology

2.1 Capture Technique

Microbat calls were sampled using Anabat Swift devices and Anabat Chorus devices (Titley Electronics). Passive monitoring was undertaken from several periods within the last 12 months totalling 77 trap nights (One trap night being one detector recording for one night) including 17-22 October 2022, 13-17 February 2023 and 27-31 March 2023. The original call files display Australian Eastern Standard Time. The data was analysed using Anabat Insight.

Monitoring commenced at dusk (approximately 1800 hours) and continued until dawn (approximately 0530 hours). Ultrasonic call monitoring surveys on anabat detectors were conducted using full-spectrum fitted with omnidirectional ultrasonic microphone.

2.2 Call Identification

Anabat recordings were analysed using Anabat software (Anabat Insight). Identifications were made by categorising call shape and frequency, with a species match given in consideration to region, known bat distributions, and habitats present. The focus of the bat surveys was to assess the presence of bat species found within the Project Area, and to assess the potential for rare and threatened species to occur.

Call identification for this dataset was based on call keys and descriptions published for Queensland (Reinhold *et al.*, 2001) and New South Wales (Pennay *et al.*, 2004).

Species' identification was further refined using the probability of occurrence of each species based on their geographic distribution (Churchill, 2008, Van Dyck and Strahan, 2008). Species nomenclature used in this report follows Churchill (2008).

The reliability of identification is as follows:

- **Definite** - one or more calls where there is no doubt about the identification of the species;
- **Probable** - most likely to be the species named, low probability of confusion with species that use similar calls; and,
- **Possible -** call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

2.3 National Standard

The format and content of this report complies with the nationally accepted standards for the interpretation and reporting of Anabat and Songmeter data (Reardon, 2003), which is currently available from the Australasian Bat Society at www.ausbats.org.au.

3.0 Results

3.1 Total Species Recorded

The majority of calls were considered to be of medium to good quality calls.

A total of 8,840 sequence files were analysed. Two devices did not have any identifiable calls. A small proportion of the files in this dataset contained background noise or resulted in poor quality calls that did not provide bat calls for analysis. While some call sequences were recognised as bat calls, the quality was not sufficient to assign species identification.

A summary of the species identified through bat call analysis is provided in **Table 1**.

Table 1: Summary of bat call analysis (QLD)

Species	NC Act	EPBC Act	October 2022		February 2023			March 2023		
			A9	A12	A14	A19	A26	C2	C11	C15
Austronomus australis	LC	NOC	Definite	Definite		Definite			Definite	Definite
Chaerephon jobensis	LC	NOC		Probable	Probable	Probable			Definite	Probable
Chalinolobus dwyeri	V	V		Probable	Probable	Probable	Probable			Probable
Chalinolobus gouldii	LC	NOC	Definite	Definite	Definite	Definite	Probable	Definite	Definite	Definite
Chalinolobus morio	LC	NOC			Probable			Definite	Probable	Probable
Chalinolobus nigrogriseus	LC	NOC		Definite	Definite	Definite	Definite		Definite	Definite
Chalinolobus picatus	LC	NOC			Probable	Probable	Probable		Probable	Probable
Miniopterus australis	LC	NOC								Probable
Miniopterus orianae oceanensis	LC	NOC		Probable	Probable	Probable	Probable		Probable	Probable
Myotis macropus	LC	NOC	Possible		Possible	Possible	Possible	Possible	Possible	Possible
Nyctophilus sp	LC	NOC	Possible		Possible	Possible	Possible	Possible	Possible	Possible
Ozimops lumsdenae	LC	NOC	Possible		Possible	Possible	Possible	Possible	Possible	Possible
Ozimops ridei	LC	NOC	Definite	Definite	Definite	Definite	Probable			Probable
Rhinolophus megaphyllus	LC	NOC	Definite	Definite	Definite	Definite			Definite	Definite
Saccolaimus flaviventris	LC	NOC								Definite
Scotorepens balstoni	LC	NOC	Definite	Definite	Definite	Definite			Definite	Definite
Scotorepens greyii	LC	NOC	Probable	Probable	Probable	Probable	Probable		Probable	Probable
Scotorepens sp.	LC	NOC		Probable	Probable	Probable	Probable		Probable	Probable
Setirostris eleryi	LC	NOC		Possible	Possible	Possible	Possible		Possible	Possible

Taphozous troughton	LC	NOC	Definite	Definite	Definite	Definite		Definite	Definite
Vespadelus troughtoni	LC	NOC		Probable					Probable
Vespadelus vulturnus	LC	NOC		Probable			Probable		Probable

LC: Least Concern, NOC: Not of Concern, V: Vulnerable

3.2 Samples of Calls / Sequences Files

Samples of call extracted from the dataset for each species identified is provided in the following figures

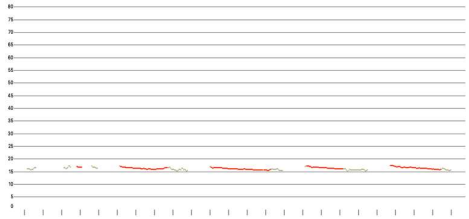
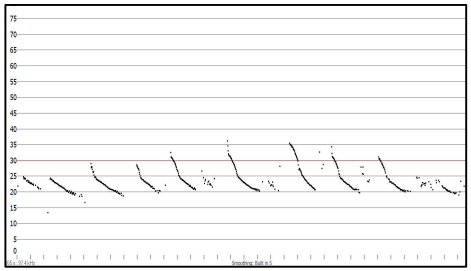
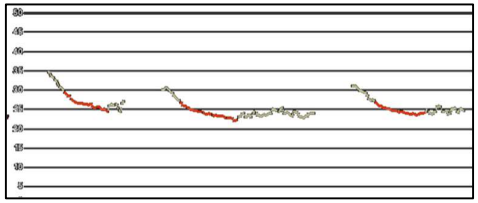
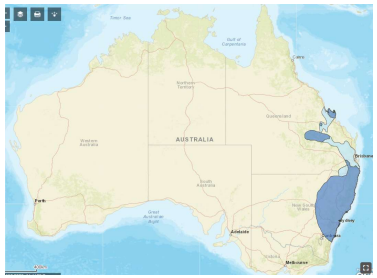
Species	Calls	Known distribution (Extract from Ausbats maps from Australian Bat Society)
Figure 1: *Austronomus australis*		
Definite call. This bat is easily recognised by its constant frequency calls range in bandwidth from 10.5 to 15 kHz (Pennay *et al.*, 2004).		
Figure 2: *Chaerephon jobensis*		
Definite call. Their characteristic frequency average 19.8 kHz (range 16.12-23.6kHz). Pulse shape variable and inconsistent with abrupt changes in frequency. *C. jobensis* often flies in pairs and therefore produce paired call pulses at alternating frequencies with intermittent, “excited”, linear pulses.		

Figure 3: *Chalinolobus dwyeri*

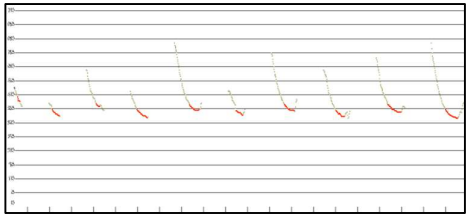




Probable call.

The call is composed of alternate curved pulses, which have up-sweeping, down-sweeping or no tail. The average call characteristic frequency varies between 23 to 24 kHz. Every second pulse stepped-up by about 2 kHz, so that the lower pulses are about 22.5 kHz and the higher pulses are about 25 kHz.

Figure 4: *Chalinolobus gouldii*

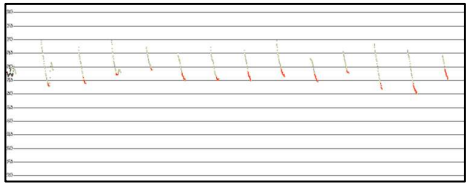




Definite call.

This species has a curved shape call with characteristic frequency 28 to 34kHz. Pulse alternates in frequency and mostly down-sweeping tail or no tail.

Figure 5: *Chalinolobus morio*

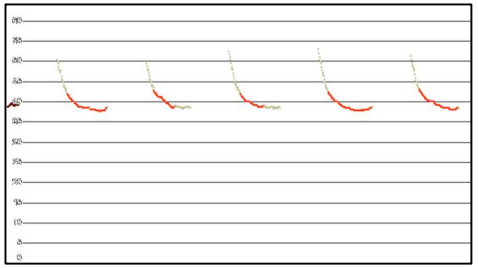




Definite call.

C. morio has a down-sweeping tail curved pulse with characteristic frequency 47.5 to 53 kHz. It often has a very brief characteristic section. Species that overlap in frequency (*Vespadelus troughtoni, V. pumilus* and *V. vulturnus*) but all have up-sweeping tails.

Figure 6: *Chalinolobus nigrogriseus*

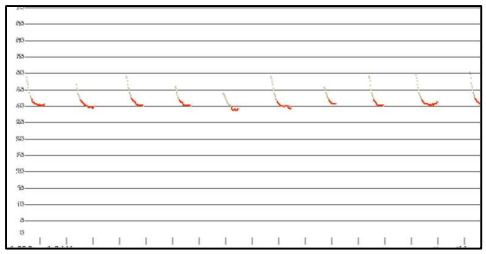




Definite call.

This species has a curved shape pulse with characteristic frequency between 37 to 40 kHz. Usually with no tail or occasionally up sweeping tail. *C. nigrogriseus* have relatively longer characteristic and tail sections, usually 2/3 or more of the total pulse (Pennay *et al* 2004).

Figure 7: *Chalinolobus picatus*

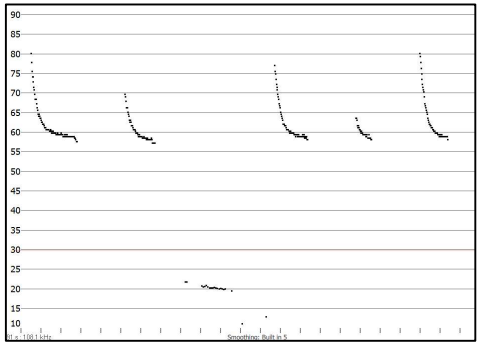




Probable call.

The call is composed of alternate curved pulses without a tail or short up-sweeping tail when in search phase. Average characteristic frequency 38 to 42 kHz. Every second pulse is stepped-up by about 2 kHz.

Figure 8: *Miniopterus australis*

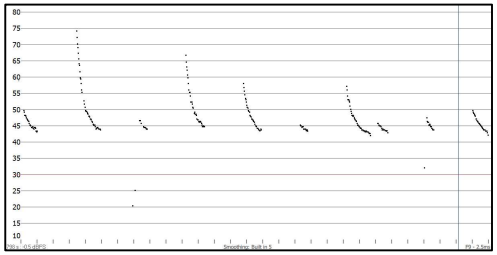


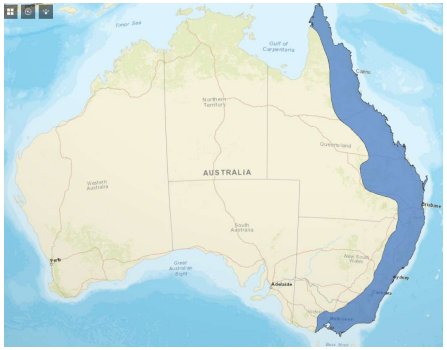


Definite call.

This species displays a characteristic frequency between 54.5 – 64.5 kHz with a curved, usually down-sweeping tail (Pennay *et al* 2004). It overlaps in frequency with *Vespadelus pumilus* between 57 – 58 kHz but the latter exhibits curved up-sweeping tail.

Figure 9: *Miniopterus orianae oceanensis*





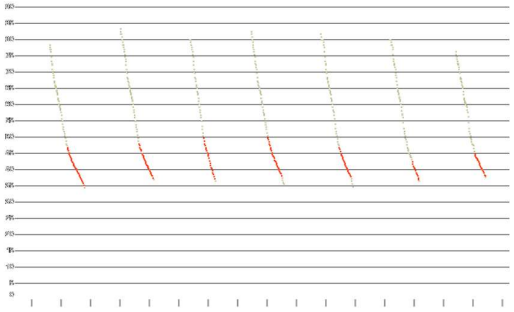
Probable call.

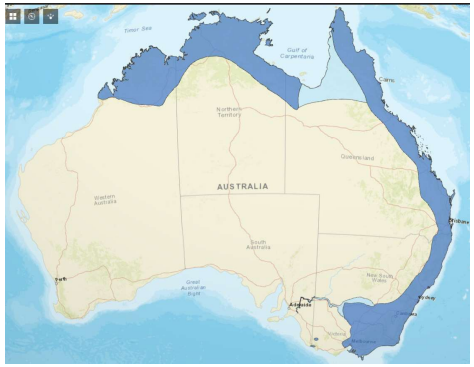
The species call is characterised by its long curved pulse with a small down-sweeping tail and its frequency between 43-47kHz (Reinhold, 2001).

Pulse shape and time between calls usually variable within a sequence.

Shorter duration, can be distinguished from *V. vulturnus* by having a longer pre-characteristic section (drop in frequency usually greater than 2 kHz) and most pulses do not have an up-sweeping tail (Reinhold, 2001). Pulse shape and time between calls can be quite variable within a sequence (Reinhold, 2001).

Figure 10: *Myotis macropus*





Possible call.

Near-vertical pulse dropping to about 30 to 35-50kHz. *M. macropus* mostly have a pulse interval of less than 75ms and usually have one kink close to the middle so that the second part has a lesser slope than the first (Reinhold, 2001).

This call can be confused with *Nyctophilus spp* calls. The latest have usually a pulse interval greater than 95ms and are slightly more complicated structure

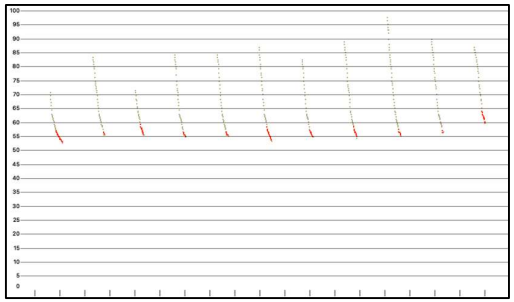
with two kinks instead of one.

Figure 11: Nyctophilus spp

Possible call.

This species displays a near-vertical pulse, characteristic frequency between 80 and 35KHz (Pennay *et al*, 2004).

The species from this genus cannot be distinguished from each other.





N. geoffroyi

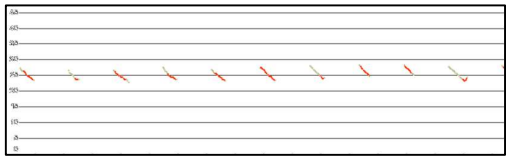


N. gouldi

Figure 12: *Ozimops lumsdenae*

Definite call.

Characteristic frequency higher than 22 and lower than 24kHz. *O. lumsdenae* pulse can be confused with *S. flaviventris* However, the latter rarely has calls above 22kHz. *O. lumsdenae* reference calls have pulses] rising in frequency and can get up to 27kHz.



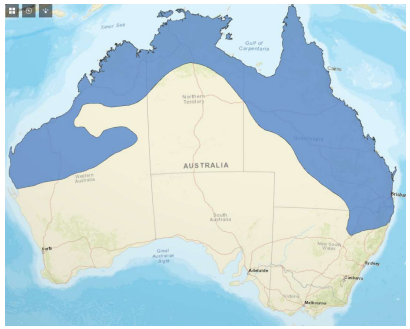
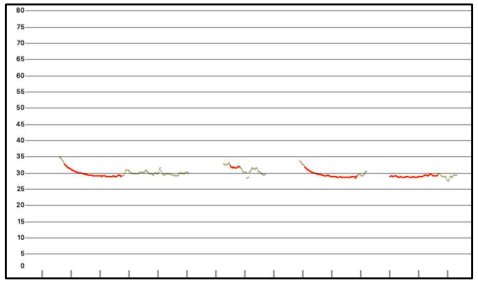
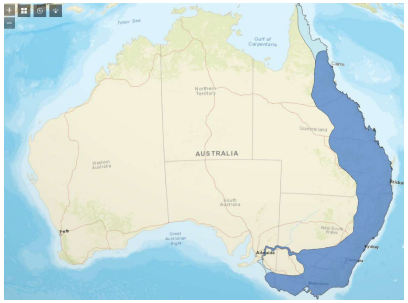


Figure 13: *Ozimops ridei*

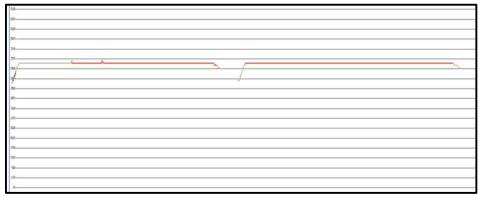


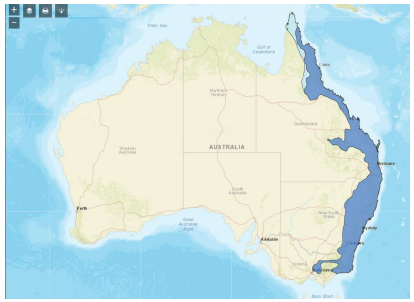


Definite call.

O. ridei calls are flat and sometimes a bit curved with frequency a bit lower than 30kHz. Characteristic frequency of this species is between 28 to 36 kHz. Calls in the same frequency range as *Micronomus norfolkensis*, but *O. ridei* calls may jump up to a higher frequency than the surrounding pulses, this does not occur in a regular pattern like in *M. norfolkensis*.

Figure 14: *Rhinolophus megaphyllus*

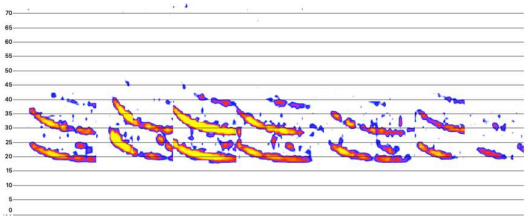




Definite call.

The species call cannot be misidentified with any other species. Pulses have an up-sweeping initial section a perfectly flat, relatively long characteristic section and a down sweeping tail (Reinhold, 2001). Characteristic frequency ranges from 66 to 72 kHz.

Figure 15: *Saccolaimus flaviventris*



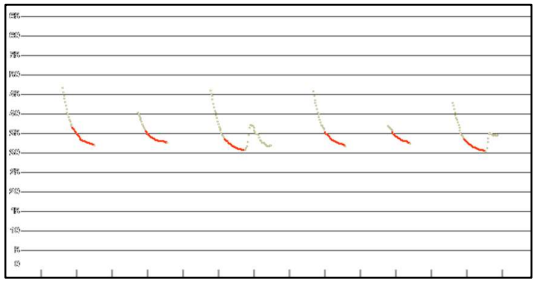


Definite call.

Curved, characteristic frequency 18 to 21.5 kHz. The characteristic frequency does not go above 22 kHz. Other species that could overlap do not occur in this area.

T. troughtoni also produces a flat type call pulse at the same frequency as *S. saccolaimus*. It is typically long and straight or slightly curved and almost horizontal, similar to *S. saccolaimus*.

Figure 16: *Scotorepens balstoni*

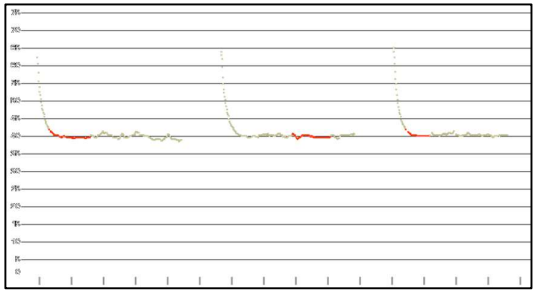




Probable call.

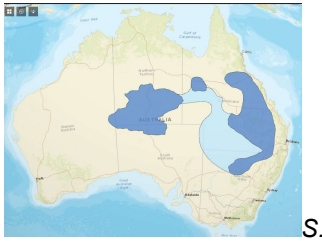
Pulse of this species is curved with tail variable, but an up-sweeping tail is often more prominent with greater duration. Characteristic frequency 31 to 35 kHz (n = 28) and the frequency of the knee 33 to 37 kHz.

Figure 17: *Scotorepens greyii*

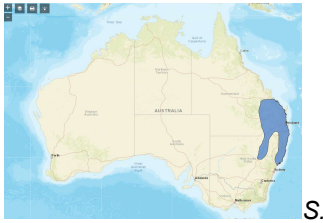


Probable call.

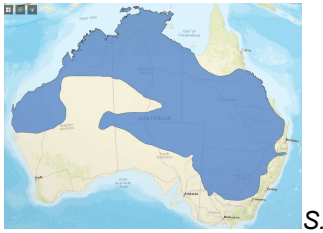
S. greyii has a curved and up-sweeping tail pulse. Its characteristic frequency is between 36 to 41.5 kHz. *S. eleryi* and S. sp (Parnaby) cannot be distinguished from S. greyii.



S. eleryi

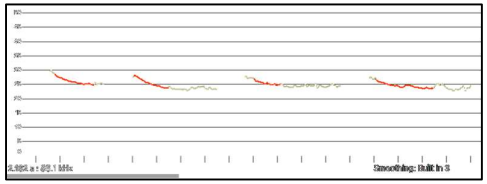


S. sp. (Parnaby



S. greyii

Figure 18: *Taphozous troughtoni*

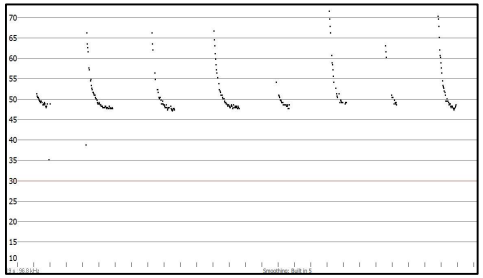


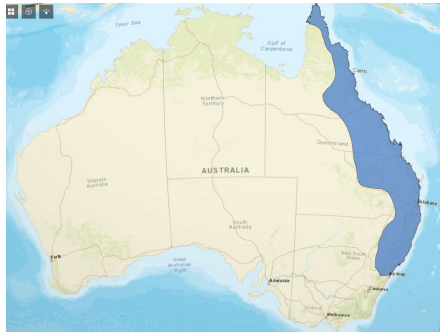


Definite call.

T. troughtoni produces a flat type call pulse at the same frequency as *S. saccolaimus*. It is typically long and straight or slightly curved and almost horizontal, similar to *S. saccolaimus*.

Figure 19: *Vespadelus troughtoni*





Possible call.

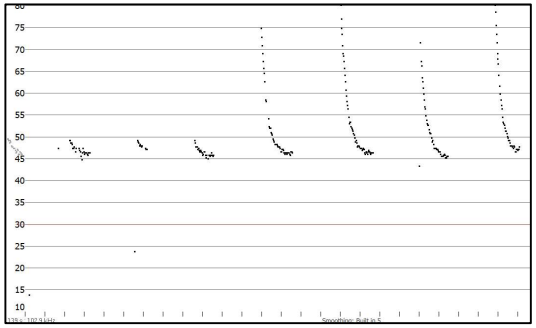
This species displays a curved pulse with not prominent up-sweeping tail. Its characteristic frequency is between 48.5 to 55 kHz (Pennay *et al*, 2004). If the end frequency is lower than 51 kHz, then the call can be identified to *V. Troughtoni* and be differentiated from *V. pumilus*.

Figure 20: Vespadelus vulturnus

Curved and up-sweeping tail calls with characteristic frequency between 45 to 53 kHz.

It cannot be distinguished from *V. regulus*, or some *V. darlingtoni* when up-sweeping tail.

It is distinguished from *Miniopterus schreibersii oceanensis* by having consecutive pulses even, with mostly up-sweeping tails and drop in frequency of pre-characteristic section mostly less than 2 kHz.





4.0 Conclusion

A total of 23 microbat species were either confirmed 'definite', 'probable' or 'possible' within the Project area. All bats identified on the site were expected to be present within the region.

Calls from *Nyctophilus sp* have been identified as possible in the project areas, as they are very similar to *Myotis macropus*. Two species of *Nyctophilus* possibly occur within the Project Area.

Chalinolobus dwyeri calls have been detected as probable at several sites. This species is listed as vulnerable under state and federal legislation.

Two of the reliably identified call types were only attributable to genus level due to similarities in call characteristics of the following groups:

- Nyctophilus/Myotis species
    - ✓ Steep, almost-linear linear (FM) call pulses are distinctive from those of other bat calls but cannot be reliably identified to species
    - ✓ Three species of Nyctophilus potentially occur in the project area (*N. geoffroyi* or *N. gouldii*)
    - ✓ These calls are also often confused with *Myotis Macropus* therefore all four species are listed as possible
- *Scotorepens greyii, Scotorepens sp. (Parnaby) and Setirostris eleryi*
    - Steep, curvilinear (FM-qCF) pulses with Fc of 37-41 kHz and a long tail
    - This species can be distinguished from *Chalinolobus nigrogriseus* in same Fc range by shorter pulse duration and hooked pulse body (cf. longer and flatter body in C. nigrogriseus)
    - Both Scotorepens spp. and *S. eleryi* are likely to occur in the project area, *S. eleryi* and *S. sp. (Parnaby)* calls are indistinguishable from *S. greyii* therefore both these species have been marked as 'possible' alongside *S. greyii identified* calls.

5.0 References

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APPENDIX D BIRD SPECIES RECORDED DURING FIELD SURVEYS

Birds recorded foraging and roosting predominately within the canopy (< 20 m high):

Apostlebird (*Struthidea cinerea*);
Australasian darter (*Anhinga novaehollandiae*);
Australasian grebe (*Tachybaptus novaehollandiae*);
Australasian pipit (*Anthus novaeseelandiae*);
Australian bustard (*Ardeotis australis*);
Australian king parrot (*Alisterus scapularis*);
Australian magpie (*Cracticus tibicen*);
Australian pied cormorant (*Phalacrocorax varius*);
Australian wood duck (*Chenonetta jubata*);
Australian zebra finch (*Taeniopygia guttata castanotis*);
Black-fronted dotterel (*Elseyornis melanops*);
Black-faced cuckoo-shrike (*Coracina novaehollandiae*);
Black-winged stilt (*Himantopus himantopus*);
Blue-faced honeyeater (*Entomyzon cyanotis*);
Brush cuckoo (*Cacomantis variolosus*);
Brown honeyeater (*Entomyzon cyanotis*);
Brown treecreeper (*Climacteris picumnus*);
Brown quail (*Coturnix ypsilophora*);
Cockatiel (*Nymphicus hollandicus*);
Common bronzewing (*Phaps chalcoptera*);
Common myna (*Acridotheres tristis*);
Crested pigeon (*Ocyphaps lophotes*);
Dollarbird (*Eurystomus orientalis*);
Double-barred finch (*Taeniopygia bichenovii*);
Dusky moorhen (*Gallinula tenebrosa*):
Eastern barn owl (*Tyto javanica*);
Eastern koel (*Eudynamys orientalis*);
Emu (*Dromaius novaehollandiae*);
Fairy martin (*Petrochelidon ariel*);
Fan-tailed cuckoo (*Cacomantis flabelliformis*);
Forest kingfisher (*Todiramphus macleayii*);
Galah (*Eolophus roseicapilla*);
Golden-headed cisticola (*Cisticola exilis*);
Grey butcherbird (*Cracticus torquatus*);
Grey-crowned babbler (*Pomatostomus superciliosus*);
Grey fantail (*Rhipidura albiscapa*);
Grey shrikethrush
Grey teal (*Anas gracilis*);

Hoary-headed grebe (*Poliocephalus poliocephalus*);
Horsfield bronze cuckoo (*Chrysococcyx basalis*);
Horsfield's bushlark (*Mirafra javanica*);
Large-billed scrubwren (*Sericornis magnirostra*);
Laughing kookaburra (*Dacelo novaeguineae*);
Leaden flycatcher (*Myiagra rubecula*);
Lewin's honeyeater (*Meliphaga lewinii*);
Little black cormorant (*Phalacrocorax sulcirostris*);
Little friarbird (*Philemon citreogularis*);
Magpie-lark (*Grallina cyanoleuca*);
Masked lapwing (*Vanellus miles*);
Mistletoebird (*Dicaeum hirundinaceum*);
Noisy friarbird (*Philemon corniculatus*);
Noisy miner (*Manorina melanocephala*);
Olive-backed Oriole (*Oriolus sagittatus*);
Painted buttonquail (*Turnix varius*);
Pacific black duck (*Anas superciliosa*);
Pacific koel (*Eudynamys orientalis*);
Pale-headed rosella (*Platycercus adscitus*);
Peaceful dove (*Geopelia placida*);
Pheasant coucal (*Centropus phasianinus*);
Pied butcherbird (*Cracticus nigrogularis*);
Pied currawong (*Strepera graculina*);
Pink-eared duck (*Malacorhynchus membranaceus*);
Rainbow bee-eater (*Merops ornatus*);
Rainbow lorikeet (*Trichoglossus moluccanus*);
Red-backed fairywren (*Malurus melanocephalus*);
Restless flycatcher (*Myiagra inquieta*);
Red-winged parrot (*Aprosmictus erythropterus*);
Rufous whistler (*Pachycephala rufiventris*);
Sacred kingfisher (*Todiramphus sanctus*);
Satin flycatcher (*Myiagra cyanoleuca*);
Scaly-breasted lorikeet (*Trichoglossus chlorolepidotus*);
Singing honeyeater (*Lichenostomus virescens*);
Shining bronze cuckoo (*Chrysococcyx lucidus*);
Spangled drongo (*Dicrurus bracteatus*);
Spotted bowerbird (*Chlamydera maculata*);
Sulphur-crested cockatoo (*Cacatua galerita*);
Superb fairywren (*Malurus cyaneus*);
Squatter pigeon (*Geophaps scripta scripta*);

Straw-necked ibis (*Threskiornis spinicollis*);
Striated pardalote (*Pardalotus striatus*);
Tree martin (*Petrochelidon nigricans*);
Weebill (*Smicrornis brevirostris*);
White-bellied cuckoo-shrike (*Coracina papuensis*);
White-browed babbler (*Pomatostomus superciliosus*);
White-faced heron (*Egretta novaehollandiae*);
White-naped honeyeater (*Melithreptus lunatus*);
White-throated gerygone (*Gerygone olivacea*);
White-throated honeyeater (*Melithreptus albogularis*);
White-throated treecreeper (*Cormobates leucophaea*);
White-winged chough (*Corcorax melanorhamphos*); and
Willie wagtail (*Rhipidura leucophrys*).

Species recorded either above the canopy or with known tendencies or potential to fly >50 m high:

Black kite (*Milvus migrans*);
Black-shouldered kite (*Elanus axillaris*);
Brown falcon (*Falco berigora*);
Nankeen kestrel (*Falco cenchroides*);
Peregrine falcon (*Falco peregrinus*);
Torresian crow (*Corvus orru);*
Wedge-tailed eagle (*Aquila audax*)*;* and
Whistling kite (*Haliastur sphenurus*).

APPENDIX E MNES SIGNFICANT IMPACT ASSESSMENT

1. MNES IMPACT ASSESSMENT

A Significant Impact Assessment (SIA) of Matters of National Environmental Significance (MNES) was performed against the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (SIG 1.1) (DEWHA, 2013), in consideration of Proposed Action activities and potential impacts, as well as the mitigation and management measures. 10 MNES, considered known or likely occur within the Proposed Action Area, were included within this SIA.

The SIA criteria for MNES differ depending on the category of matter being assessed. The matters (identified as relevant to the Proposed Action) that must undergo an SIA are:

- Threatened ecological communities;
- Threatened species listed as vulnerable;
- Threatened species listed as endangered or critically endangered; and
- Migratory species.

For the first three matters above, 'habitat critical to survival' is referenced within the relevant SIA criteria. As defined in the *SIG 1.1* (DEWHA, 2013), habitat critical to the survival of a species or ecological communities are areas that are necessary:

- *"For activities such as foraging, breeding, roosting, or dispersal;*
- *For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);*
- *To maintain genetic diversity and long-term evolutionary development; and/or*
- *For the reintroduction of populations or recovery of the species or ecological community.*

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act."

Additionally, the SIA criteria for threatened vulnerable species refer to impacts to an 'important population' of the species. The SIG 1.1 (DEWHA, 2013) define an 'important population' of a species as:

"An 'important population' is populations that are necessary for a species long-term survival and recovery. This may include populations that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range."

Individual species' or ecological communities' conservation advice or recovery plans may more specifically define or identify habitat critical to the survival of a species or an important population. When no further specificity is described in such documents, the above definitions have been used for MNES SIAs.

1.1 THREATENED ECOLOGICAL COMMUNITIES (TEC)

1.1.1 BRIGALOW (A. HARPOPHYLLA DOMINANT AND CO-DOMINANT) SIGNIFICANT IMPACT ASSESSMENT

Brigalow (*Acacia harpophylla* dominated and co dominated) (Brigalow TEC)

The Proposed Action is likely to result in a significant impact to Brigalow TEC.

The Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (Brigalow TEC) is listed as Endangered under the EPBC Act and is likely to occur within the Study Area.

The Brigalow TEC is characterised by the presence of *Acacia harpophylla* (brigalow) as one of the most abundant tree species (Butler, 2007). *A. harpophylla* is either dominant in the tree layer, or co-dominant with other species (notably *Casuarina cristata* (belah), other species of *Acacia*, or species of *Eucalyptus*). The Brigalow TEC has a considerable range of vegetation structure and composition united by a suite of species that tend to occur on acidic and salty clay soils (Isbell, 1962; Johnson, 1964; Bui and Henderson, 2003). It is important to note however, that not all vegetation in which *A. harpophylla* is dominant or co-dominant is part of the listed ecological community and key diagnostic characteristics and condition thresholds must be met in order for the TECs presence to be confirmed (DoE, 2013). Key diagnostic characteristics, condition thresholds and other information on the Brigalow TEC can be accessed from the Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community (DoE, 2013).

Within the Study Area, *A. harpophylla* dominant or co-dominant vegetation is present within RE 11.12.21 as well as any regrowth patch of a sufficient size dominated or co-dominated by *A. harpophylla* which has not been comprehensively cleared in 15 years (DoE, 2013). Remnant vegetation patches mapped as RE 11.12.21 and regrowth vegetation patches with canopy composition consistent with RE 11.12.21 were identified during the survey effort of the Study Area. These communities were considered to be of poor to moderate quality, with occasionally high presence of weeds in the understorey. With the exception of small, fragmented patches of Brigalow which do not meet the patch size criteria to be considered a TEC, remnant and regrowth patches of *A. harpophylla* dominant vegetation identified across the Study Area were considered likely to constitute Brigalow TEC. Table 1-1 details how the key diagnostic criteria for the Brigalow TEC have been met by the patches of RE 11.12.21 in the Study Area, based on ground-truthing surveys.

TABLE 1-1: KEY DIAGNOSTIC CRITERIA FOR BRIGALOW TEC RELEVANCE TO THE STUDY AREA

Key Diagnostic Criteria for TEC	Comment on Requirement met in Study Area
The patch is ≥ 0.5 ha; and	Patches are greater than 0.5ha in size across the Study Area. Where patches smaller than this size occur, they have been excluded from consideration.
Exotic perennial plants comprise less than 50% of total vegetation cover of the patch.	Rapid ground-truthing via quaternary assessment revealed exotic perennial plants mostly comprised less than 50% of the ground cover or that bare ground was present due to cattle grazing and seasonal effects. It is noted that the cover of native perennial grasses can be variable, depending on severity of impact and rainfall conditions. Additionally, not all patches consistent with Brigalow TEC were able to be assessed. In accordance with a conservative approach, and because delineation of patches is not possible at the current scale of mapping, areas mapped as RE 11.12.21 or baring traits similar to mapped areas were determined to likely be Brigalow TEC.

The Proposed Action will largely avoid this TEC within the Study Area. 8.5 ha will be removed of 326.9 ha confirmed to occur, representing 2.6% of the total Brigalow TEC within the Study Area.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-2. It has been concluded that the Proposed Action is likely to cause a significant impact to Brigalow TEC.

TABLE 1-2: SIGNIFICANT IMPACT ASSESSMENT FOR BRIGALOW TEC

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:		
Reduce the extent of an ecological community;	Brigalow TEC is considered likely to occur within the development footprint due to presence of patches likely meeting the key diagnostic criteria and condition thresholds following ground truthing. 326.9 ha of this TEC occurs within the Study Area, 8.5 ha of which is within the permanent disturbance footprint. Permanent impact to this 8.5 ha will result in a reduction of 2.6% of Brigalow TEC within the Study Area. Clearing of Brigalow is listed as a key threatening process under the Approved Conservation Advice for the TEC. It is likely the removal of 8.5 ha will reduce the extent of an ecological community.	Likely
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;	Brigalow TEC is considered likely to occur within the development footprint due to presence of likely key diagnostic features observed in patches of Brigalow woodland. 326.9 ha of this TEC occurs within the Study Area, 8.5 ha of which is within the permanent disturbance footprint (2.6% total). The Brigalow TEC observed within the Study Area is in a highly fragmented state at present, the areas of impact from the Proposed Action are unlikely to further the fragmentation of these patches. The Proposed Action is unlikely to significantly further fragmentation of Brigalow TEC within the Study Area.	Unlikely
Adversely affect habitat critical to the survival of an ecological community;	*Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community* (TSSC, 2013) state that habitat critical to the survival of the TEC areas 'includes all patches that meet the key diagnostic characteristics and condition thresholds for the ecological community; plus the buffer zones, particularly where these include native vegetation.' It is noted that the size threshold for a patch of Brigalow to be defined a TEC is 0.5 ha. All identified patches are habitat critical for the survival of Brigalow TEC. Therefore, an impact of 8.5 ha, resulting from the Proposed Action, will likely have an impact on habitat critical to the survival of TEC.	Likely
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including	The Proposed Action layout has largely avoided impact of the Brigalow TEC, with 8.5 ha of total permanent impact. Brigalow TEC is often found in cracking clay soils, often not associated with alluvium landscapes that rely on floodwaters for deposition of minerals and soils (TSSC, 2013).	Unlikely

Criteria	Description	Criteria Triggered?
reduction of groundwater levels, or substantial alteration of surface water drainage patterns;	The 8.5 ha of impact to Brigalow TEC is unlikely to significantly modify abiotic factors in the vicinity, to a greater extent than already impacted by historic land clearing and present land use (cattle grazing). The Proposed Action is unlikely to significantly affect abiotic factors necessary for Brigalow TEC to survive.	
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;	Key canopy species for the brigalow TEC are *Acacia harpophylla* (Brigalow) potentially with *Casuarina cristata* or *Eucalyptus sp.* (TSSC, 2013). It is unlikely that an impact to 8.5 ha as a proportion of 326.9 ha Brigalow TEC will substantially modify the structural or floral composition of the areas of retained TEC to the extent that it occurs within the Study Area.	Unlikely
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • Assisting invasive species, that are harmful to the listed ecological community, to become established; and/or • Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; and	Threats to the Brigalow TEC include (TSSC, 2013): • Clearing; • Fire • Weeds; • Pest animals; • Inappropriate grazing regimes; • Climate change • Of these, several pose a threat to the quality or integrity of the TEC. Specifically, clearing, weeds, pest animals and inappropriate grazing regimes. Not all listed threats will be exacerbated by the Proposed Action due to previous historic and present agricultural use and the observed presence of feral flora and fauna species. Mitigation measures are proposed to avoid the further introduction and incursion of invasive species into the Study Area and specifically in ecologically sensitive areas such as areas of Brigalow TEC. The Proposed Action layout has avoided majority of the Brigalow TEC found within the Study Area. Impact to 8.5 ha of Brigalow TEC as a proportion of 326.9 ha known to occur within the Study Area will not cause a substantial reduction in the quality or integrity of the ecological community. As suggested the proponent will utilise measures to reduce the spread of weeds and seeds through appropriate biosecurity procedures. The Study Area is presently utilised for agricultural and grazing purposes, the Proposed Action will not be furthering agricultural practices such as herbicide and pesticide usage such that it would impact the TEC.	Unlikely
Will not interfere with the recovery of an ecological community.	*Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community* (TSSC, 2013) lists priority actions to support conservation of the species and guide recovery as: • Research and monitoring to improve our understanding of the ecological community and the best methods to aid its management and recover; • Protect the ecological community to prevent further losses; • Restore the ecological community by active abatement of threats, appropriate management, restoration and other conservation initiatives; and • Communicate, engage with and support people to increase understanding of the value and function of the ecological community and encourage their efforts in its	Unlikely

Criteria	Description	Criteria Triggered?
	protection and recovery. Particularly landowners utilising land for agricultural practices. As the Proposed Action layout has largely avoided clearing of Brigalow TEC and the calculated impacts of 8.5 ha (2.6%) as a proportion of the observed occurrence of Brigalow TEC within the Study area it is unlikely that this would interfere with the recovery of the TEC. The proponent will, as part of mitigation measures, engage in the abatement of threats in the form of a biosecurity management plan and vegetation management plan, and create no go areas as part of construction to prevent indirect impacts Brigalow TEC outside of the Proposed Action.	
Significant Impact: Likely		

1.1.2 POPLAR BOX GRASSY WOODLAND ON ALLUVIAL PLAINS SIGNIFICANT IMPACT ASSESSMENT

Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)

The Proposed Action is likely to result in a significant impact to Poplar Box TEC.

The Poplar Box grassy woodland on alluvial plains TEC (Poplar Box TEC) is listed as Endangered under the EPBC Act and is known to occur within the Study Area.

Poplar Box TEC is characterised by having *Eucalyptus populnea* as the dominate crown cover reaching up to 10 m or more in height with a cover of at least 10%. The TEC occurs from the Brigalow Belt in Queensland down into NSW where it occurs on various soil types on alluvial plains associated with Queensland RE Land Zones 3 and 4. An estimate of over 70% of the Poplar Box TEC has been lost within Queensland (TSSC, 2019).

Poplar Box is best represented by five REs in Queensland, though can occur outside of these constraints, including as a patch of regrowth vegetation (DAWE, 2019). RE 11.3.2 corresponds to poplar box woodlands TEC and is mapped to occur across the Study Area. Six quaternary vegetation assessments in accordance with Neldner et al, (2022) and two Biocondition transects in accordance with Eyre et al, (2015) confirmed the poplar box woodlands TEC as known to occur within the Study Area.

The quaternary vegetation assessments identified likely areas of TEC due to necessary canopy composition but did not record sufficient data to make a conclusive determination on presence – only the two Biocondition transects captured data off which a successful identification of poplar box woodlands TEC can be made.

Table 1-3 details how the Category B key diagnostic criteria for the Poplar Box Woodlands TEC were met by the vegetation in the Study Area, based on ground-truthing surveys.

TABLE 1-3: KEY DIAGNOSTIC CRITERIA FOR POPLAR BOX TEC RELEVANCE TO THE STUDY AREA

Key Diagnostic Criteria for TEC	Comment on Requirement met in Study Area
The crown cover of canopy trees in the patch is ≥ 10%; and	Biocondition transects returned a canopy cover of 47% and 37.5%. Quaternary assessments generally showed signs of canopy cover greater than 10%. Portions of the eucalypt woodland and open forest in alluvial zones contained variation in the dominance of eucalypt species in the canopy with some areas dominated by *Eucalyptus tereticornis*. Delineation of these patches is not possible at the current scale of mapping completed and a conservative approach has been applied and all alluvial and riparian woodlands mapped as RE 11.3.2 have been classified as Poplar Box woodland TEC.
≥ 50% of perennial vegetation cover in ground layer is native; and	Biocondition transects returned non-native plant cover of 1%. Quaternary assessments generally showed signs of cattle grazing and some exotic cover, though further assessment would be required at these locations to determine perennial native ground cover.
Either; • ≥ 20 perennial native plant spp. per patch in ground layer; OR	Biocondition transects returned recordings of 'large Eucalyptus species' (>44cm dbh) of 20 per ha and 16 per ha. Quaternary assessments generally observed large poplar box (*E. populnea*) individuals greater than 15m in height and with dbh likely broader than 30cm. It should be noted that the Biocondition transect with 20 large Eucalyptus species per ha featured only poplar box as the dominant canopy species. The other Biocondition transect occurred in a vegetation community co-dominant

Key Diagnostic Criteria for TEC	Comment on Requirement met in Study Area
• ≥ 10 mature trees/ha with ≥ 30cm dbh (and/or hollows).	with other Eucalyptus species such as forest red gum (*E. tereticornis*) and Moreton Bay ash (*Corymbia tesselaris*). However, the threshold of 10+ poplar box individuals p/ha with a greater than 30cm dbh was met.

The Proposed Action will largely avoid this TEC wihtin the Study Area. 8.2 ha will be removed of 501.1 ha, representing 1.7% of the total Poplar Box TEC within the Study Area.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-4. It has been concluded that the Proposed Action is unlikely to cause a significant impact to Poplar Box TEC.

TABLE 1-4: SIGNIFICANT IMPACT ASSESSMENT FOR POPLAR BOX GRASSY WOODLAND TEC

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:		
Reduce the extent of an ecological community;	Poplar Box TEC is considered known to occur within the development footprint due to presence of REs consistent with the TEC and observed condition in accordance with the key diagnostic criteria. 501.1 ha of this TEC is determined to occur within the Study Area, 8.2 ha of which is within the permanent disturbance footprint. Permanent impact to this 8.2 ha will result in a reduction of approximately 1.7% the TEC within the Study Area. This is likely to constitute a reduction in the extent of an ecological community	Likely
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;	501.1 ha of this TEC occurs within the Study Area, 8.2 ha of which is within the disturbance footprint. The landscape observed within the Study Area is presently fragmented resulting from historic and present land use including grazing, logging and agricultural use. The impact of 8.2 ha to Poplar Box Woodland or 1.7% of the observed TEC within the Study Area, specifically in the south of the Study Area where linear patches of mapped poplar box woodlands will be separated into multiple patches, is likely to increase fragmentation of the TEC.	Likely
Adversely affect habitat critical to the survival of an ecological community;	The *Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DEE, 2019) defines areas critical to the survival of this ecological community as the 'best quality, most intact patches of the ecological community'. The community, in Queensland is most closely associated with Broad Vegetation Group (BVG) 17a. The pre-clearing extent of this community was projected at 8,293,808 ha. The current known remnant extent of this community within Qld is 35.4% (2,936,008.032 ha). Impact to 8.2 ha of this TEC as a proportion of the present known extent of the habitat for this TEC, 0.0003%, is unlikely to adversely affect habitat critical to the survival of the ecological community.	Unlikely

Criteria	Description	Criteria Triggered?
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;	501.1 ha of this TEC occurs within the Study Area, 8.2 (1.7%) ha of which is proposed to be impacted by the development. Poplar Box grassy woodland is a grassy woodland that occurs on alluvial soils found within the Study Area. Abiotic factors will vary due to a wide range of factors and ecological conditions including microclimates, fire regimes and drought. The impact to 1.7% of the community as a proportion of the community's presence within the Study Area is unlikely to substantially modify these factors beyond that which they are seasonally observed to vary. No significant impact proposed.	Unlikely
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;	The *Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DEE, 2019) lists poplar box (*Eucalyptus populnea*) as the defining species for this ecological community. Additionally, there is a distinctly sparse or absent shrub layer in this TEC. For the Proposed Action, 8.2 ha of Poplar Box TEC lies within the impact footprint. It is not anticipated that clearing of 8.2 hectares as a proportion of 501.1 ha (1.7%) of the TEC within the Study area would cause a substantially change in the species composition in occurrences of the ecological community such that it would be significant and deleterious to the TEC broadly. Given the structure of this ecological community, the Proposed Action is unlikely to cause a significant change in species composition, especially considering the minimal ongoing impact that wind farms impose. A biosecurity management plan will be created to minimise the possibility of invasive species degrading over this ecological community.	Unlikely
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • Assisting invasive species, that are harmful to the listed ecological community, to become established; and/or • Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or	Poplar Box TEC is considered known to occur within the development footprint due to presence of diagnostic features within current ground-truthed REs. 501.1 ha of this TEC occurs within the Study Area, 8.2 ha of which is within the disturbance footprint. As listed in the *Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DEE, 2019), threats to the TEC under the EPBC Act include: • Over-abundance of noisy miners excluding other birds; • Loss of climatic habitat; • Land-clearing; • Competition and land degradation by rabbits and goats; • Invasive species and their impact on biodiversity (including cane toads, feral cats and foxes, plants etc.); and • Beak and feather disease affecting endangered psittacines. Of these, land clearing and invasive species are applicable to the Proposed Action. To minimise the impact of clearing, Poplar Box TEC has been avoided as much as possible at the design phase. Mirco-siting is likely to further reduce impacts to poplar box TEC where present within the impact footprint. Weeds of National Significance and restricted biosecurity matters are known to are known to occur within the Study Area. A biosecurity plan will be designed to minimise potential impacts regarding disease and invasive species. It is unlikely with the implementation of a biosecurity management plan that weeds, invasive species and disease will become more prevalent than that which is already observed.	Unlikely

Criteria	Description	Criteria Triggered?
inhibit the growth of species in the ecological community; and	Ultimately, the Proposed Action is unlikely to cause a substantial reduction in the quality or integrity of Poplar Box TEC in the Study Area or the landscape.	
Will not interfere with the recovery of an ecological community.	The *Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DEE, 2019), lists key recovery actions to conserving PBGW as: • Protect the ecological community to prevent further loss of extent and condition; • Restore the ecological community within its current and potential range by active abatement of threats, revegetation and other conservation initiatives; • Communicate - engage with and support people to increase understanding of the value and function of the ecological community and encourage their efforts in its protection and recovery; and • Research and monitoring to improve our understanding of the ecological community and methods for restoration and protection over the long-term. The Proposed Action is unlikely to interfere with any of these objectives due to the relatively small area of impact to the TEC (8.2 ha). This impact represents 0.0003% of known habitat for this TEC therefore, impact is not significant.	Unlikely
Significant Impact: Likely		

1.2 THREATNED FAUNA SPECIES

1.2.1 KOALA SIGNIFICANT IMPACT ASSESSMENT

Koala (*Phascolarctos cinereus*)

The Proposed Action is likely to result in a significant impact to the koala.

The koala has recently had its listing upgraded from Vulnerable to Endangered under the EPBC Act (as of the 12th February 2022) and was concluded to be known to occur throughout the Study Area due to the positive identification of a faecal pellet of the species. Additionally, there is a record for the species that occurs within the Study Area from WildNet (not dated) as well as an undated ALA observation from just outside the Study Area (< 2km). The Study Area is within the range for the species and contains habitat suitable for koala survival throughout.

The Study Area is located centrally within koala's distribution, with the species having one of the broadest distributions of threatened arboreal mammal species under the EPBC with a range extending from north-eastern Queensland to the south-east corner of Southern Australia. The biological species distribution is widespread in coastal and inland areas that extend over approximately one million square kilometres (Martin et al., 1999). The occurrence throughout this range is dependent on environmental values such as rainfall, availability of preferred food sources and connectivity between suitable habitat (primarily riparian habitat associated with breeding).

Under the Conservation Advice for Phascolarctos cinereus (koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DCCEEW, 2022) habitat for the koala is described as:

> *Koala habitat includes both coastal and inland areas that are typically characterised by Eucalyptus forests and woodlands. Biophysical habitat attributes for the koala include places that contain the resources necessary for individual foraging, survival (including predator avoidance), growth, reproduction and movement.*

Furthermore, habitat critical to the survival of the species has also been defined. These are habitats that the species relies on to avoid or halt decline and promote the recovery of the species. Under the EPBC Act, the following factors and other relevant factors are considered when identifying habitat that is critical to the survival of the species:

> *a) Whether the habitat is used during periods of stress (examples: flood, drought or fire);*
>
> *b) whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);*
>
> *c) the extent to which the habitat is used by important populations;*
>
> *d) whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development;*
>
> *e) whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements;*

f) whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation;

g) any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.

Koala food trees are typically considered to be those of the following genus: *Angophora, Corymbia, Eucalyptus, Lophostemon* and *Melaleuca*.

This considered, the Study Area contains varied koala habitat. For the purposes of defining koala habitat, the Study Area has been classified as preferred breeding and foraging habitat, general breeding and foraging, dispersal habitat and generally unsuitable habitat. This is due to the differing quality of habitat, lack of evidence of utilisation in the Study Area, and ecological function provided each of these habitat types.

Observations of this species' scat were made in open *Eucalyptus crebra* and *E. populnea* dominated woodland, adjacent to a farm dam in the south of the property. All species utilisation findings from fieldwork indicate a preference for the high-quality preferred breeding and foraging habitat broad habitat type, which is consistent with the literature on koala (DAWE, 2022)

The following broad habitat groups as defined in Section 5.2 are considered koala habitat:

Preferred breeding and foraging habitat:

- Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels.

General breeding and foraging habitat:

- Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; and

Dispersal habitat:

- Grasslands and cultivated agricultural land (containing occasional paddock trees); and
- Brigalow woodlands.

Generally unsuitable habitat:

- Grasslands and cultivated agricultural land (with no paddock trees for broad stretches)
- Vine forests/thickets and dry rainforest; and
- Waterbodies and drainage features (predominately farm dams).

Koala habitat across the Study Area has been assessed as comprising 29,493.7 ha (approximately 62.9% of the total Study Area). Preferred breeding and foraging habitat accounts for 1,618.2 ha, comprising 5.5% of total species habitat, with general breeding and foraging habitat accounting for 21,067.5 ha and 71.4%, respectively. 6,808 ha of dispersal habitat (23% of total species habitat) is mapped to occur within the Study Area.

This estimated clearing is comprised of 16.4 ha to preferred breeding and foraging habitat (1% of available habitat of this type), 867.9 ha to general breeding and foraging habitat (4.1% of available habitat of this type) and 315.7 ha to dispersal habitat (4.6% of available habitat of this type).

Disturbance to dispersal habitat is considered unlikely to contribute to a significance impact due to koala's ability to disperse across the linear infrastructure components of the Proposed Action. As the Proposed Action will not cause a barrier to movement of koalas, and the ability for the species to move across modified landscapes, including areas of cleared ground with isolated trees, disturbance to areas of dispersal habitat will not contribute to the significance of the impact.

Based on this assessment, the area of significant residual impact to koala is estimated to be 884.3 ha to foraging and breeding habitat only.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-5. It has been concluded that the Proposed Action is likely to cause a significant impact to the koala.

TABLE 1-5: SIGNIFICANT IMPACT ASSESSMENT FOR THE KOALA

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population,	Koala dispersal habitat within the Study Area is composed of unsuitable foraging species in the *Acacia* genus and cleared grassland with sparse paddock trees providing sheltering function for dispersing animals. 315.7 ha, (4.6% of this habitat type within the Study Area) of koala dispersal habitat is estimated to be disturbed during the construction phase of the Proposed Action, however koala dispersal across the Study Area will be maintained post-development. Koala preferred breeding and foraging habitat and general breeding and foraging habitat also occur in the Study Area, with 16.4 ha (1 % of this type habitat type within the Study Area) and 867.9 ha (4.1% of this type habitat of within the Study Area), expected to be impacted by the Proposed Action, respectively. Preferred breeding and foraging habitat is composed of fringing riparian woodlands associated with *Eucalyptus tereticornis* and general breeding and foraging habitat is composed of open woodland dominated by *E. crebra* and *E. populnea* which occurs most extensively in the south of the Study Area. Mitigation measures such as pre-clearance surveys and micro-siting of proposed infrastructure areas in higher quality foraging and breeding habitat will ensure affected connectivity value and presence of any locally important trees are preserved. Given this, it is unlikely any koala population in the Study Area will be impacted by the Proposed Action to the extent it will lead to a long-term decrease in the size of a population.	Unlikely
Reduce the area of occupancy of the species,	Koala has a widespread distribution across the east coast of Australia that ranges more than 1,660,000 km^2 (DAWE, 2022). The species has a smaller and more fragmented area of occupancy estimated at 19,428 km^2 (DAWE, 2022). 29,493.7 ha of species habitat has been mapped to occur throughout the Study Area (62.9% of the Study Area), with projected impacts of 315.7 ha to koala dispersal habitat (4.6% of this habitat type within the Study Area), 16.4 ha to preferred breeding and foraging habitat (1% of this habitat type within the Study Area) and 867.9 ha (4.1% of this type habitat of within the Study Area) to general breeding and foraging habitat. Disturbance to dispersal habitat does not remove the function of this habitat or create a barrier to movement as there is a large quantity of viable koala habitat throughout the Study Area. As there are large areas of suitable koala preferred and general breeding and foraging habitat occurring throughout the Study Area (22,685.7 ha total), and the linear nature of predicted disturbances allowing for retention of important habitat patches and maintained connectivity between these patches, koala are expected to persist in the Study Area.	Unlikely

Criteria	Description	Criteria Triggered?
Fragment an existing population into two or more populations,	The home range for the koala is highly variable, with the species known to disperse between 3 to 500 ha across various habitats (Wilmott, 2020). It is not expected an impact to 315.7 ha of koala dispersal habitat (4.6% of this habitat type within the Study Area) 16.4 ha to preferred koala breeding and foraging habitat (1% of this habitat type within the Study Area) and 867.9 ha (4.1% of this type habitat of within the Study Area) to general koala breeding and foraging habitat will fragment existing koala populations. Impacts associated with the Proposed Action will only remove habitat in small linear patches. Due to the linear nature of clearing it is expected koala will still be able to disperse across tracks and small cleared areas within the Study Area. It is therefore unlikely the Proposed Action will fragment an existing koala population into two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species,	Koala habitat within the development footprint has been concluded to be habitat critical to the survival of the species as it provides foraging, breeding and dispersal functions. The disturbance to dispersal habitat is not considered to be significant (315.7 ha or 4.6% of this habitat type within the Study Area), as the linear design of the Proposed Action will still allow for koala dispersal across the landscape (thus retaining its function). The proposed access tracks, overhead transmission line and wind turbine towers will not reduce the ability for koalas to disperse through the landscape. Additionally, high-value koala preferred breeding and foraging habitat is mostly avoided in the design phase, with 16.4 ha of a total 1,618.2 ha within the Study Area (approximately 1%) projected to be cleared by the Proposed Action. However, despite the implementation of mitigation measures including pre-clearance surveys and micro-siting of planned infrastructure, avoidance of high-value habitat and retention of movement and dispersal function through linear WTG design, it is considered likely that the Proposed Action will adversely affect habitat critical to the survival of the species due to the area of general breeding and foraging habitat impacted (867.9 ha impacted or 4.4% of this habitat type within the Study Area).	Likely
Disrupt the breeding cycle of a population,	Koala breeding and foraging habitat is mapped to occur within the Study Area across 22,685.7 ha (76.8% of suitable koala habitat in the Study Area) including 1,618.2 ha of preferred breeding and foraging habitat and 21,067.5 ha of general breeding and foraging habitat. Projected impacts are expected to 16.4 ha of preferred foraging and breeding habitat (1% of this habitat type in the Study Area) and 867.9 ha general breeding and foraging habitat (4.4% of this habitat type in the Study Area). Mitigation measures such as pre-clearance surveys and micro-siting of proposed infrastructure areas in both preferred and general breeding and foraging habitat will ensure connectivity values are retained (allowing for individuals to safely traverse between suitable habitat patches) and locally important or higher quality trees are preserved where possible. Given these mitigation measures, and that the Proposed Action is largely avoiding preferred breeding and foraging habitat, it is not expected the Proposed Action will disrupt the breeding cycle of a koala population within the Study Area.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the	The projected disturbance to koala habitat within the Study Area has been calculated as 315.7 ha of koala dispersal habitat (4.6% of this habitat type within the Study Area), 16.4 ha to preferred breeding and foraging habitat (1% of this habitat type within the Study Area) and 867.9 ha (4.1% of this type habitat of within the Study Area) to general breeding and foraging habitat. Impacts to dispersal habitat have not been considered for this significance impact assessment as the removal of this habitat type does not prevent koala from utilising it for dispersal purposes.	Unlikely

Criteria	Description	Criteria Triggered?
species is likely to decline,	Additionally, preferred koala breeding and foraging habitat has largely been avoided, with only 1% of this habitat type within the Study Area projected to be disturbed. While a larger share of general breeding and foraging habitat is expected to be disturbed (4.4%), this still constitutes a very small percentage of habitat in relation to the larger context of the Study Area. It is unlikely the Proposed Action will decrease the availability or quality of koala habitat to the extent that the species will decline.	
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive species such as feral cats (*Felis catus*) and wild dogs (*Canis lupus*) are common pests encountered Queensland and are particularly harmful to native, threatened mammals. Both of these invasive species are known to occur in the Study Area. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures, including development and adherence to a Biosecurity Management Plan that will ensure that invasive species observed within the Study Area and further invasive species are not introduced to the Study Area.	Unlikely
Introduce disease that may cause the species to decline, or	Koala populations are known to be impacted by diseases, specifically koala retrovirus (KoRV) and Chlamydia (*Chlamydia pecorum*). There is no evidence to suggest the construction and/or operational activities would introduce a disease, such as Chlamydia, that would cause the species to be at risk of illness and subsequent population decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur, as detailed in a Biosecurity Management Plan. This includes following biosecurity measures and ensuring proper personal protection equipment is worn by construction workers and vehicle washdowns before entering any sites near koala habitat.	Unlikely
Interfere with the recovery of the species.	The interim recovery objectives for the koala are: • Protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility; and • Maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges. The Proposed Action will only impact a small portion of koala habitat within the Study Area (315.7 ha of dispersal habitat, or 4.6% of all dispersal habitat within the Study Area and 867.9 ha of general breeding and foraging habitat or 4.4% of this habitat type within the Study Area), with an even smaller portion of preferred breeding and foraging habitat comprised of riparian woodland suitable for drought and extreme heat refuge to be affected (16.4 ha or 1% of all preferred breeding and foraging habitat to be impacted in the Study Area). Furthermore, impacts associated with the Proposed Action will only remove habitat in small linear patches, with connectivity values retained and mitigation measures including pre-clearance surveys and micro-siting employed to further preserve important habitat traits. Therefore, the Proposed Action is unlikely to interfere with the above recovery objectives.	Unlikely
Significant impact: Likely		

1.2.2 GREATER GLIDER SIGNIFICANT IMPACT ASSESSMENT

Greater glider (southern and central) (*Petauroides volans*)

The Proposed Action is likely to result in a significant impact to the greater glider.

The greater glider (southern and central) (greater glider) was upgraded from a listing of Vulnerable to Endangered under the EPBC Act, on the 5th July 2022, and is known to occur within the Study Area.

The greater glider was recorded extensively within the Study Area during targeted spotlighting surveys in the June 2023 surveys, with 14 individuals observed in the southeast of the Study Area. Additionally, one ALA record of the species (2020) is present within the Locality, one Wildnet record of the species is present within the Study Area (n.d.).

It is noted in the Conservation Advice that two separate taxa of subspecies likely co-exist in this area. However, until such ambiguity is resolved, the listed entity will be referred to as *Petauroides volans* (DCCEEW, 2022).

Greater glider habitat consists of tall, eucalypt forests with mature hollow-bearing trees (Eyre, 2004). Micro-habitat and landscape features essential for greater glider include live and dead hollow bearing trees for denning function, habitat connectivity for dispersal function and feed trees for foraging purposes.

Habitat critical to survival for the greater glider has been defined in *Conservation Advice for Petauroides volans (Greater Glider (southern and central)* (DECCEW, 2022) as:

- *Large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region; and*
- *Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization; and*
- *Cool microclimate forest/woodland areas (e.g. protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes); and*
- *Areas identified as refuges under future climate changes scenarios; and*
- *Short-term or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas*

Greater glider habitat within the Study Area can be considered to contain large contiguous area of eucalypt forest containing mature hollow-bearing trees and a diverse range of the species' preferred food species as well as a smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization and so aligns with the Conservation Advice as being habitat critical to the survival of greater glider

Suitable greater glider foraging, denning and dispersal habitat has been identified within the Study Area based on ground-truthing of habitat attributes and confirmed records of the species during survey effort. Therefore, greater glider habitat within the Study Area is considered habitat critical to survival of the species.

The Study Area contained the following broad habitat types as denning habitat, foraging habitat, and generally unsuitable habitat for the species.

Denning habitat:

- Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels; and

Foraging and dispersal habitat:

- Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;

Generally unsuitable habitat:

- Brigalow woodlands;
- Vine forest/thickets and dry rainforest;
- Waterbodies and drainage features; and
- Grasslands and cultivated agricultural land.

Ground-truthed surveys have identified 1,425.3 ha of greater glider denning habitat, 20,895.0 ha of foraging habitat, and 24,346.8 ha of generally unsuitable habitat, within the Study Area. A total of 877.4 ha of greater glider habitat (including approximately 15.5 ha of denning habitat and 861.9 ha of foraging habitat) is expected to be impacted as a result of the Proposed Action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-6. It has been concluded that the Proposed Action is likely to cause a significant impact to the greater glider.

TABLE 1-6: SIGNIFICANT IMPACT ASSESSEMNT FOR THE GREATER GLIDER

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population,	15.5 ha of greater glider denning habitat (1.1% of this habitat within the Study Area) and 861.9 ha of greater glider foraging habitat (4.1% of habitat within the Study Area) are projected to be cleared during the construction phase of the Proposed Action. A known population of greater glider utilises the Study Area with 14 individuals identified in the southeast of the Study Area. Mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will ensure that impacts to essential microhabitat features (hollow-bearing trees) are further avoided where possible. Disturbance associated with linear infrastructure will also ensure that movement and gliding ability for the species is not affected. With these mitigation measures enacted, the extent of species habitat throughout the Study Area (22,284.3 ha or 48% of the Study Area) and relatively low impacts to high-value denning habitat, it is unlikely the Proposed Action will result in the long-term decrease in the size of a population of greater glider.	Unlikely
Reduce the area of occupancy of the species,	Greater glider conservation advice identifies an area of occupancy for the species at approximately 15,316 km^2 (DCCEEW 2023). 22,284.3 ha of habitat suitable for greater glider has been mapped to occur throughout the Study Area (roughly 48% of the Study Area), with projected impacts of 15.5 ha to denning habitat (1.1% of this habitat type within the Study Area) and 861.9 to foraging habitat (4.1% of this habitat type within the Study Area). The Proposed Action allows for a large degree of avoidance for high-value denning habitat, and the linear nature of predicted disturbances allows for retention of important habitat patches with connectivity to these patches retained. Impacts to 861.9 ha of	Unlikely

Criteria	Description	Criteria Triggered?
	foraging habitat is unlikely to reduce the area of occupancy for the species in the Study Area.	
Fragment an existing population into two or more populations,	The home range for the greater glider varies across their natural extent, however it is accepted the species generally has a small home range due to low reproductive rate, sensitivity to disturbance and inability to traverse non-native forest (DCCEEW, 2022). in Queensland sub-populations where the species' range is generally broader on account of less-productive forests (fewer hollows and poorer leaf nutrition), greater glider has outlier dispersal range of up to 19 ha (DES, 2022). However, with this broader home range, it is expected viability of greater glider habitat is more sensitive to disturbance of important den trees (Eyre, 2006, p. 279). Use of linear infrastructure will ensure habitat is removed in only small patches and gliding function between suitable habitat communities is not reduced. Evasion of denning trees will occur as much as practicable during construction phase where infrastructure is able to be micro-sited. This, in addition to a relatively small disturbance to 15.5 ha of denning habitat (1.1% of this habitat within the Study Area) and larger disturbance of 861.9 ha to the less ecologically significant foraging habitat (4.1% of this habitat within the Study Area) makes it unlikely the Proposed Action will fragment the existing population or populations of greater glider that occur within the Study Area.	Unlikely
Adversely affect habitat critical to the survival of a species,	Greater glider was observed utilising the Study Area at length, with 14 individuals identified across distinct habitat patches in the south of the Study Area. It is likely all greater glider habitat mapped within the Study Area constitutes habitat critical to the survival of the species. This habitat is accepted as habitat which contains any of the following (DCCEEW, 2022): • Large contiguous eucalypt forest with mature hollow-bearing trees and diverse food tree species; • Habitat patches that can facilitate dispersal of the species; • Cool microclimate areas; and/or • Refuges from climate change or fire. Given the projected impact of 15.5 ha to denning habitat (1.1% of all denning habitat within the Study Area) and 861.9 ha of foraging habitat (4.1% of all foraging habitat within the Study Area), all of which constitutes habitat critical to the survival of the species, it is likely the Proposed Action will adversely affect habitat critical to the survival of the species, even with mitigation measures such as micro-siting at areas of proposed infrastructure.	Likely
Disrupt the breeding cycle of a population,	Greater gliders utilise the shelter provided by denning habitat for breeding (DES, 2022). Disturbances associated with the Proposed Action will impact 15.5 ha of denning habitat (1.1% of this habitat within the Study Area). In addition to relatively low impacts to greater glider denning habitat, pre-clearance surveys and micro-siting at areas of proposed infrastructure will be implemented to avoid impacting identified denning and breeding trees. Given this, it is unlikely the Proposed Action will impact or disrupt the breeding cycle of greater glider.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The Proposed Action will result in the disturbance of 15.5 ha of greater glider denning habitat (1.1% of this habitat within the Study Area) and 861.9 ha of dispersal and foraging habitat (4.1% of this habitat within the Study Area). While there is potential the Proposed Action will lead a negative impacts on greater glider, given the confirmed population(s) utilising the Study Area, it is unlikely that associated disturbance will decrease the quality or availability of habitat such that it would result in the species' decline.	Unlikely

Criteria	Description	Criteria Triggered?
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive species such as feral cats (*Felis catus*), European red fox (*Vulpes vulpes*) and wild dogs (*Canis lupus*) are ubiquitous in Queensland. All of these invasive species are known to occur in the Study Area. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures, including development and adherence to a Biosecurity Management Plan that will ensure that new invasive species are not introduced into the Study Area and that populations of invasive species within the Study Area do not further proliferate as a result of the Proposed Action.	Unlikely
Introduce disease that may cause the species to decline, or	There is currently limited evidence of diseases causing detrimental effects on greater glider populations in Queensland. The Proposed Action is unlikely introduce a disease that would cause decline in this species.	Unlikely
Interfere with the recovery of the species.	There is no formally adopted Recovery Plan for this species. However, given the projected impact to habitat critical to the survival of the species (15.5 ha of impact to denning habitat and 861.9 ha to foraging habitat within the Study Area) the Proposed Action has potential to interfere with the recovery of the species. Mitigation measures such as pre-clearance surveys and micro-siting of infrastructure where important habitat is identified will likely reduce interference with the recovery of this species. However, this cannot be quantified at present.	Likely
Significant impact: Likely		

1.2.3 LARGE-EARED PIED-BAT SIGNIFICANT IMPACT ASSESSMENT

Large-eared pied bat (*Chalinolobus dwyeri*)

The Proposed Action has the potential to result in a significant impact to the large-eared pied bat.

The large-eared pied bat is listed as Endangered under the EPBC Act, as of 15th November 2023. This species has been concluded as likely to occur within the Study Area, due to 'probable' recordings of the species that were produced from Anabats deployed in four locations throughout the Study Area across multiple survey events.

A total of 10 Anabats were deployed over four of the eight surveys for a total of 40 trapping nights. A total of 144 habitat and vegetation assessments were completed over the eight surveys and identified suitable habitat of ironbark woodlands close to a waterbodies where 'probable' large-eared pied bat calls were recorded. Additionally, the Study Area is within the range for the species and contains habitat suitable for large-eared pied bat survival (as evidenced by species presence), as further explained below.

The large-eared pied bat is a medium-sized bat that is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland, down south to Bungonia in the NSW Southern Highlands (DERM, 2011). Large-eared pied bat prefers a specific intersection of habitat traits which makes habitat for the species both uncommon and susceptible to clearing-related impacts. Per the conservation guidelines for the species;

> *Large-eared pied bat has close association with the presence of sandstone escarpment (for roosts) and fertile valleys (for foraging), particularly where the valleys support box gum woodland. This is a relatively restricted combination of habitat factors, and the extent of woodlands on fertile soils within its range has been greatly diminished by clearing (Pennay, 2008*).

Escarpments provide roosting habitat for this species, with the availability of diurnal roost options an important indicator of habitat suitability. Large-eared pied bat prefers rhyolite cliffs and caves for roosting purposes, although geology is secondary to presence of suitably deep and high caves and overhangs which provide shelter from natural disturbances (DCCEEW, 2021).

Fertile valleys and vegetated areas provide foraging habitat for large-eared pied bat, with riverine and riparian corridors being identified as favourable for the insectivorous species. The species has been recorded foraging in canopied vegetation communities of various description, however, including dry and wet sclerophyll forest, grassy woodland, *Callitris* dominated forest, tall open eucalypt forest with a rainforest sub-canopy, subtropical rainforest and small clearings adjacent to rainforest (DCCEEW, 2021).

Though not confirmed, the majority of records coming from fertile, canopied woodland indicates a sensitivity to clearing. Given this, important habitat for this species can likely be defined as suitably fertile woodland foraging habitat in the locality of roosting habitat.

Habitat for the large-eared pied bat has been delineated from the broad habitat types, based on the habitat requirements for the species. This is as follows:

Foraging habitat:

- Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey; and
- Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels.

Generally unsuitable habitat:

- Vine forest/ thickets and dry rainforest;
- Waterbodies and drainage features;
- Grasslands and cultivated agricultural land; and
- Brigalow woodlands dominated by *Acacia harpophylla*.

There is a total 21,719.7 ha foraging habitat within the Study Area. A total of 886.3 ha of large-eared pied bat habitat is expected to be impacted as a result of the Proposed Action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-7. It has been concluded that the Proposed Action has the potential to cause a significant impact to the large-eared pied bat.

TABLE 1-7: SIGNIFICANT IMPACT ASSESSMENT FOR LARGE-EARED PIED-BAT

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population;	The Study Area likely provides foraging resources to support large-eared pied bat, however there is an absence of suitable caves for roosting. The species is considered likely to occur within the Study area due to 'probable' recordings of the species that were produced from four Anabat recording devices deployed across the Study Area during multiple field surveys. 21,719.7 ha of foraging habitat for large-eared pied-bat (45% of the Study Area) has been identified and mapped within the Study Area, with a total of 886.3 ha of foraging habitat (4.4% of all foraging habitat within the Study Area) projected to be impacted as a result of the Proposed Action. Given the four 'probable' recording locations of the species within the Study Area, there is potential a large-eared pied-bat occurs within the Locality, with roost sites outside the Study Area. There are no known roosts within the Study Area, so impacts as a result of the Proposed Action is limited to loss of foraging habitat only. Given no known roosts are likely to be impacted, and the large availability of foraging habitat retained in the Study Area, the Proposed Action is unlikely to lead to a long-term decrease in the size of a population.	Unlikely
Reduce the area of occupancy of the species;	The estimated area of occupancy of large-eared pied bat is 1,500 km^2 (150,000 ha), of which the Study Area occurs at the northern-most extent (DCCEEW, 2023). Area of occupancy for the species is determined by total area of know maternity roost sites, which provide an essential roosting, sheltering and breeding function for the species (DCCEEW, 2023). No roosting habitat is mapped to occur within the Study Area, however likely recordings of the species across multiple locations and multiple survey events indicate the	Unlikely

Criteria	Description	Criteria Triggered?
	possibility for large-eared pied-bat roosting habitat within the Locality. Vegetation clearance in the proximity of roosts is identified as a key threat to large-eared pied-bat in the species' conservation advice (DCCEEW, 2023). The Proposed Action is projected to impact a total of 886.3 ha of foraging habitat (4.1% of all foraging habitat within the Study Area).	
Fragment an existing population into two or more populations;	The Proposed Action is expected to impact a total of 886.3 ha of foraging habitat (4.1% of all foraging habitat within the Study Area). This impact will only remove small, linear patches of habitat. Furthermore, large-eared pied-bat is a highly mobile species. It is therefore considered unlikely that the Proposed Action will fragment an existing important population into two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species;	Large-eared pied-bat conservation advice identifies that, due to loss, degradation and fragmentation of habitat, especially foraging habitat, all suitable habitat for the species likely constitutes habitat critical to the survival (DCCEEW, 2023). A total of 886.3 ha of foraging habitat (4.1% of all foraging habitat within the Study Area) for large-eared pied bat is projected to be impacted as a result of the Proposed Action. No roosting habitat, which is essential for the species, has been mapped to occur within the Study Area. However, large-eared pied-bats were recorded at four locations within the Study Area across multiple survey events, indicating the potential for suitable roosting sites within the Locality. Given this, there is potential the Proposed Action will adversely affect habitat critical to the survival of large-eared pied-bat, via removal of suitable foraging habitat in proximity of suitable roosting habitat.	Likely
Disrupt the breeding cycle of a population;	Large-eared pied bats utilise roosting habitat for breeding function. This includes cliffs, escarpments, overhangs, cracks or rocky ledges (DCCEEW, 2023). The Proposed Action is estimated to impact 886.3 ha of foraging habitat (4.1% of all foraging habitat within the Study Area), however no roosting habitat has been identified within the Study Area Therefore, it is unlikely the Proposed Action will disrupt the breeding cycle of an important population of large-eared pied-bat.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	A total of 21,719.7 ha of large-eared pied bat foraging habitat has been identified and mapped within the Study Area, with projected impacts to this habitat of 886.3 ha (4.1% of all foraging habitat within the Study Area). The species displays fidelity to established foraging habitat (DCCEEW, 2023). Foraging resources in proximity of established diurnal roosts are of high ecological value for large-eared pied-bat, however no essential roosting habitat in the Study Area has been identified, and while there is potential for roosting habitat in the Locality, that cannot be confirmed. Given this, it is considered unlikely that impacts associated with the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely

Criteria	Description	Criteria Triggered?
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Predation by introduced predators (such as feral cats (*Felis catus*), European red foxes (*Vulpes vulpes*) and rats (*Rattus sp*.)) has been suggested as a potential threat to cave roosting microbats in Australia. Additionally, roosting habitat disturbance by feral goats (*Capra hircus)* is considered a major risk to the species (DCCEEW, 2023). No feral goats were observed within the Study Area. Additionally, the Proposed Action activities during construction and operation will adopt and follow Biosecurity measures, including development and adherence to a Biosecurity Management Plan that will ensure that new invasive species are not introduced into the Study Area and that populations of invasive species within the Study Area do not further proliferate as a result of the Proposed Action.	Unlikely
Introduce disease that may cause the species to decline; and	The impact of diseases, including but not limited to, whitenose syndrome (WNS) is a potential threat to the species. White-nose syndrome is caused by the fungus *Pseudogymnoascus destructans* and leads to death through an infection of the muzzle and other parts of the body. The disease has not yet been detected in Australia but is a threat to cave-dwelling bats in other parts of the world and could have a significant impact on this species if it is introduced (DCCEEW, 2023). Precautions will be taken to ensure that the spread of disease does not occur, as detailed in a Biosecurity Management Plan. This includes following biosecurity measures and ensuring proper personal protection equipment is worn by construction workers and vehicle washdowns before entering identified habitats.	Unlikely
Interfere with the recovery of the species.	There is currently no adopted Recovery Plan for the species. The priority conservation objective stated within the species Conservation Advice is: *The distribution and the abundance of the species' subpopulations are maintained, and no known maternity roosts are lost. Foraging habitat within the vicinity of known roosts is maintained and is not cleared.* The Proposed Action will impact 886.3 ha (4.1% of all foraging habitat within the Study Area) of long-eared pied bat habitat within the Study Area. No maternity roost sites or roosting habitat has been identified in the Study Area or Locality, albeit the population structure of this species within QLD is poorly known and there are likely maternity roosts that have not been discovered (DCCEEW, 2023). However, with no known roosting sites to be impacted by the Proposed Action, it is unlikely the recovery of large-eared pied-bat will be interfered with.	Unlikely
Significant Impact: Likely		

1.2.4 SOUTHERN SQUATTER PIGEON SIGNIFICANT IMPACT ASSESSMENT

Squatter pigeon (southern subspecies) (*Geophaps scripta scripta*)

The Proposed Action is likely to result in a significant impact to the southern squatter pigeon.

The squatter pigeon (southern subspecies) (southern squatter pigeon) is listed as Vulnerable, under the EPBC Act, as of 16th July 2000, and is known to occur within the Study Area. This species was successfully identified on one occasion during field surveys in October 2022 and one occasion during field surveys in September 2023. Both observations were made in the north to north-west section of the Study Area.

The southern squatter pigeon is a ground-dwelling pigeon and can be differentiated from the northern subspecies by its larger body, and the skin around the eyes being predominantly blue-grey compared with yellowy-orange to orange-red in the northern subspecies (Crome, 1976; Ford, 1986; Higgins & Davies, 1996; Squatter Pigeon Workshop, 2011). The southern squatter pigeon inhabits open forests to sparse, open woodlands and scrub mostly dominated in the overstorey by *Eucalyptus, Corymbia, Acacia* or *Callitris* species, on sandy or gravelly soils, within approximately 3 km of a suitable, permanent or seasonal waterbody. Retention of these woodland canopy species which provide shelter from predatory birds is an important habitat factor for the southern squatter pigeon and is a notable distinction between the habitat value of open woodland compared to cleared land, which does not constitute important or critical habitat for the species.

Additional to presence of woodland canopy species, southern squatter pigeon conservation guidelines identify proximity to water as the most important determinant of habitat suitability, with open ground cover that permits ease of movement also crucial:

> *It is nearly always found near permanent water such as rivers, creeks and waterholes. Sandy areas dissected by gravel ridges, which have open and short grass cover allowing easier movement, are preferred (*DCCEEW, 2015).

Specifically in Queensland, foraging and breeding habitat is known to occur on well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills, and lateritic (duplex) soils on low 'jump-ups' and escarpments within 1 km of watercourses. The southern squatter pigeon nests on the ground where it forages for seeds among sparse and low grass. It roosts in low trees at night.

Habitat for the southern squatter pigeon has been delineated from the broad habitat types, based on the habitat requirements for the species. This is as follows:

Foraging habitat:

Within 3km of permanent or seasonal waterbodies:

- Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;
- Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels; and
- Brigalow woodlands dominated by *Acacia harpophylla*

Breeding habitat:

Within 1km of permanent waterbodies:

- Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;

- Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels; and
- Brigalow woodlands dominated by *Acacia harpophylla*

Generally unsuitable habitat:

- Waterbodies and drainage features;
- Grasslands and cultivated agricultural land; and
- Vine forest/ thickets and dry rainforest.

A total of 24,290.8 ha of southern squatter pigeon habitat has been mapped to occur within the Study Area, including 8,023.0 ha of foraging habitat and 16,267.8 ha of breeding habitat. 437.2 ha of foraging and roosting habitat and 524 ha of breeding habitat is expected to be impacted as a result of the Proposed Action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-8. It has been concluded that the Proposed Action is likely to cause a significant impact to the southern squatter pigeon.

TABLE 1-8: SIGNIFICANT IMPACT ASSESSMENT FOR THE SOUTHERN SQUATTER PIGEON

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species;	437.2 ha of southern squatter pigeon foraging and roosting habitat (5.4% of all foraging and roosting) and 524 ha of breeding habitat (3.2% of all breeding habitat) is expected to be disturbed within the Study Area. Three individual observations of the species have been made across the Study Area. Additionally, based on a conservative approach, the Study Area falls within the conservation-significant southern extent of the species occurrence south of the Carnarvon Ranges, making the impacted population an 'important sub-population.' However, impacts to approximately 5.4% of total available foraging and roosting habitat and 3.2% of total available breeding habitat are unlikely to cause a local population to experience decline. Furthermore, southern squatter pigeon has an observed tendency to inhabit disturbed and partially disturbed areas. Therefore, the Proposed Action is unlikely to lead to a long-term decrease in the size of an important population.	Unlikely
Reduce the area of occupancy of an important population;	This species' area of occupancy is roughly estimated at 10,000 km^2, with a presumed low reliability in this figure (Garnett & Cornell, 2000). The Proposed Action will lead to disturbance to 437.2 ha of southern squatter pigeon foraging and roosting habitat (5.4% of all foraging and roosting) and 524 ha of southern squatter pigeon breeding habitat (3.2% of all breeding habitat) within the Study Area. Three individual observations of the species have been made across the Study Area. Additionally, based on a conservative approach, the Study Area falls within the conservation-significant southern extent of the species occurrence south of the Carnarvon Ranges, making the impacted population an 'important sub-population.' The linear nature of the Proposed Development and the retention of the majority of the squatter pigeon habitat in the Study Area will allow the persistence of the species. Therefore, it is likely with implemented mitigation measures	Unlikely

Criteria	Description	Criteria Triggered?
	such as pre-clearance surveys and micro-siting, impacts associated with the Proposed Action are unlikely to reduce area of occupancy for an important population of this species.	
Fragment an existing important population into two or more populations;	Impacts to 437.2 ha of southern squatter pigeon foraging and roosting habitat (5.4% of all foraging and roosting habitat) and 524 ha of southern squatter pigeon breeding habitat (3.2% of all breeding habitat) are unlikely to fragment populations of this species due to southern squatter pigeon's comfort dispersing through disturbed areas. Three individual observations of the species have been made across the Study Area. Additionally, based on a conservative approach, the Study Area falls within the conservation-significant southern extent of the species occurrence south of the Carnarvon Ranges, making the impacted population an 'important sub-population.' Disturbance will largely occur within small, isolated turbine locations, or narrow linear areas within the Study Area. This will ensure that southern squatter pigeon remains connected, both within and outside of the Study Area.	Unlikely
Adversely affect habitat critical to the survival of a species;	24,290.8 ha of southern squatter pigeon habitat has been mapped to occur within the Study Area. Based on a conservative approach, the Study Area falls within the conservation-significant southern extent of the species occurrence south of the Carnarvon Ranges, making the impacted population an 'important sub-population.' Additionally, this habitat provides foraging and breeding function to the species. Due to the identified foraging and breeding habitat, and that the population of squatter pigeon within the Study Area potentially constitutes an 'important sub-population,' it has been considered likely the Study Area supports habitat critical to the survival of the species. Therefore, projected impacts of 437.2 ha to southern squatter pigeon foraging and roosting habitat (5.4% of all foraging and roosting habitat) and 524 ha to southern squatter pigeon breeding habitat (3.2% of all breeding habitat) are likely to adversely affect habitat critical to the survival of the species.	Likely
Disrupt the breeding cycle of an important population;	524 ha of southern squatter pigeon breeding habitat (3.2% of total breeding habitat) is expected to be disturbed within the Study Area. Three individual observations of the species have been made across the Study Area. Additionally, based on a conservative approach, the Study Area falls within the conservation-significant southern extent of the species occurrence south of the Carnarvon Ranges, making the impacted population an 'important sub-population.' Considering the retention of connectivity values, the species' ability to breed throughout the year (North, 1913-14), and the implementation of micro-siting at planned infrastructure sites, it is unlikely that the breeding cycle of southern squatter pigeon will be disrupted by the Proposed Action.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	The Proposed Action will result in the disturbance 437.2 ha of southern squatter pigeon foraging and roosting habitat (5.4% of total foraging and roosting habitat) and 524 ha of southern squatter pigeon breeding habitat (3.2% of all breeding habitat). This accounts for only a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 24,290.8 ha of southern squatter pigeon habitat total. It is expected that the small amounts of disturbance in the larger context of the landscape will not	Unlikely

Criteria	Description	Criteria Triggered?
	remove/isolate or decrease the quality of habitat that would result in species decline.	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	Invasive species such as feral cats (*Felis catus*) and European red foxes (*Vulpes vulpes*) are common pests encountered Queensland and are particularly harmful to native threatened birds. These invasive species are known to occur in the Study Area. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area.	Unlikely
Introduce disease that may cause the species to decline; and	There is currently limited evidence of diseases causing detrimental effects on southern squatter pigeon populations in Queensland. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely
Interfere substantially with the recovery of the species.	There are no formally adopted recovery plans for this species. However, it is considered that the disturbance of habitat in linear areas within the Study Area will not affect the recovery of this species. Additionally, impacted areas in the Study Area (437.2 ha impact to southern squatter pigeon foraging and breeding habitat (5.4% of total foraging and roosting habitat) and 524 ha impact to southern squatter pigeon breeding habitat (3.2% of total breeding habitat)) will remain connected to adjacent areas of suitable habitat, and mitigation measures such as micro-siting and pre-clearance surveys will be utilised. This will enable the species to continually traverse the landscape, ensuring genetic viability of the population. The Proposed Action is also unlikely to restrict access or limit the availability of current breeding habitat adjacent to known waterbodies such as farm dams and watercourses. While there is potential the population within the Study Area constitutes an 'important sub-population' of squatter pigeon, with the above avoidance and mitigation measures enacted, it is unlikely the Proposed Action will interfere substantially with the recovery of the species.	Unlikely
Significant Impact: Likely		

1.2.5 BLACK-BREASTED BUTTONQUAIL SIGNIFICANT IMPACT ASSESSMENT

Black-breasted buttonquail (*Turnix melanogaster*)

The Proposed Action is unlikely to result in a significant impact to the black-breasted buttonquail.

The black-breasted buttonquail is listed as Vulnerable under the EPBC Act as of 16th July 2000, and is considered to have the potential to occur within the Study Area. Although there are no recent records in the locality of the species, there is a 2021 record 20km to the east in Coominglah State Forest from 2021. Additionally, suitable habitat for the species was identified in the Study Area, although fragmented and limited.

Black-breasted buttonquail is a cryptic, mostly ground-dwelling bird endemic to coastal and near-coastal south-east Queensland and north-east New South Wales (TSSC, 2015). The species inhabits rainforest and closed forest ecosystems, with a preference for low, dry rainforest communities such as semi-evergreen vine thickets and araucarian microphyll to notophyll vine forests (Smyth et al, 2001). These vegetation communities often have a dense understorey high in complex shrubs and coarse woody debris, which provide important shelter and breeding value for the species (Smyth et al, 2001). They may also be found in low, dense acacia thickets and, in littoral areas, in vegetation behind sand dunes.

Black-breasted buttonquail forages along forest floors, preying on invertebrates sheltered amongst leaf litter. Presence of leaf litter is a crucial habitat determinant for black-breasted buttonquail, with a given community requiring extensive deposits of litter to provide suitable habitat (TSSC, 2015). To this extent, habitat for the species is considered to occur on highly fertile soils which facilitate rapid foliage growth and provide a constant layer of fallen leaves (TSSC, 2015).

Habitat critical to the survival of the black-breasted button-quail has been defined within the National Recovery Plan for Black-breasted Button-quail (*Turnix melanogaster*) (DCCEEW, 2022):

- *Foraging and breeding habitat;*
- *Habitat for the long-term maintenance of the species;*
- *Areas with potential habitat; and*
- *Areas supporting recovery.*

However, an 'important population' for the black-breasted buttonquail has not been defined in relevant species guidelines published by DCCEEW. Therefore, for this SIA the definition presented at the start of this appendices for an 'important population' has been considered for this species.

Potential habitat for the black-breasted buttonquail within the Study Area includes the 'Vine forest/thicket and dry rainforest' broad habitat types. This constitutes habitat critical to the survival of the species, though there is not considered to be an important population that resides in the Study Area.

There is a total of 232.3 ha of potential habitat for the species in the Study Area, 3.1 ha of which is subject to impact from the Proposed Action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-9. It has been concluded that the Proposed Action is unlikely to cause a significant impact to the black-breasted buttonquail.

TABLE 1-9: SIGNIFICANT IMPACT ASSESSMENT FOR THE BLACK-BREASTED BUTTONQUAIL

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species;	Black-breasted buttonquail is considered potential to occur within the Study Area. A total of 232.3 ha of potential habitat for this species has been identified within the Study Area, however no individuals have been recorded within the Study Area or Locality within the last 20 years. The species is estimated to have an area of occupancy of 75'000 ha (Garnett et al., 2011) and given the broad-scale loss of vine thicket vegetation and other black-breasted button-quail habitat (up to 90%, as suggested in Hamley et al., 1997), it is highly likely that the remaining distribution is severely fragmented. As the species is doesn't have any known population within the Study Area, it is unlikely that any potential population would be an 'important population'. It is therefore unlikely that the Project will lead to a long-term decrease in the size, reduce the area of occupancy, or fragment an existing important population of the species.	Unlikely
Reduce the area of occupancy of an important population;		Unlikely
Fragment an existing important population into two or more populations;		Unlikely
Adversely affect habitat critical to the survival of a species;	Black-breasted buttonquail is considered potential to occur within the Study Area. A total of 232.3 ha of potential habitat for this species has been identified within the Study Area. Habitat critical to the survival of the black-breasted button-quail has been defined within the National Recovery Plan for Black-breasted Button-quail (*Turnix melanogaster*) (DCCEEW, 2022): • Foraging and breeding habitat; • Habitat for the long-term maintenance of the species; • Areas with potential habitat; and • Areas supporting recovery. Based on this definition, the potential habitat within the Study Area constitutes habitat critical to the survival of the species. A total of 3.1 ha of this potential habitat is subject to disturbance by the Proposed Action. Potential impact to 3.1 ha of habitat critical to the survival of the species is not considered to be 'adverse' given that this is such a small area (1.3% of habitat in Study Area). Therefore, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of an important population;	Black-breasted buttonquail is considered potential to occur within the Study Area. A total of 232.3 ha of potential habitat for this species has been identified within the Study Area, however no individuals have been recorded within the Study Area or Locality within the last 20 years. There is not expected to be any important population of the black-breasted buttonquail in the Study Area, due to the lack of records of the species in the locality, and the fragmented existence of potential habitat. Therefore, impact to 3.1 ha of potential habitat is unlikely to disrupt the breeding cycle of an important population.	Unlikely

Criteria	Description	Criteria Triggered?
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	Black-breasted buttonquail is considered potential to occur within the Study Area. A total of 232.3 ha of potential habitat for this species has been identified within the Study Area, however no individuals have been recorded within the Study Area or Locality within the last 20 years. Due to the absence of any records of the species, and the fragmented existence of potential habitat, it is unlikely that impact to 3.1 ha of potential habitat would modify this species habitat to the extent that the species would decline.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	Based on the species conservation advice (TSSC, 2015), both invasive flora and fauna species have been identified as a threat to the black-breasted buttonquail. These include: • Habitat degradation as a result of domestic livestock and feral pigs (*Sus scrofa*); and • Predation by feral animals such as feral cats (*Felis catus*) and foxes (*Vulpes vulpes*) (Mathieson & Smith, 2009). Biosecurity risks associated with the Project will be managed with a biosecurity plan, as outlined in Section 6 of this EAR. Ensuring that this plan is adequately followed, it is considered unlikely that the Project will result in increasing the risk of any of the above invasive species becoming established in the species habitat.	Unlikely
Introduce disease that may cause the species to decline; and	No specific disease has been identified within the approved conservation advice as a threat to this species (TSSC, 2015). Biosecurity risks associated with the Project will be managed with a biosecurity plan, as outlined in Section 6 of this IAR. Ensuring that this plan is adequately followed, it is considered unlikely that the Project will introduce a disease that may cause the species to decline.	Unlikely
Interfere substantially with the recovery of the species.	The main recovery plan objectives for this species, outlined in National Recovery Plan for Black-breasted Button-quail (Turnix melanogaster) (DCCEEW, 2022), include: • By 2032, maintain and improve the extent, condition and connectivity of habitat of the Black-breasted Button-quail; • By 2032, demonstrably reduce the severity of identified anthropogenic threats across the extent of the species' range; • By 2032, achieve, measure and sustain a stable or positive trend in area of occupancy and population size (assessed by new baseline counts) in the number of mature individuals of the Black-breasted Button-quail; and • This will be achieved by implementing the actions set out in this recovery plan that minimise threats while protecting and enhancing the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery actions and increasing public awareness. Although the Project will result in the disturbance of 3.1 ha of potential black-breasted buttonquail potential habitat, as this habitat is only potential (no population has been identified within the Study Area) than it is unlikely that this impact will interfere with the recovery of the species (TSSC, 2015).	Unlikely
Significant Impact: Unlikely		

1.2.6 WHITE-THROATED NEEDLETAIL SIGNIFICANT IMPACT ASSESSMENT

White-throated needletail (*Hirundapus caudacutus*)

The Proposed Action is unlikely to result in a significant impact to the white-throated needletail.

White-throated needletail is listed as Vulnerable under the EPBC Act as of 19th July 2019 and is considered to have the potential to occur in the Study Area. White-throated needletail is also listed as migratory under the EPBC Act due to its inclusion in the *Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention*), the *China-Australia Migratory Bird Agreement (CAMBA*), and the *Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA*). Because of its co-listing, the species must be assessed as vulnerable and migratory. There are records of the species in the locality from 2009, and suitable foraging habitat occurs above the Study Area, as the species almost exclusively forages aerially.

White-throated needletail migrates to Australia during the species' non-breeding season, roughly October to April (DoE, 2015). During this time the species remains almost exclusively aerial, foraging above a variety of habitats as it moves along the eastern coast of Australia, before returning to preferred breeding locations across Asia in autumn (TSSC, 2019). The species is largely considered to roost aerially, with no nesting or breeding habitat present in Australia.

Conservation Advice for White-throated Needletail (TSSC, 2019) identifies this broad range of suitable foraging habitat as the following:

> *White-throated Needletail forages at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland, mudflats […] or coastal saltworks. Large tracts of native vegetation, particularly forest, may be a key habitat requirement for species.*
>
> *Areas of updraughts, such as ridges, cliffs or sand-dunes […] or along the edges of low-pressure systems, which both lift their food sources and assist with their flight, are preferred for foraging purposes as well, with the species potentially following these systems across Australia.*

Considering this, the entirety of the aerial space above the Study Area (46,830 ha) may be considered potential foraging habitat for the white-throated needletail. It must be noted, however, that the species will only occur as a flyover visitor and no observations of the species were made across six separate bird utilisation surveys completed during the appropriate migratory season where they are present in Australia (October – April)

A definition for an important population of this species as not been defined either for this species either, so the definition provided at the start of this appendices will be used. For the purposes of an assessment as a vulnerable species, it is assumed that no important population occurs in the Study Area, given the lack of observation of the species during field surveys, and scarcity of records in the locality (one record in 2009).

Significant impact assessments based on the guidance provided in the SIG 1.1 are presented in Table 1-10 (for vulnerable listing) and Table 1-11 (for migratory listing). It has been concluded that the Proposed Action is unlikely to cause a significant impact to the white-throated needletail. Considering the species nature as an aerial species in Australia, and proclivity to fly at RSA heights and above, there is a risk of turbine collision risk althou. Therefore, should the species be observed in the Study Area, adaptive management measures will be undertaken to further prevent any impact to this species.

TABLE 1-10: SIGNIFICANT IMPACT ASSESSMENT FOR THE WHITE-THROATED NEEDLETAIL (VULNERABLE)

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species;	White-throated needletail is almost exclusively aerial in nature while in Australia, with the entire Study Area (46,830 ha) considered aerial foraging habitat for the species (DAWE, 2015). It is unlikely that development for the Project will interfere with this species ability to forage and disperse overhead. The white-throated needletail is considered potential to occur within the Study Area, with no individuals recorded during field surveys. The minimum threshold for an ecologically significant impact to a population for white-throated needletail is 10 individuals (DAWE, 2015). As the species was not identified within the Study Area and no impacts to this species ability to forage aerially overhead will occur, it is considered unlikely that the Project will lead to a long-term decrease in the size of an important population of the species.	Unlikely
Reduce the area of occupancy of an important population;	White-throated needletail's area of occupancy while migrating through coastal Eastern Australia is estimated at approximately 126,000 km^2 (TSSC, 2019). As discussed, white-throated needletail, is almost exclusively aerial whilst migrating across Australia. Therefore, disturbance of vegetation associated with the Project is unlikely to reduce this area of occupancy. Additionally, no important population has been identified utilising the Study Area.	Unlikely
Fragment an existing important population into two or more populations;	White-throated needletail is a highly mobile species that migrates southwards over large areas of coastal Eastern Australia in the spring, summer, and autumn seasons (TSSC, 2019). It is not expected that the Project will fragment a population of this species given its dispersive and aerial nature.	Unlikely
Adversely affect habitat critical to the survival of a species;	The Study Area has been considered as habitat critical to the survival of the species conservatively, based on its potential utility for foraging behaviour. However, the Proposed Actions potential impacts will not adversely affect this habitat for white-throated needletail, as its foraging value is highly unlikely to be altered. Therefore, it is unlikely that the Project would adversely affect habitat critical to the survival of this species.	Unlikely
Disrupt the breeding cycle of an important population;	White-throated needletail does not breed during its migration to Australia. While a loss of old growth forest and mature hollow bearing trees in the northern hemisphere is suspected to be impacting the species' breeding success, it is not projected the Project will disrupt or have any impact on white-throated needletail's ability to breed.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	A loss of potential roosting sites in Australia is potentially contributing to the decline of the species, as well as the loss of suitably wooded habitat that invertebrate prey species require (TSSC, 2019). However, since no roosting habitat has been identified and the entire foraging habitat is aerial it is unlikely that the Project will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely

Criteria	Description	Criteria Triggered?
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	No invasive species have been identified as a threat to the white-throated needletail. Additionally, biosecurity risks associated with the Project will be managed with a biosecurity plan, as outlined in Section 5 of this EAR. Ensuring that this plan is adequately followed, it is considered unlikely that the Project will result in invasive species that are potentially harmful to the white-throated needletail becoming established in the Study Area.	Unlikely
Introduce disease that may cause the species to decline; and	While not necessarily a disease, the use of insecticides, particularly organochlorines, has been linked with the decline of white-throated needletail through indirect impacts. These indirect impacts include secondary poisoning through bioaccumulation of insecticides in prey species, and the decrease in the availability of preferred invertebrate prey species (Tarburton, 2014). There is no evidence to suggest the Project would increase the risk of these impacts. However, precautions will be taken as detailed in a Biosecurity Management Plan, to ensure that organochlorines are not used in the Project.	Unlikely
Interfere substantially with the recovery of the species.	There are no threat abatement or recovery actions proposed or underway for this species. Due to no individuals being observe during field surveys, and the habitat within the Study Area being exclusively aerial foraging habitat, it is considered unlikely that the Project will interfere with the recovery of the species.	Unlikely
Significant Impact: Unlikely		

TABLE 1-11: SIGNIFICANT IMPACT ASSESSMENT FOR THE WHITE-THROATED NEEDLETAIL (MIGRATORY)

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The whole Study Area is considered important habitat for this species but impacts to this habitat will not change its utility for the white-throated needletail. This is because the species is an aerial forager, and its prey, insects, will not be dissuaded from the Project Area due to the Proposed Actions activities. Additionally, there is no significant impact threshold set out in DoE (2015) for impacts to important habitat for this species, due to its aerial nature.	Unlikely
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	DoE (2015) does not identify any invasive species as harmful to the white-throated needletail. This said, a biosecurity plan will be implemented for the Project, as well as other biosecurity measures. With such measures, it is unlikely that harmful invasive species become established in the Study Area.	Unlikely

Criteria	Description	Criteria Triggered?
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The white-throated needletail does not breed in Australia, nor is it considered to roost. Therefore, any occurrence of the species in the Study Area is likely to be a strict, flyover, aerial visitor which would not be impacted by the Proposed Action, apart from potential collision risks which will be adaptively managed as outlined in the BBMP. An ecologically significant proportion of white-throated needletail is 10 individuals (for nationally significant) or 100 (for internationally significant) (DoE, 2015). Considering the lack of observation, and the strict aerial nature of this species, the Study Area is unlikely to be a host to an ecologically significant proportion of this species. The Proposed Action is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the white-throated needletail population.	Unlikely
Significant Impact: Unlikely		

1.2.7 AUSTRALIAN PAINTED SNIPE SIGNIFICANT IMPACT ASSESSMENT

Australian painted snipe (*Rostratula australis*)

The Proposed Action is unlikely to result in a significant impact to the Australian painted snipe.

The Australian painted snipe is listed as Endangered under the EPBC Act, effective 15 May 2013, and was assessed as having the potential to occur in the Study Area. This is because suitable habitat for the species was identified in the Study Area, and there is a record of the species from 2000, 20km south-west of the Study Area.

The Australian painted snipe is a stocky, wading bird featuring a chestnut coloured head, white band around the eye and a white crown stripe, a long pinkish bill, metallic green back and wings, barred with black and chestnut, and a pale V-shaped stripe extending from the shoulder down to the upper back (DoE, 2024). The species is typically 220–250 mm in length, with a wingspan of 500–540 mm and weigh approximately 125–130 grams (DSEWPC, 2013b).

The Australian painted snipe occurs throughout Australia, being recorded at wetlands in all Australian states and territories, however, is the most localised in eastern Australia. The species inhabits shallow terrestrial freshwater wetlands, and occasionally brackish. Common habitats for the species include temporary and/or permanent lakes, swamps and claypans, inundated or waterlogged grassland, saltmarsh, farm dams and sewage farms, and bore drains (DSEWPC, 2013). In drought conditions, the Australian painted snipe requires suitable wetland conditions and may move to other suitable habitats if required (Marchant and Higgins, 1993), however migratory patterns are poorly known for the species (Pringle, 1987).

Breeding habitat for the species is known to be more specific, where the species requires shallow wetlands with areas of bare wet mud and upper and canopy cover within the immediate vicinity. All recorded nests have been located in or near small islands in freshwater wetlands (Rogers, 2002).

Potential habitat for this species in the Study Area includes the 'waterbodies and drainage features' broad habitat type, which totals 56 ha of potential habitat. This habitat is considered potential foraging habitat only, and not breeding habitat.

Habitat critical to the survival of this species is not specifically defined, so the definition provided at the start of this appendices will be utilized. Considering this, the 56 ha of potential habitat in the Study Area is not thought to be habitat critical to the survival of the species, as no individuals of the species have been observed using it and is in poor condition due to the historical cattle grazing use of the Study Area.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-12. It has been concluded that the Proposed Action is likely to cause a significant impact to the Australian painted snipe.

TABLE 1-12: SIGNIFICANT IMPACT ASSESSMENT FOR THE AUSTRALIAN PAINTED SNIPE

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population,	Impact to 1.3 ha of potential Australian painted snipe foraging habitat (2.3% of total habitat available) is expected to be disturbed within the Study Area, though no known population is known to occur. The current range of distribution of the species is extensive, at 710,000,000 ha, and impact to 1.3 ha of potential habitat is not going to reduce this range of occupancy. Furthermore, the Proposed Action's activities are unlikely to cause a local population to experience decline (or fragment), as there is no evidence to suggest a local population occurs. Additionally, the impacts that may occur to potential habitat are very small (1.3 ha) and are unlikely to impact any potential populations.	Unlikely
Reduce the area of occupancy of the species,		Unlikely
Fragment an existing population into two or more populations,		Unlikely
Adversely affect habitat critical to the survival of a species,	While we have mapped potential habitat for this species, this habitat is not expected to constitute habitat critical to the survival of the species due to the degraded nature of the habitat. Therefore, the Proposed Action's potential impact to 1.3 ha of potential foraging habitat is unlikely to adversely affect habitat critical to the survival of this species.	Unlikely
Disrupt the breeding cycle of a population,	No breeding habitat is considered to occur in the Study Area, as the species requires shallow freshwater wetlands with interspersed small island and nearby canopy cover. As there is no such habitat in the Study Area, it is unlikely that breeding practices will be directly impacted. A species breeding cycle can be disrupted due to substantial changes in foraging behaviour, but the small impact to 1.3 ha of potential foraging habitat is unlikely to lead to a substantial impact. Ultimately, considering the unlikeliness of the species breeding in the Study Area, and the limited pre-existing foraging value, it is unlikely that the Proposed Action's impacts would disrupt the species breeding cycle.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The Proposed Action will result in the disturbance 1.3 ha of potential Australian painted snipe foraging habitat (2.3% of total habitat available). This accounts for only a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 56 ha of Australian painted snipe habitat total. It is expected that the small amounts of disturbance in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The following invasive species are expected to be detrimental to the Australian painted snipe (DSEWPC, 2013): • Livestock via grazing and trampling of wetland vegetation and nests; • Feral foxes and cats via predation; and • Weeds that replace native wetland vegetation. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area. The Study Area has been historically used for cattle grazing, so no new impacts will arise from the Proposed Action with regards to livestock.	Unlikely

Criteria	Description	Criteria Triggered?
Introduce disease that may cause the species to decline, or	The conservation advice for Australian painted snipe does not list any diseases as harmful to the species. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely
Interfere with the recovery of the species.	There are no formally adopted recovery plans for this species, but the conservation advice lists regional priority recovery actions that involve abatement/research of the following threats: • Habitat loss, disturbance and modification; • Invasive weeds; • Trampling, browsing and grazing; • Animal predation or competition; and • Fire. Considering the potential impacts of the Proposed Action (Section 6 of this EAR) along with mitigation measures (Section 7 of this EAR), the Proposed Action is unlikely to result in, or exacerbate any of these threats. This is because only 1.3 ha of potential habitat for the species will be impacted, and other threats are mitigated through the biosecurity management plan, staff site inductions etc.	Unlikely
Significant Impact: Unlikely		

1.2.8 YELLOW-BELLIED GLIDER SIGNIFICANT IMPACT ASSESSMENT

Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)

The Proposed Action is unlikely to result in a significant impact to the yellow-bellied glider (south-eastern).

The yellow-bellied glider (south-eastern) (yellow-bellied glider) is listed as vulnerable under the EPBC Act and is considered as having the potential to occur within the Study Area.

The yellow-bellied glider has a widespread distribution, from the upper reaches of south-east Queensland to south-eastern South Australia. Though it's distribution is somewhat confined to the coastal portion of this area, their distribution extends over the Great Dividing Range in some areas of Queensland and New South Wales. Although widespread, the species distribution is patchy due to biogeographic processes and extensive land clearing. The species-specific habitat requirements also tend to fragment populations even within single forests (DAWE, 2022).

Broadly, habitat for yellow-bellied glider includes wet and dry eucalypt-dominated sclerophyll woodlands and forests. Forest age is a reliable determinant of abundance of the sub-species, as they require mature old growth for foraging and shelter. Additionally, they also show a preference for such woodlands and forests that have a high proportion and diversity of winter-flowering and smooth-barked eucalypts, which help provide diversity in food sources year-round. Additionally, the sub-species also typically have large home-ranges (50-65 ha) to further provide this food resource diversity. Food sources for the species include insects sheltering in shed bark, manna, eucalypt nectar and pollen and various *Eucalyptus* species are used for sap-feeding, a process whereby sap is drawn from the tree via V-shaped incisions and vertical furrows created by the species large, lower incisor teeth. Sap feed trees are considered a critical habitat feature for the sub-species, and a variety of trees are used for this, primarily *Eucalyptus* species however (DAWE, 2022). Known trees used for sap-feeding that are present in suitable habitat in the Project Area include: *Corymbia citriodora* and *Eucalyptus tereticornis*.

Another critical microhabitat feature for the species are hollows found in old, mature trees usually greater than one metre in diameter, which provide dens for shelter during the day. Hollow-bearing trees for this species are typically live, smooth-barked eucalypts (DAWE, 2022).

Under the *Conservation Advice for Petaurus australis australis (yellow-bellied glider (south-eastern))* (DAWE, 2022), habitat critical to the survival of the species is habitat that contains any one of the following attributes:

- Large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees;
- Areas identified as refuges under future climate change scenarios;
- Short or long-term post-fire refuges that allow the species to persist, recover and recolonise burnt areas;
- Habitat corridors required to facilitate dispersal between fragmented habitat patches and/or that enable recolonization or movement away from threats; and
- Areas in which some trees have evidence of use for sap extraction by yellow-bellied glider.

DAWE (2022) outlines that impact assessments for the species should consider the following species attributes:

- Highly specialised diet and requirement of trees with unknown characteristics for sap feeding;
- Prefer to den in living hollow-bearing trees;
- Groups live in large, exclusive home ranges as foraging substrates are dispersed and variable through time and space; and
- Large areas of forest are required to maintain population viability.

These points are considered in the species significant impact assessment.

Yellow-bellied glider habitat within the Study Area can be considered to contain large contiguous area of eucalypt forest containing winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees, as well as a smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization and so aligns with the Conservation Advice as being habitat critical to the survival of yellow-bellied glider.

Suitable yellow-bellied glider foraging, denning and dispersal habitat has been identified within the Study Area based on ground-truthing of habitat attributes. The Study Area contained the following broad habitat types as denning habitat, foraging habitat, and generally unsuitable habitat for the species.

Denning habitat:

- Riparian woodland and open forests dominated by *E. tereticornis* often associated with stream channels; and

Foraging and dispersal habitat:

- RE 11.12.6 (*Corymbia citriodora* open forest on igneous rocks (granite)) within the BHT of Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey.

Patches of this habitat have been excluded from the mapped potential yellow bellied glider habitat due to either:

- Being disconnected from the main area of habitat that has connectivity to Camboon State Forest; or
- Being narrow riparian woodland adjacent to cleared areas.

Additionally, eucalyptus woodland and open forest habitat in the south-east corner of the Study Area has been included as yellow-bellied glider habitat due to its connectivity to Camboon Satate Forest and being adjacent to mapped denning habitat for the species.

Ground-truthed surveys have identified 921.1 ha of yellow-bellied glider denning habitat and 3171.8 ha of yellow-bellied glider foraging habitat within the Study Area. A total of 303.1 ha of yellow-bellied glider habitat (including approximately 11.8 ha of denning habitat and 291.3 ha of foraging habitat) is expected to be impacted as a result of the Proposed Action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-13. It has been concluded that the Proposed Action is unlikely to cause a significant impact to the yellow-bellied glider.

TABLE 1-13: SIGNIFICANT IMPACT ASSESSMENT FOR YELLOW-BELLIED GLIDER

Criteria	Description	Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population;	Yellow-bellied glider is considered potential to occur within the Study Area with no individual observed during targeted field surveys. The amount of habitat to be cleared is up to 303.1 ha, or 7.4% of the total amount of potential yellow-bellied glider habitat within the Study Area. The impact will be clearing of small amounts of remnant patches along with small amounts of linear clearing. Mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will ensure that impacts to essential microhabitat features (hollow-bearing trees) are further avoided where possible. Disturbance associated with linear infrastructure will also ensure that movement and gliding ability for the species is not affected. The Study Area will remain connected to adjacent, larger remnant forests, like Camboon State Forest. Therefore, the Proposed Action is unlikely to lead to a long-term decrease in the size of the population.	Unlikely
Reduce the area of occupancy of the species;	This species is predicated to have an area of occupancy of 12,724 km^2. The clearing of 303.1 ha of potential yellow-bellied glider habitat from the Proposed Action equates to only 0.02% of the species area of occupancy. The nature of clearing involved within the Study Action, being small areas of linear infrastructure across the landscape, is unlikely to reduce the species area of occupancy.	Unlikely
Fragment an existing population into two or more populations,	The yellow-bellied glider is considered potential to occur within the Study Area, with no evidence of the species or population inhabiting the Study Area to date. The proposed potential yellow-bellied glider habitat to be cleared (303.1 ha) is unlikely to fragment an existing important population. Clearing will largely occur within small, isolated turbine locations, or narrow linear areas within the Project Area. Such small clearings will ensure that yellow-bellied glider habitat remains connected, both within and outside of the Study Area	Unlikely
Adversely affect habitat critical to the survival of a species;	Under the *Conservation Advice for Petaurus australis australis (yellow-bellied glider (south-eastern))* (DAWE, 2022), habitat critical to the survival of the species is habitat that contains any one of the following attributes: • Large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees; • Areas identified as refuges under future climate change scenarios; • Short or long-term post-fire refuges that allow the species to persist, recover and recolonise burnt areas; • Habitat corridors required to facilitate dispersal between fragmented habitat patches and/or that	Unlikely

Criteria	Description	Triggered?
	enable recolonization or movement away from threats; and • Areas in which some trees have evidence of use for sap extraction by yellow-bellied glider. Due to potential habitat being dominated by smooth-bark eucalypts, and/or potentially providing a movement corridor for the species (between state forests), the mapped potential habitat may be considered habitat critical to the survival of the species. However, as no evidence of the species was identified in the Study Area or immediate surrounds based on desktop analysis and field surveys, including targeted surveys for the species, the removal of 303.1 ha or 7.4% of potential habitat is unlikely to adversely affect habitat critical to the survival of the species.	
Disrupt the breeding cycle of a population;	Yellow-bellied gliders have a plausible home range of 25-85 ha (Craig, 1985; Goldingay & Quin, 2004). The Proposed Action will result in the clearing of 11.8 ha or 1.3% of the total yellow-bellied glider breeding and denning habitat within the Study Area. The design phase as well as micro-siting will avoid hollow-bearing trees that are necessary for the successful breeding cycle of the species. Therefore, the Proposed Action is unlikely to disrupt the breeding cycle of a population.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	The Proposed Action will result in the removal of 303.1 ha or 7.4% of the total available potential yellow-bellied glider habitat within the Study Area. However the habitat within the Study Area will remain connected to larger remnant patches outside of the Study Area, and additionally, no population is currently known to utilise this habitat, with the species considered potential to occur. Thus, the small amounts of clearing in the larger context of the landscape is unlikely to remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;	Invasive species such as feral cats (Felis catus) and cane toads (Rhinella marina) are common pests encountered in Queensland and are particularly harmful to native, threatened mammals. Both of these invasive species are known to occur in the Study Area. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures that ensure that further invasive species are unlikely to introduced into the Study Area.	Unlikely
Introduce disease that may cause the species to decline; or	There is currently limited evidence of diseases noted in the conservation advice or literature causing detrimental effects on greater glider populations in Queensland. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures and ensuring proper personal protection equipment (PPE) is worn by construction workers.	No

Criteria	Description	Triggered?
Interfere with the recovery of the species.	There is no adopted or made Recovery Plan for this species. Clearing will largely occur within small, isolated turbine locations, or narrow linear areas within the Study Area. Additionally, the Study Area will remain connected to adjacent State Forests. The design phase, micro siting, and other mitigation methods will ensure that interference with the recovery of the species is unlikely.	Unlikely
Significant Impact: Potential		

1.3 FLORA SPECIES

1.3.1 OOLINE SIGNIFICANT IMPACT ASSESSMENT

Ooline (*Cadellia pentastylis*)

The Proposed Action is unlikely to result in a significant impact to ooline.

Ooline is listed as Vulnerable under the EPBC Act as of 16th July 2000, and is assessed as having the potential to occur within the Study Area. This species was not identified during survey events in the Study Area, though there is a record of the species 50kms east of the Study Area near Coominglah State Forest (ALA, 2003).

Ooline occurs in north-west New South Wales and southern and central Queensland. This species inhabits dry rainforest, vine thickets and some mixed sclerophyllous communities on mid-to-upper slopes of hills and ridges (300m to 600m above sea level) comprised of a varied clay and sandstone geology (Benson, 1993).

Potential ooline habitat occurs within the Study Area in association with the broad habitat type *Vine forest / thickets and dry rainforest*. This habitat has been mapped, with a total of 232.3 ha of potential habitat occurring in the Study Area. 3.1 ha of this habitat is expected to be impacted as a result of the Proposed Action.

In the absence of an official definition, potential species habitat defined above and mapped to occur within the Study Area has conservatively been considered habitat critical to the survival of ooline, though the Study area does not support an important population of the species.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-14. It has been concluded that the Proposed Action is unlikely to cause a significant impact to ooline.

TABLE 1-14: SIGNIFICANT IMPACT ASSESSMENT FOR OOLINE

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species;	232.2 ha of potential ooline habitat occurs within the Study Area (0.5% of the total Study Area). 3.1 ha of potential habitat (1.3% of all habitat within the Study Area) is expected to be disturbed as a result of the Proposed Action. No observations of the species have been made across the Study Area. One database record of the species from 2003 (ALA) occurs approximately 50kms east of the Study Area. It is unlikely an important population of ooline occurs within the Study Area. Impacts to approximately 1.3% of total available potential habitat within the Study Area are unlikely to impact any local populations of the species. Additionally, mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will ensure disturbance to the species are further avoided where possible. Therefore, the Proposed Action is unlikely to lead to a long-term decrease in the size of an important population.	Unlikely
Reduce the area of occupancy of an important population;	Ooline occurs in central and southern Queensland and north-west New South Wales. Its area of occupancy in this range is unknown, though roughly 40 disjunct populations are known	Unlikely

Criteria	Description	Criteria Triggered?
	across its natural distribution (approximately 25 populations in Queensland and 15 in New South Wales) (DEWHA, 2008). The Proposed Action will lead to disturbance of 3.1 ha of potential ooline habitat, or 1.3% of all habitat within the Study Area. No observations of the species have been made across the Study Area. One database record of the species from 2003 (ALA) occurs approximately 50kms east of the Study Area. It is unlikely an important population of ooline occurs within the Study Area. With the addition of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that impacts to approximately 1.3% of total available potential habitat within the Study Area will reduce the area of occupancy of an important population of ooline.	
Fragment an existing important population into two or more populations;	The Proposed Action will lead to disturbance of 3.1 ha of potential ooline habitat, or 1.3% of all habitat within the Study Area. No observations of the species have been made across the Study Area. One database record of the species from 2003 (ALA) occurs approximately 50kms east of the Study Area. It is unlikely an important population of ooline occurs within the Study Area. Disturbances associated with the Proposed Action will largely occur at small, isolated turbine locations, or narrow, linear areas of projected access tracks within the Study Area. This will ensure that effects of fragmentation are minimised at all opportunities. With the addition of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that impacts to approximately 1.3% of total available potential habitat within the Study Area will fragment an existing important population of ooline into two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species;	Habitat critical to the survival of ooline has not been defined. In lieu of an official definition, ooline habitat as defined by the species' SPRAT profile has been used: *"semi-evergreen vine thickets and sclerophyll vegetation on undulating terrain of various geology […] associated with upper and mid-slopes in the landscape. The altitude is generally 300-460 m above sea level, with some stands known to occur at 600 m above sea level (Benson, 1993)."* 232.3 ha of potential ooline habitat has been mapped to occur within the Study Area. Though no observations of the species have been made across the Study Area and only database records of the species occur within approximately 50kms of the Study Area, if a population is observed in future surveys, the immediate vicinity may be considered habitat critical to the survival of the species. The Proposed Action will lead to disturbance of 3.1 ha of potential ooline habitat, or 1.3% of all habitat within the Study Area. With implementation of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that the Proposed Action will adversely affect habitat critical to the survival of ooline, especially considering this is a small amount of habitat in comparison to the broader Study Area.	Unlikely

Criteria	Description	Criteria Triggered?
Disrupt the breeding cycle of an important population;	The SPRAT profile for ooline identifies avifauna dispersal and passive fall as probable methods of reproduction for the species, though it is noted low rate of seed viability is one of the key threatening processes for ooline. (SPRAT) Disturbance to 3.1 ha of potential ooline habitat, or 1.3% of all habitat within the Study Area is unlikely to disrupt the species' ability to reproduce within the Study Area. Additionally, with no observations of the species across the Study Area and just one database record of the species approximately 50kms east of the Study Area (ALA, 2003) it is unlikely an important population of ooline occurs within the Study Area. Considering the implementation of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that the breeding cycle of an important population of ooline will be disrupted by the Proposed Action.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	The Proposed Action will result in the disturbance of 3.1 ha of potential ooline habitat (1.3% of total habitat available). This accounts for a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 232.3 ha of potential ooline habitat. It is expected that small scale disturbance in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	Invasive fauna such as feral goats (*Capra hircus*) and wild pigs (*Sus scrofa*) as well as invasive flora including tiger pear (*Opunita* aurantiaca) are identified as threats to ooline. (DEWHA, 2008) Wild pig and *Opuntioid* cactii are known to occur in the Study Area, though no wild goats have been observed. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area.	Unlikely
Introduce disease that may cause the species to decline; and	There is currently limited evidence of diseases causing detrimental effects on ooline populations in Queensland. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely
Interfere substantially with the recovery of the species.	There are no formally adopted recovery plans for this species. However, there are *Regional* and *Local Priority Actions* identified by the *Approved Conservation Advice for* Cadellia pentastylis (DEWHA, 2008), which, listed below, determine key management issues of; • Habitat loss, disturbance and modification • Conservation information • Fire • Invasive weeds • Trampling, browsing or grazing • Recovery of additional sites and/or populations The Proposed Action will result in 3.1 ha of disturbance to potential ooline habitat (1.3% of all habitat within the Study Area). It is unlikely this impact will lead to habitat loss, disturbance or modification of ooline habitat to the	Unlikely

Criteria	Description	Criteria Triggered?
	extent that recovery of the species is substantially interfered with. Additional priority actions will be managed so as not to interfere substantially with the recovery of the species, including control of invasive weeds through a biosecurity management plan and mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure to retain connectivity values and reduce impacts where possible. It is not expected the Proposed Action will lead to an increased fire risk. While the Study Area is used for agricultural purposes, it is not expected the Proposed Action will propagate further impacts of trampling and grazing, especially regarding high-threat species such as feral goats. It is therefore considered unlikely the Proposed Action will substantially interfere with the recovery of ooline.	
Significant Impact: Unlikely		

1.3.2 COSSINIA SIGNIFICANT IMPACT ASSESSMENT

Cossinia (*Cossinia australiana*)

The Proposed Action is unlikely to result in a significant impact to cossinia.

Cossinia is listed as Endangered under the EPBC Act as of 16th July 2000, and is assessed as having the potential to occur within the Study Area. This species was not identified during survey events in the Study Area, though there is an out-of-date record of the species 1 km east of the Study Area in Montour State Forest (ALA, 2002).

Cossinia is endemic to central and southern Queensland where it occurs from 20m to 520m above sea level in *Araucaria* vine forests and semi-evergreen thickets on varied geology of red volcanic soils and black clay loams. (DEWHA, 2008; DES, 2012) In addition to occurrences as a scattered or uncommon individual among closed forests, cossinia also inhabits ecotones between dry rainforest and sclerophyllous communities. (DES, 2012)

Potential cossinia habitat occurs within the Study Area in association with the broad habitat type *Vine forest / thickets and dry rainforest*. This habitat has been mapped, with a total of 232.3 ha of potential habitat occurring in the Study Area. 3.1 ha of this habitat is expected to be impacted as a result of the Proposed Action.

In the absence of an official definition, potential species habitat defined above and mapped to occur within the Study Area has been considered habitat critical to the survival of cossinia. This is largely due to the 2002 record 1km east of the Project Area.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-15. It has been concluded that the Proposed Action has the potential to cause a significant impact to cossinia.

TABLE 1-15: SIGNIFICANT IMPACT ASSESSMENT FOR COSSINIA

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population;	232.2 ha of potential cossinia habitat occurs within the Study Area (0.5% of the total Study Area). 3.1 ha of potential habitat (1.3% of all habitat within the Study Area) is expected to be disturbed as a result of the Proposed Action. No observations of the species have been made across the Study Area. One out-of-date database record of the species from 2002 (ALA) occurs approximately 1 km east of the Study Area in Montour State Forest. Impacts to approximately 1.3% of total available potential habitat within the Study Area are unlikely to impact any local populations of the species. Additionally, mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will ensure disturbance to the species are further avoided where possible. Therefore, the Proposed Action is unlikely to lead to a long-term decrease in the size of a population of cossinia.	Unlikely

Criteria	Description	Criteria Triggered?
Reduce the area of occupancy of the species;	Cossinia is endemic to central and southern Queensland. Its area of occupancy in this range is unknown, though occurs in a roughly 300km range between Rockhampton and Kingaroy in scattered habitat patches as an uncommon or isolated individual. (DEWHA, 2008). The Proposed Action will lead to disturbance of 3.1 ha of potential cossinia habitat, or 1.3% of all habitat within the Study Area. No observations of the species have been made across the Study Area. One out-of-date database record of the species from 2002 (ALA) occurs approximately 1 km east of the Study Area in Montour State Forest. With the addition of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that impacts to approximately 3.1 ha of potential habitat or 1.3% of total available potential habitat within the Study Area will reduce the area of occupancy of cossinia.	Unlikely
Fragment an existing population into two or more populations;	The Proposed Action will lead to disturbance of 3.1 ha of potential cossinia habitat, or 1.3% of all habitat within the Study Area. No observations of the species have been made across the Study Area. One out-of-date database record of the species from 2002 (ALA) occurs approximately 1 km east of the Study Area in Montour State Forest. Disturbances associated with the Proposed Action will largely occur at small, isolated turbine locations, or narrow, linear areas of projected access tracks within the Study Area. This will ensure that effects of fragmentation are minimised at all opportunities. With the addition of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that impacts to approximately 1.3% of total available potential habitat within the Study Area will fragment an existing population of cossinia into two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species;	Habitat critical to the survival of cossinia has not been defined. In lieu of an official definition, cossinia habitat as defined by the species' conservation advice has been used: *"fragmented relict patches of* Araucarian *vine forests or vine thickets on fertile soils in central and southern Queensland (DEWHA, 2008)."* 232.3 ha of potential cossinia habitat has been mapped to occur within the Study Area in areas of semi-evergreen vine thickets. Though no observations of the species have been made across the Study Area and only out-of-date database records of the species occur 1km east of the Study Area, if a population is observed in future surveys, the immediate vicinity may be considered habitat critical to the survival of the species. The Proposed Action will lead to disturbance of 3.1 ha of potential cossinia habitat, or 1.3% of all habitat within the Study Area. It is expected that small scale disturbance in the larger context of the landscape and the available potential habitat for this species that is retained will not lead to an adverse impact to cossinia.	Unlikely

Criteria	Description	Criteria Triggered?
Disrupt the breeding cycle of a population;	Disturbance to 3.1 ha of potential cossinia habitat, or 1.3% of all habitat within the Study Area is unlikely to disrupt the species' ability to reproduce within the Study Area. Additionally, with no observations of the species across the Study Area and just one out-of-date database record of the species approximately 1km east of the Study Area (ALA, 2002) it is unlikely a population of ooline occurs within the Study Area. Considering the implementation of mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure, it is unlikely that the breeding cycle of a population of cossinia will be disrupted by the Proposed Action.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	The Proposed Action will result in the disturbance of 3.1 ha of potential cossinia habitat (1.3% of total habitat available). This accounts for a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 232.3 ha of potential cossinia habitat. It is expected that small scale disturbance in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Cossinia often occurs in ecotonal habitat at the edge of dry rainforest ecosystems and is susceptible to edge effects and outcompetition by introduced weeds. (DES, 2012) Invasive flora is therefore considered one of the largest threatening process to cossinia. Lantana (*Lantana camara*), Dutchman's Pipe (*Aristolochia elegans*), Madeira Vine (*Anredera cordifolia*), Cat's Claw Creeper (*Macfadyena unguis-cati*) and Climbing Asparagus (*Asparagus plumosus*) are the primary weeds which threaten cossinia (DEWHA, 2008). Lantana and cat's claw creeper have been confirmed to occur within the Study Area. The Proposed Action will result in the disturbance of 3.1 ha of potential cossinia habitat (1.3% of total habitat available), with associated impacts likely to introduce edge effects and invasive flora to potential cossinia habitat. The adoption of and adherence to a biosecurity management plan during construction and operation activities, are likely to mitigate impacts associated with invasive species that are harmful cossinia becoming established.	Unlikely
Introduce disease that may cause the species to decline; and	There is currently limited evidence of diseases causing detrimental effects on cossinia populations in Queensland. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely
Interfere with the recovery of the species.	There are no formally adopted recovery plans for this species. However, there are *Regional* and *Local Priority Actions* identified by the *Approved Conservation Advice for* Cossinia australiana (DEWHA, 2008), which, listed below, determine key management issues of; • Habitat loss, disturbance and modification	Unlikely

Criteria	Description	Criteria Triggered?
	• Invasive weeds • Conservation information • Recovery of additional sites and/or populations The Proposed Action will result in 3.1 ha of disturbance to potential cossinia habitat (1.3% of all habitat within the Study Area). It is unlikely this impact will lead to habitat loss, disturbance or modification of cossinia habitat to the extent that recovery of the species is interfered with. Additional priority actions will be managed so as not to interfere with the recovery of the species, including control of invasive weeds through a biosecurity management plan and mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure to retain connectivity values and reduce impacts where possible. It is therefore considered unlikely the Proposed Action will substantially interfere with the recovery of	
Significant Impact: Unlikely		

1.3.3 AUSTRAL CORNFLOWER SIGNIFICANT IMPACT ASSESSMENT

Austral Cornflower (*Rhaponticum australe*)

The Proposed Action is unlikely to result in a significant impact to Austral cornflower.

Austral cornflower is listed as Vulnerable under the EPBC Act, effective 16 July 2000, and was assessed as having the potential to occur in the Study Area. This species was not identified during survey events in the Study Area, though there are three out-of-date record of the species 20 km east of the Study Area (ALA, 1997).

Austral cornflower's distribution occurs across 600km, from Mt Moffat to Gatton. It is thought to be extinct in NSW and Victoria, but it historically occurred in these two states, showing a remarkable decline in species distribution range. Extant populations of the species vary in size, and the overall population is unknown and extent of occurrence is not defined. The species occurs in eucalypt open forests with a grassy understorey on black clay soils. The species has been recorded on roadsides. Typical associated species include: *Chloris Gayana, Cirsium vulgare, Eucalyptus tereticornis* and *Angophora floribunda* (DEWHA, 2008).

Potential Austral cornflower habitat occurs within the Study Area in association with the broad habitat type *Eucalypt woodlands and open forests*. This habitat has been mapped, with a total of 21,719.7 ha of potential habitat occurring in the Study Area. Noting that the key mitigation measures is to undertake detailed field surveys of the 90% design Development Footprint, and avoid populations of the species should they be located, while 886.3 ha of potential habitat is expected to be impacted as a result of the Proposed Action, the actual impact to the species will be negligible.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-16. It has been concluded that the Proposed Action has potential to cause a significant impact to Austral cornflower.

TABLE 1-16: SIGNIFICANT IMPACT ASSESSMENT FOR AUSTRAL CORNFLOWER

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population of a species;	Austral cornflower occurs in central and southern Queensland and its total area of occupancy is unknown but has contracted significantly compared to its historical range which extended to NSW and Victoria. No observations of the species have been made across the Study Area. Due to the lack of observation of the species, it is unlikely an important population of Austral cornflower occurs within the Study Area. Additionally, mitigation measures such as pre-clearance surveys of 90% design of the Development Footprint and micro-siting at areas of planned infrastructure will ensure disturbance to the species are further avoided where possible. Therefore, it is unlikely that impacts to approximately 4.1% of total available potential habitat within the Study Area will lead to a long-term decrease or fragment a population of Austral cornflower, or reduce the area of occupancy of the species.	Unlikely
Reduce the area of occupancy of an important population;		Unlikely
Fragment an existing important population into two or more populations;		Unlikely

Criteria	Description	Criteria Triggered?
	With the implementation of mitigation measures such as pre-clearance surveys of the 90% design Development Footprint and micro-siting at areas of planned infrastructure to avoid any populations of the species should they be identified.	
Adversely affect habitat critical to the survival of a species;	Although the species was not identified during survey events and three out of date records occur 20 km east of the Study Area, if a population is observed in future surveys, the immediate vicinity may be considered habitat critical to the survival of the species. The Proposed Action's potential impact to 886.3 ha of potential habitat is unlikely to adversely affect habitat critical to the survival of this species, as an extensive area of potential habitat will remain (only 4.1% of potential habitat in the Study Area is disturbed).	Unlikely
Disrupt the breeding cycle of an important population;	Austral cornflower has been observed flowering in spring, late summer and autumn, but beyond this, little is known about the species reproductive cycle (DCCEEW, 2024). Disturbance to 886.3 ha of potential Austral cornflower habitat, or 4.1% of all habitat within the Study Area is unlikely to disrupt the species' ability to reproduce within the Study Area. Additionally, there are no observations of the species have been made across the Study Area. Due to the lack of observation of the species, it is unlikely an important population of Austral cornflower occurs within the Study Area. Therefore, it is unlikely that the Proposed Action would disrupt the breeding cycle of an important population of this species.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	The Proposed Action will result in the disturbance of 886.3 ha of potential Austral cornflower habitat (4.1% of total habitat available). Though this is a large area, it is relatively small compared in the context of the Study Area, which supports 21,719.7 ha of potential Austral cornflower habitat. Additionally, the species is not known to occur in the Study Area. Additionally, mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will be completed prior to disturbing any habitat or potential individuals of the species. The Proposed Actions disturbance to this species, in context to the habitat available in the Study Area, and mitigation measures, is unlikely to cause the species to decline.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	Invasive flora are listed as a threat to the species, as are grazing fauna species (DEWHA, 2008). The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area.	Unlikely

Criteria	Description	Criteria Triggered?
Introduce disease that may cause the species to decline; and	Austral cornflower conservation advice does not list any diseases as a threat to the species (DEWHA, 2008). There is no evidence to suggest the Proposed Action will introduce a disease that may cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely
Interfere substantially with the recovery of the species.	There are no formally adopted recovery plans for this species. However, there are *Regional* and *Local Priority Actions* identified in the *Approved Conservation Advice for Stemmacantha australis (Austral Cornflower)* (DEWHA, 2008), which, listed below, determine key management issues of; • Habitat loss, disturbance and modification; • Conservation information; • Invasive weeds; • Trampling, browsing or grazing; and • Recovery of additional sites and/or populations. The Proposed Action will result in 886.3 ha of disturbance to potential Austral cornflower habitat (4.1% of all habitat within the Study Area). It is unlikely this impact will lead to habitat loss, disturbance or modification of Austral cornflower habitat to the extent that recovery of the species is substantially interfered with. Additional priority actions will be managed so as not to interfere substantially with the recovery of the species, including control of invasive weeds through a biosecurity management plan and mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure to retain connectivity values and reduce impacts where possible. While the Study Area is used for agricultural purposes, it is not expected the Proposed Action will propagate further impacts of trampling and grazing. It is therefore considered unlikely the Proposed Action will substantially interfere with the recovery of Austral cornflower.	Unlikely
Significant Impact: Unlikely		

1.3.4 SOLANUM DISSECTUM SIGNIFICANT IMPACT ASSESSMENT

Solanum dissectum

The Proposed Action is unlikely to result in a significant impact to *Solanum dissectum*.

Solanum dissectum is listed as Endangered under the EPBC Act, effective 7 December 2016, and is assessed as having the potential to occur in the Study Area. This species was not identified during survey events in the Study Area, though there is a database record of the species 30 km north-west of the Study Area near Moura (ALA, 2017).

S. dissectum is distributed between Blackwater, Bauhinia, Thangool and Dululu, though is confined to localised areas where the species has been observed. The species occurs in open forest and woodland habitats on solodic clay soils characterized by brigalow (*Acacia harpophylla)* or *Eucalyptus thozetiana* (TSSC, 2016).

Potential *S. dissectum* habitat occurs within the Study Area in association with the broad habitat type *Brigalow woodlands*. This habitat has been mapped, with a total of 328.8ha of potential habitat occurring in the Study Area. 8.7 ha of this habitat is expected to be impacted as a result of the Proposed Action.

Habitat critical to the survival of this species has not been defined, in lieu, the definition provided at the start of this appendices has been utilised. Therefore, 328.8 ha of potential *S. dissectum* habitat in the Study Area has conservatively been considered to constitute habitat critical to the survival of the species.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-17. It has been concluded that the Proposed Action is unlikely to cause a significant impact to *S. dissectum.*

TABLE 1-17: SIGNIFICANT IMPACT ASSESSMENT FOR *SOLANUM DISSECTUM*

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population,	The Proposed Action is expected to disturb 8.7 ha of potential *S. dissectum* habitat (2.6% of total habitat available) within the Study Area, though no known population of the species occurs in the Study Area or Locality. The area of occupancy of the species is poorly understood due to the limited known occurrences of the species. Therefore, substantial impacts to species habitat have the potential to reduce the area of occupancy or fragment a population. Impacts to 8.7 ha of potential habitat is not expected to constitute a substantial impact to the species, as this is a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 328.8 ha of potential *S. dissectum* habitat. Therefore, the Proposed Action is unlikely to lead to a long-term decrease in the species population size, reduce the area of occupancy, or fragment any populations of the species.	Unlikely
Reduce the area of occupancy of the species,		Unlikely
Fragment an existing population into two or more populations,		Unlikely

Criteria	Description	Criteria Triggered?
Adversely affect habitat critical to the survival of a species,	Though the species was not identified during survey events and the closest recent record occurs approximately 30 km from the Study Area, if a population is observed in future surveys, the immediate vicinity may be considered habitat critical to the survival of the species. The Proposed Action's potential impact to 8.7 ha of potential habitat is unlikely to adversely affect habitat critical to the survival of this species, as an extensive 320.5 ha of potential habitat will remain (only 2.6% of potential habitat in the Project Area is disturbed).	Unlikely
Disrupt the breeding cycle of a population,	*S. dissectum* reproductive output (number of flowers, fruit and seeds) is thought to be somewhat low, with fewer than 100 seeds produced per stem during the species' fruiting period (between March and July each year) (TSSC, 2016). However, the species is acknowledged to resprout successfully from disturbance and avifauna dispersal is a likely vector for reproduction (TSSC, 2016). Considering the limited direct impact to the species' potential habitat (8.7 ha) and limited indirect impacts from operation, it is unlikely that the Proposed Action will disrupt the breeding cycle of *S. dissectum.* Furthermore, mitigation measures such as a biosecurity management plan and pre-clearance surveys and micro-siting at areas of planned infrastructure will be implemented to ensure the breeding cycle of a population is not disrupted.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The Proposed Action will result in the removal of 8.7 ha of potential *S. dissectum* habitat (2.6% of total habitat available). This accounts for a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 328.8 ha of potential *S. dissectum* habitat. It is expected that small scale disturbance in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive weeds such as green panic (*Megathyrsus maximus pubiglumis*) and buffel grass (*Cenchrus ciliaris*) are identified as threats to *S. dissectum* as they can outcompete the species in its preferred microhabitat. The Proposed Action activities during construction and operation will adopt and follow will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area.	Unlikely
Introduce disease that may cause the species to decline, or	*S. dissectum* conservation advice does not list any diseases as a threat to the species (TSSC, 2016). There is no evidence to suggest the Proposed Action will introduce a disease that may cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely

Criteria	Description	Criteria Triggered?
Interfere with the recovery of the species.	There are no formally adopted recovery plans for this species. However, there are *Primary Conservation Actions* and *Conservation and Management Actions* identified in the *Conservation Advice for Solanum dissectum* (TSSC, 2016), which, listed below, aim to; • Maintain and protect existing populations, and protect and enhance habitat to provide potential for reproduction of plants within existing populations • Consult with private landowners with *Solanum dissectum* on their properties and develop site-specific management actions and the implementation of conservation agreements; and • Manage sites to identify, control and reduce the spread of invasive species such as introduced grasses, especially buffel grass. The Proposed Action will aim to control invasive grasses through a biosecurity management plan. Mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will aim to retain connectivity values and reduce impacts where possible (as well as identify and protect any specimens that may occur). It is therefore considered unlikely the Proposed Action will interfere with the recovery of the species	Unlikely
Significant Impact: Unlikely		

1.3.5 *SOLANUM JOHNSONIANUM* SIGNIFICANT IMPACT ASSESSMENT

Solanum johnsonianum

The Proposed Action is unlikely to result in a significant impact to *Solanum johnsonianum*.

Solanum johnsonianum is listed as Endangered under the EPBC Act, effective 7 December 2016, and was assessed as having the potential to occur in the Study Area. This species was not identified during survey events in the Study Area, though there is a database record of the species 30 km north-west of the Study Area near Moura (ALA, 2018).

S. johnsonianum is distributed between Rolleston, Theodore, Biloela and Dululu, though is confined to localised areas where the species has been observed . The species occurs in open forest and woodland habitats on heavy cracking clay soils dominated or co-dominated by brigalow (*A. harpophylla)*. Other species associated with *S. johnsonianum* include *Eucalyptus thozetiana* with an understory of wilga (*Geijera parviflora*) (TSSC, 2016).

Potential *S. johnsonianum* habitat occurs within the Study Area in association with the broad habitat type *Brigalow woodlands*. This habitat has been mapped, with a total of 328.8ha of potential habitat occurring in the Study Area. 8.7 ha of this habitat is expected to be impacted as a result of the Proposed Action.

Habitat critical to the survival of this species has not been defined, in lieu, the definition provided at the start of this appendices has been utilised. Therefore, 328.8 ha of potential *S. dissectum* habitat in the Study Area has conservatively been considered to constitute habitat critical to the survival of the species.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-18. It has been concluded that the Proposed Action is unlikely to cause a significant impact to *S. johnsonianum*.

TABLE 1-18: SIGNIFICANT IMPACT ASSESSMENT FOR *SOLANUM JOHNSONIANUM*

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population,	The Proposed Action is expected to disturb 8.7 ha of potential *S. johnsonianum* habitat (2.6% of total habitat available) within the Study Area, though no known population of the species occurs in the Study Area or Locality. The area of occupancy of the species is poorly understood due to the limited known occurrences of the species. Therefore, substantial impacts to species habitat have the potential to reduce the area of occupancy or fragment a population. Impacts to 8.7 ha of potential habitat is not expected to constitute a substantial impact to the species, as this is a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 328.8 ha of potential *S. johnonianum* habitat. Therefore, the Proposed Action is unlikely to lead to a long-term decrease in the species population size, reduce the area of occupancy, or fragment any populations of the species.	Unlikely
Reduce the area of occupancy of the species,		Unlikely
Fragment an existing population into two or more populations,		Unlikely

Criteria	Description	Criteria Triggered?
Adversely affect habitat critical to the survival of a species,	Although the species was not identified during survey events and the closest recent record is approximately 30 km from the Study Area, if a population is observed in future surveys, the immediate vicinity may be considered habitat critical to the survival of the species. The Proposed Action's potential impact to 8.7 ha of potential habitat is unlikely to adversely affect habitat critical to the survival of this species, as an extensive 320.5 ha of potential habitat will remain (only 2.6% of potential habitat in the Project Area is disturbed).	Unlikely
Disrupt the breeding cycle of a population,	*S. johnsonianum* reproductive output (number of flowers, fruit and seeds) is thought to be somewhat low, with fewer than 100 seeds produced per stem during the species' fruiting period (between April to May each year) (TSSC, 2016). Considering the limited direct impact to the species' potential habitat (8.7 ha) and limited indirect impacts from operation, it is unlikely that the Proposed Action will disrupt the breeding cycle of *S. johnsonianum.* Furthermore, mitigation measures such as a biosecurity management plan and pre-clearance surveys and micro-siting at areas of planned infrastructure will be implemented to ensure the breeding cycle of a population is not disrupted.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The Proposed Action will result in the removal of 8.7 ha of potential *S. johnsonianum* habitat (2.6% of total habitat available). This accounts for a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 328.8 ha of potential *S. johnsonianum* habitat. It is expected that small scale disturbance in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive weeds such as green panic (*Megathyrsus maximus pubiglumis*) and buffel grass (*Cenchrus ciliaris*) are identified as threats to *S. johnsonianum* as they can outcompete the species in its preferred microhabitat. The Proposed Action activities during construction and operation will adopt and follow will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area.	Unlikely
Introduce disease that may cause the species to decline, or	*S. johnsonianum* conservation advice does not list any diseases as a threat to the species (TSSC, 2016). There is no evidence to suggest the Proposed Action will introduce a disease that may cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely

Criteria	Description	Criteria Triggered?
Interfere with the recovery of the species.	There are no formally adopted recovery plans for this species. However, there are *Primary Conservation Actions* and *Conservation and Management Actions* identified in the *Conservation Advice for Solanum johnsonianum* (TSSC, 2016), which, listed below, aim to; • Maintain and protect existing populations, and protect and enhance habitat to provide potential for reproduction of plants within existing populations • Consult with private landowners with *Solanum johnsonianum* on their properties and develop site-specific management actions and the implementation of conservation agreements; and • Manage sites to identify, control and reduce the spread of invasive species such as introduced grasses. The Proposed Action will aim to control invasive grasses through a biosecurity management plan. Mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure will aim to retain connectivity values and reduce impacts where possible (as well as identify and protect any specimens that may occur). It is therefore considered unlikely the Proposed Action will interfere with the recovery of the species	Unlikely
Significant Impact: Unlikely		

1.3.6 *XEROTHAMNELLA HERBACEA* SIGNIFICANT IMPACT ASSESSMENT

Xerothamnella herbacea

The Proposed Action is unlikely to result in a significant impact to the *Xerothamnella herbacea*.

Xerothamnella herbacea is listed as Endangered under the EPBC Act, effective 16 July 2000, and was assessed as having the potential to occur in the Study Area. This species was not identified during survey events in the Study Area, though there is a database record of the species 30 km north-west of the Study Area near Moura (ALA, 2018).

X. herbacea is known only from a few official observations: two records north of Chinchilla, one record near Theodore, and a record near Goondoowindi. The species occurs in well-shaded and gilgai-rich microhabitats in brigalow (*Acacia harpophylla*) dominated woodlands with heavy, grey to dark brown clay soils. The species is known to occur in cleared/non-remnant vegetation (DEWHA, 2008).

Potential *X. herbacea* habitat occurs within the Study Area in association with the broad habitat type *Brigalow woodlands*. This habitat has been mapped, with a total of 328.8 ha of potential habitat occurring in the Study Area. 8.7 ha of this habitat is expected to be impacted as a result of the Proposed Action.

Habitat critical to the survival of this species has not been defined, in lieu, the definition provided at the start of this appendices has been utilised. Therefore, 328.8 ha of potential *S. dissectum* habitat in the Study Area has conservatively been considered to constitute habitat critical to the survival of the species.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-19. It has been concluded that the Proposed Action is unlikely to cause a significant impact to *X. herbacea*.

TABLE 1-19: SIGNIFICANT IMPACT ASSESSMENT FOR THE *XEROTHAMNELLA HERBACEA*

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population,	The Proposed Action is expected to disturb 8.7 ha of potential *X. herbacea* habitat (2.6% of total habitat available) within the Study Area, , though no known population of the species occurs in the Study Area or Locality. The area of occupancy of the species is poorly understood due to the limited known occurrences of the species. Therefore, substantial impacts to species habitat have the potential to reduce the area of occupancy or fragment a population. Impacts to 8.7 ha of potential habitat is not expected to constitute a substantial impact to the species, as this is a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 328.8 ha of potential *X. herbacea* habitat. Therefore, the proposed development is unlikely to lead to a long-term decrease in the species population size, reduce the area of occupancy, or fragment any populations of the species.	Unlikely
Reduce the area of occupancy of the species,		Unlikely
Fragment an existing population into two or more populations,		Unlikely

Criteria	Description	Criteria Triggered?
Adversely affect habitat critical to the survival of a species,	Although the species was not identified during survey events and the closest recent record is approximately 30 km from the Study Area, if a population is observed in future surveys, the immediate vicinity may be considered habitat critical to the survival of the species. The Proposed Action's potential impact to 8.7 ha of potential habitat is unlikely to adversely affect habitat critical to the survival of this species, as an extensive 320.5 ha of potential habitat will remain (only 2.6% of potential habitat in the Project Area is disturbed).	Unlikely
Disrupt the breeding cycle of a population,	Little is known about the breeding cycle of *X. herbacea*. Considering the limited direct impacts to the species' potential habitat (8.7 ha) and limited indirect impacts from operation activities, it is unlikely the Proposed Action will disrupt the breeding cycle of *X. herbacea.* Furthermore, mitigation measures such as a biosecurity management plan and pre-clearance surveys and micro-siting at areas of planned infrastructure will be implemented to ensure the breeding cycle of a population is not disrupted.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The Proposed Action will result in the removal of 8.7 ha of potential *X. herbacea* habitat (2.6% of total habitat available). This accounts for a small area of habitat to be removed in relation to the larger context of the Study Area, which supports 328.8 ha of potential *X. herbacea* habitat. It is expected that small scale disturbance in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive flora such as green panic (*Megathyrsus maximus pubiglumis*) and buffel grass (*Cenchrus ciliaris*) are identified as threats to *X. herbacea* as they can outcompete the species in its microhabitat. Cattle and native livestock are also a threat to the species via trampling and grazing (DEWHA, 2008). The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures to prevent introduction of new invasive species or the spread of those known to the Study Area.	Unlikely
Introduce disease that may cause the species to decline, or	The *X. herbacea* conservation advice does not list any diseases as a threat to the species. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures as part of a biosecurity management plan.	Unlikely
Interfere with the recovery of the species.	There are no formally adopted recovery plans for this species. However, there are *Regional* and *Local Priority Actions* identified by the *Approved Conservation Advice for Xerothamnella herbacea* (DEWHA, 2008), which, listed below, determine key management issues of; • Habitat loss, disturbance and modification • Conservation information • Fire • Invasive weeds • Trampling, browsing or grazing • Recovery of additional sites and/or populations The Proposed Action will result in 8.7 ha of disturbance to potential *X. herbacea* habitat (2.6% of all habitat within the Study Area). It is unlikely this impact will lead to habitat loss, disturbance or modification of *X. herbacea*	Unlikely

Criteria	Description	Criteria Triggered?
	habitat to the extent that recovery of the species is interfered with. Additional priority actions will be managed so as not to interfere substantially with the recovery of the species, including control of invasive weeds through a biosecurity management plan and mitigation measures such as pre-clearance surveys and micro-siting at areas of planned infrastructure to retain connectivity values and reduce impacts where possible. It is not expected the Proposed Action will lead to an increased fire risk. While the Study Area is used for agricultural purposes, it is not expected the Proposed Action will propagate further impacts of trampling and grazing. It is therefore considered unlikely the Proposed Action will substantially interfere with the recovery of the species	
Significant Impact: Unlikely		

1.4 MIGRATORY SPECIES

For migratory species SIA, the presence of important habitat and/or an 'ecologically significant proportion of these species' in the Study area needs to be assessed, with definitions provided in the *SIG 1.1* (DEWHA, 2013). For migratory species, an area of important habitat is:

- *Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or*
- *Habitat that is of critical importance to the species at particular life-cycle stages; and/or*
- *Habitat utilised by a migratory species which is at the limit of the species range; and/or*
- *Habitat within an area where the species is declining.*

Furthermore, important habitat for migratory shorebirds is defined as nationally important or internationally important in the *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DEE, 2017). Where relevant, this document is consulted in migratory species SIAs.

An 'ecologically significant proportions of a migratory bird' varies from species to species, and DEWHA (2013) states that species' population status, genetic distinctiveness, specific behavioural patterns (i.e., Site fidelity and dispersal rates) should be considered. The *Draft Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) have standardised counts that act as thresholds for an 'ecologically significant proportion'.

1.4.1 WHITE-THROATED NEEDLETAIL

A significant impact assessment for white-throated needletail as a migratory species is provided above in Table 1-11 under its assessment as a vulnerable species. It has been concluded that the Proposed Action is unlikely to cause a significant impact to the white-throated needletail.

1.4.2 SATIN FLYCATCHER SIGNIFICANT IMPACT ASSESSMENT

Satin flycatcher (*Myiagra cyanoleuca*)

The Proposed Action is unlikely to result in a significant impact to the satin flycatcher.

The satin flycatcher is listed as Migratory under the EPBC Act. This species was considered known to occur due to the positive identification of the species via direct observation and bird call identification during the October 2022 and October 2023 field surveys. The Study Area occurs within the range for the species, and the habitat requirements for the species occur within the Study Area as explained below.

Satin flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. There is no information available on roosting habitat and the species is known to forage in the canopy and subcanopy of its preferred habitat type. Breeding occurs within south-east Australia. The species is often found near wetlands and watercourses, often in moister, taller forests.

Important habitat for the species, as defined by the *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015), includes:

> *Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.*

There are heavily vegetated gullies in eucalypt-dominated forests and taller woodlands in the form of vine thickets/rainforest with dense vegetation in the Study Area which are suitable foraging and dispersal habitat for the species. All other habitat in the Study Area is generally unsuitable for the species.

Foraging habitat:

- Riparian woodland and open forest dominated by *E. tereticornis* often associated with stream channels; and
- Vine forest/ thickets and dry rainforest.

Generally unsuitable habitat:

- Eucalypt woodland and open forest dominated by *E. crebra* with a grassy understorey;
- Waterbodies and drainage features;
- Grasslands and cultivated agricultural land; and
- Brigalow woodlands dominated by *Acacia harpophylla*.

Ground-truthed surveys have identified 1,964.6 ha of satin flycatcher foraging and roosting habitat within the Study Area. The high level of disturbance (e.g., weeds and introduced predators) to these existing habitats means they are in likely only utilised for movement by these species and not to breed. A total of 19.6 ha of this satin flycatcher habitat is expected to be impacted as a result of the Proposed Action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-20. It has been concluded that the Proposed Action is unlikely to cause a significant impact to the satin flycatcher.

TABLE 1-20: SIGNIFICANT IMPACT ASSESSMENT FOR THE SATIN FLYCATCHER

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	A total of 1,964.6 ha of satin flycatcher habitat has been identified within the Study Area. Considering the definition above and that the species is known to utilise the Study Area, the entirety of this habitat has been considered important habitat for the species. The area of impact to important habitat for the satin flycatcher that is likely to result in a significant impact is 4,400 ha (internationally significant) or 440 ha (nationally significant) (DoE, 2015). A total of 19.6 ha, or 1% of the total satin flycatcher habitat within the Study Area is estimated to be impacted as a result of the Proposed Action. Therefore, the Proposed Action is unlikely to substantially modify, destroy or isolate an area of important habitat for the satin flycatcher.	Unlikely
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	Invasive species that have been identified as a threat to the satin flycatcher include: • Black rat (*Rattus rattus*); and • Invasive vines of riparian habitat (e.g. rubber vine (*Cryptostegia grandiflora*)). A total of 1,964.6 ha of satin flycatcher habitat has been identified within the Study Area. Considering the definition above and that the species is known to utilise the Study Area, the entirety of this habitat has been considered important habitat for the species. The Proposed Action activities during construction and operation will adopt and follow Biosecurity measures, including development and adherence to a Biosecurity Management Plan that will ensure that new invasive species are not introduced into the Study Area and that populations of invasive species within the Study Area do not further proliferate as a result of the Proposed Action.	Unlikely
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	Satin flycatchers breed at elevations of more than 600m above sea level in south-eastern Australia. They breed from November to early January, however eggs have been recorded in December in Queensland. An ecological significant proportion of a satin flycatcher population has been specified as 17,000 individuals (internationally significant) and 1,700 individuals (nationally significant) (DoE, 2015). Satin flycatcher have been directly observed and detected through bird calls within the Study Area, however, it is considered unlikely that the Study Area supports an ecologically significant proportion of a satin flycatcher population and therefore it is unlikely that the Proposed Action will disrupt the lifecycle of an of an ecologically significant proportion of the population.	Unlikely
Significant Impact: Unlikely		

1.4.3 RUFOUS FANTAIL SIGNIFICANT IMPACT ASSESSMENT

Rufous fantail (*Rhipidura rufifrons*)

The Proposed Action is unlikely to result in a significant impact to the rufous fantail.

The rufous fantail is listed as migratory under the EPBC Act due to its listing in the Convention on the *Conservation of Migratory Species of Wild Animals (Bonn Convention*). The species is considered as having the potential to occur in the Study Area despite no observations, because there is suitable habitat present and a 2002 record of the species 3km north-east of the Study Area, in Montour State Forest.

The rufous fantail breeds in south-east Australia from September to February, and migrates north outside of these months to forage in the non-breeding season. The *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) identifies important habitat for the rufous fantail as:

> *Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands.*

In their non-breeding territory, this species prefers dense, vine-thicket like habitat. Potential foraging habitat for this species within the Study Area has been mapped to include the 'Vine forest/thicket and dry rainforest' broad habitat type, resulting in 232.3 ha of potential habitat within the Study Area.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-21. It has been concluded that the Proposed Action is unlikely to cause a significant impact to the rufous fantail.

TABLE 1-21: SIGNIFICANT IMPACT ASSESSMENT FOR THE RUFOUS FANTAIL

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The area of important rufous fantail habitat that is likely to result in a significant impact if affected is 750 ha (nationally significant) and 7,500 ha (internationally significant) (DoE, 2015). The Project will result in direct impact (via land clearing) to 3.1 ha of important rufous fantail habitat. Additionally, adjacent vegetation that may also constitute important habitat will be subject to indirect disturbances such as noise, light and dust pollution. These direct and indirect disturbances will likely result in substantial modification of important rufous fantail habitat. Although there is a direct impact to important habitat, the Project is unlikely to cause a nationally or internationally significant impact to this habitat when considering the above significant impact thresholds.	Unlikely
Result in an invasive species that is harmful to the migratory species becoming established in an area of important	DoE (2015) lists black rat and rubber as invasive species harmful to the rufous fantail. The Project activities are unlikely to introduce or exacerbate new or existing invasive species such as the black rat and rubber vine in the Study Area considering the implementation of a biosecurity management plan (and other measures as per Section 6 of this EAR). Additionally, only 3.1 ha of potential foraging habitat is subject to disturbance.	Unlikely

Criteria	Description	Criteria Triggered?
habitat for the migratory species.	Ultimately, it is unlikely that the Proposed Action would promote, or introduce any invasive species into rufous fantail habitat.	
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Study Area is not within the breeding distribution for this species. An ecologically significant proportion of rufous fantail is 4,800 individuals (for nationally significant) or 48,000 (for internationally significant) (DoE, 2015). DoE (2015) also states that impact to 750 individuals needs to be investigated further. Due to the small amount of habitat to be directly disturbed by the Project (3.1 ha), it is unlikely that an ecologically significant proportion of the rufous fantail would be seriously affected by this disturbance. It should also be considered that adjacent vegetation may still be utilised by the rufous fantail (even despite the indirect disturbances that may lower its relative quality). Ultimately, the Project is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the rufous fantail population.	Unlikely
Significant Impact: Unlikely		

1.4.4 FORK-TAILED SWIFT SIGNIFICANT IMPACT ASSESSMENT

Fork-tailed Swift (*Apus pacificus*)

The Proposed Action is unlikely to result in a significant impact to the fork-tailed swift.

Fork-tailed swift is listed as migratory under the EPBC Act due to its inclusion in the *China-Australia Migratory Bird Agreement (CAMBA*), J*apan-Australia Migratory Bird Agreement (JAMBA*) and the *Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA*). The species is considered as having the potential to occur in the Study Area despite no observations, because there is suitable habitat present and a 2002 record of the species in the locality.

Fork-tailed swift migrates to Australia during the species' non-breeding season, roughly October to April (DCCEEW, 2024a). During this time the species remains almost exclusively aerial, foraging above a variety of habitats across all states of Australia. The species is largely considered to roost aerially, with it being extremely rare for the species to roost terrestrially in Australia.

The *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) identifies that important habitat for the fork-tailed swift is '*a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial'*.

Considering this, the entirety of the Study Area may be considered suitable foraging habitat for the fork-tailed swift. It must be noted however, that the species will only occur as a flyover visitor.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table 1-22. It has been concluded that the Proposed Action is unlikely to cause a significant impact to the fork-tailed swift. Considering the species nature as an aerial species in Australia, and proclivity to fly at RSA heights and above, there is a risk of turbine collision risk. Therefore, should the species be observed in the Study Area, adaptive management measures will be undertaken to further prevent any impact to this species.

TABLE 1-22: SIGNIFICANT IMPACT ASSESSMENT FOR THE FORK-TAILED SWIFT

Criteria	Description	Criteria Triggered?
An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:		
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	The whole Study Area is considered important habitat for this species but impacts to this habitat will not change its utility for the fork-tailed swift. This is because the species is an aerial forager, and its prey, insects, will not be dissuaded from the Project Area due to the Proposed Actions activities. Additionally, there is no significant impact threshold set out in DoE (2015) for impacts to important habitat for this species, due to its aerial nature.	Unlikely

Criteria	Description	Criteria Triggered?
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	DoE (2015) does not identify any invasive species as harmful to the Fork-tailed swift. This said, a biosecurity plan will be implemented for the Project, as well as other biosecurity measures. With such measures, it is unlikely that harmful invasive species become established in the Study Area.	Unlikely
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The fork-tailed swift does not breed in Australia, nor is it considered to roost. Therefore, any occurrence of the species in the Study Area is likely to be a strict, flyover, aerial visitor which would not be impacted by the Proposed Action, apart from potential collision risks which will be adaptively managed as outlined in the BBMP. An ecologically significant proportion of fork-tailed swift is 100 individuals (for nationally significant) or 1,000 (for internationally significant) (DoE, 2015). Considering the lack of observation, and the strict aerial nature of this species, the Study Area is unlikely to be a host to an ecologically significant proportion of this species. The Proposed Action is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the fork-tailed swift population.	Unlikely
Significant Impact: Unlikely		

APPENDIX F MSES SIGNIFICANT RESIDUAL IMPACT ASSESSMENT

The *Queensland environmental offsets policy Significant Residual Impact Guideline* (SRI Guideline) (DEHP, 2014) has been used to assist in deciding whether or not the Proposed Action will, or may be likely, to have a significant residual impact (SRI) on MSES identified within the Study Area.

MSES that have been identified within the Study Area and that have been included within this assessment include:

Protected wildlife habitat, for the following threatened species;

- Squatter pigeon (southern) (*Geophaps scripta scripta*);
- Koala (*Phascolarctos cinereus*);
- Greater glider (southern and central) (*Petauroides volans*);
- Large-eared pied bat (*Chalinolobus dwyeri*); and
- Short-beaked echidna (*Tachyglossus aculeatus*).

It should be noted that for Protected wildlife habitat to be considered an MSES, those species with a listing status denoted as Near Threatened, Special Least Concern (Flora) and Special Least Concern (assigned a migratory status under an international migratory agreement) who's habitat occurs within the Study Area is not considered an MSES assessable against the Significant Residual Impact criteria.

Regulated vegetation:

- Category B remnant vegetation – There is a total of 1,657.5 ha of Category B remnant vegetation present within the Study Area;
- Category C high value regrowth – There is a total of 1.9 ha of Category C high value regrowth within the Study Area;
- Category R GBR riverine regrowth. There is 191.5 ha Category R GBR riverine regrowth within the Study Area;
- Regulated Vegetation within a distance of a watercourse – There is 742.3 ha of Regulated Vegetation (Category B) within a defined distance of VM Act identified stream order three and four watercourse, within the Study Area; and
- Wetland – 4.6 ha of Regulated Vegetation within the Study Area is mapped to occur within 100 m of a wetland.

Essential Habitat – 318.8 ha of Regulated Vegetation is mapped as essential habitat for four listed threatened species (fauna) identified to occur within the Study Area; and

Flora Plant Trigger Areas – There are areas mapped as high-risk areas for threatened or near threatened plants within the Study Area.

Significant residual impact criteria for endangered and vulnerable wildlife habitat (including essential habitat)

> *"An action is likely to have a significant impact on endangered and vulnerable wildlife if the impact on the habitat is likely to:*
>
> - *Lead to a long-term decrease in the size of a local population; or*
> - *Reduce the extent of occurrence of the species; or*
> - *Fragment an existing population; or*
> - *Result in genetically distinct populations forming as a result of habitat isolation; or*

- *Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or*
- *Introduce disease that may cause the population to decline, or*
- *Interfere with the recovery of the species; or*
- *Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species." (DEHP, 2014).*

A SRIA for NC Act listed endangered and vulnerable species is conducted in Table F 1 below.

Significant residual impact criteria for special least concern (non-migratory) animal wildlife habitat

"An action is likely to have a significant impact on a special least concern (non-migratory) animal wildlife habitat if it is likely that it will result in:

- *a long-term decrease in the size of a local population; or*
- *a reduced extent of occurrence of the species; or*
- *fragmentation of an existing population; or*
- *result in genetically distinct populations forming as a result of habitat isolation; or*
- *disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species." (DEHP, 2014).*

A SRIA for NC Act listed special least concern (non-migratory) species is conducted in Table F 1 below.

F 1 SIGNIFICANT RESIDUAL IMPACT CRITERIA FOR ENDANGERED, VULNERABLE AND SPECIAL LEAST CONCERN (NON-MIGRATORY) WILDLIFE HABITAT

Species	NC Act Status	Lead to long term decrease	Extent of occurrence*	Fragmentation*	Habitat isolation*	Invasive species	Disease	Species recovery	Disruption*	Comment
FAUNA										
Squatter pigeon (southern) (*Geophaps scripta scripta*)	Vu	✗	✗	✗	✗	✗	✗	✗	✗	✗ **SRI not triggered** Squatter pigeon is considered known to occur within the Study Area and has suitable habitat mapped. This habitat occurs across 24,290.8 ha in the Study Area (16,267.8 ha of breeding habitat and 48,023.0 ha of foraging and roosting habitat). It has been concluded that 961.2 ha of direct impact to this habitat (524 ha impact to breeding habitat and 437.2 ha to foraging and roosting habitat) will not cause a significant residual impact to the species as this does not trigger any of the listed criteria.
Koala (*Phascolarctos cinereus*)	E	✗	✓	✗	✓	✗	✗	✗	✗	✓ **SRI triggered** The koala is considered known to occur within the Study Area. Koala scats were successfully identified on one occasion by ERM ecologists within the Study Area. Additionally, there is a record for the species that occurs within the Study Area from WildNet (not dated) as well as an undated ALA observation from just outside the Study Area (< 2km). A total of 1,618.2 ha of preferred koala breeding and foraging habitat, 21,067.5 ha of general breeding and foraging habitat and 6,808.0 ha of koala dispersal habitat has been identified within the Study Area. It has been concluded that direct impact to 15.5 ha of preferred koala breeding and foraging habitat and 861.9 ha

Species	NC Act Status	Lead to long term decrease	Extent of occurrence*	Fragmentation*	Habitat isolation*	Invasive species	Disease	Species recovery	Disruption*	Comment
										of general breeding and foraging habitat will trigger an SRI for extent of occurrence and habitat.
Short-beaked echidna (*Tachyglossus aculeatus*)	SLC	✗	✗	✗	✗	-	-	-	✗	✗ **SRI not triggered** The short-beaked echidna is known to occur within the Study Area. 46,830 ha of short-beaked echidna habitat has been identified within the Study Area. 1,932.2 ha of habitat for short beaked echidna is proposed to be impacted. Considering the extensive range and habitat diversity of the echidna, it has been concluded that a direct impact to 1,932.2 ha of short-beaked echidna habitat is unlikely to cause a significant residual impact to the species.
Greater glider (southern and central) (*Petauroides volans*)	Vu	✓	✓	✓	✗	✗	✗	✓	✓	✓ **SRI triggered** Greater glider is considered known to occur within the Study Area, with 14 individuals observed during surveys within the Study Area. 1,425.3 ha of greater glider denning habitat has been identified within the Study Area. 20,859.0 ha of greater glider foraging habitat has been identified within the Study Area. Greater gliders are highly susceptible to native forest clearance and disturbance and can become locally extinct in small and fragmented habitat patches as the species relies heavily on the presence of suitable microhabitat (hollow-bearing trees) which can take more than a century to develop. It has therefore been concluded that a direct impact to 877.4 ha of greater glider habitat

Species	NC Act Status	Lead to long term decrease	Extent of occurrence*	Fragmentation*	Habitat isolation*	Invasive species	Disease	Species recovery	Disruption*	Comment
										(15.5 ha of denning habitat and 861.9 ha of foraging habitat) is likely to cause a significant residual impact to the species.
Large-eared pied bat (*Chalinolobus dwyeri*)	Vu	✓	✓	✗	✗	✗	✗	✓	✗	✓ **SRI triggered** Large-eared pied bat is considered likely to occur within the Study Area. 21,719.1 ha of foraging habitat has been identified within the Study Area. SRI for this species has been determined based on the potential for this to be a significant population due to its proximity to Carnarvon and subsequently has triggered SRI as impact to 886.3 ha of foraging habitat may lead to a long term decrease, reduce the extent of occurrence of the species and impact critical habitat.

NC Act listing status: En = Endangered, Vu= Vulnerable, SLC = Special Least Concern
**These parameters are criteria relevant to assessment for SLC (non-migratory) wildlife.*
✗ Indicates it is unlikely that a significant residual impact will occur.
✓ Indicates there is potential for a significant residual impact.

F 2 SIGNIFICANT RESIDUAL IMPACT TEST - REGULATION VEGETATION ASSESSMENT

		Clearing in a regional ecosystem that is: endangered, or of concern	**Clearing in the portion of a regional ecosystem that lies within a mapped wetland**	**Clearing in a regional ecosystem that is within the defined distance of a watercourse**
1	**For clearing for linear infrastructure:** greater than 25 m wide in a grassland (structural category) regional ecosystem; or greater than 20 m wide in a sparse (structural category) regional ecosystem; or greater than 10 m wide in a dense to mid-dense (structural category) regional ecosystem. **For clearing other than clearing for linear infrastructure:** area greater than 5 ha where in a grassland (structural category) regional ecosystem; or area greater than 2 ha where in a sparse (structural category) regional ecosystem; or area greater than 0.5 ha where in a dense to middense (structural category) regional ecosystem.	✓ The Proposed Action will involve the clearing for linear infrastructure of the following listed REs: **Endangered** 5.2 ha **Of Concern** 8.4 ha	4.6 ha of Regulated Vegetation within the Study Area is mapped to occur within 100 m of a wetland.	There is 742.3 ha of Regulated Vegetation (Category B) within a defined distance of VM Act identified stream order three and four watercourse, within the Study Area.
2	Clearing within 50 m of the defining bank	N/A	N/A	✓ SRI triggered
3	Clearing within 5 m of the defining bank	N/A	✗	N/A
	Significant Impact	✓ SRI triggered	✗ No SRI triggered	✓ SRI triggered

For a prescribed activity to have a significant residual impact on a regional ecosystem that is within the defined distance of watercourses, criteria 1 and 2 must be exceeded.
For a prescribed activity to have a significant residual impact on a regional ecosystem that lies within a mapped wetland, criteria 1 and 3 must be exceeded

APPENDIX G COLLISION RISK ASSESSMENT

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Listed Migratory and Threatened Birds					
Grey falcon (*Falco hypoleucos*)	V, VU	Rare	High	**Low**	This species has been concluded as unlikely to occur within the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • Little to low number of records in the broader locality in the last 20 years (100 km radius of Study Area). Nearest records are west of the Study Area within 30km of the Study Area however the records are undated and have a spatial uncertainty of 2,000 m; • Flight height does occur within the RSA; and • Study Area lacks preferred breeding, roosting and foraging habitat in the form of riverine Eucalypt communities, open woodlands, grasslands, and acacia shrublands near tree-lined watercourses, • Small and low-density population. Although no detections have been made during seasonal BUS to date, the species is known to have extensive home ranges and the Study Area is within the known distribution so the likelihood of the event is Rare. Due to the species low population size, a collision event will constitute an ecologically significant proportion of the population and constitute a major loss in numbers of individual and so the consequence has been assessed to be High. Thus, the risk rating for this species is Low as a precautionary measure to appropriately reflect the species listed status. The species has not been detected in BUS to date and so estimates of collision risk cannot be calculated for this species. Additional surveys and monitoring will be completed as detailed in this BBMP and should suitable data become available the collision risk model will be updated.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Red Goshawk (*Erythrotriorchis radiatus*)	V, VU	Rare	High	**Low**	This species has been concluded as being unlikely to occur within the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • Little to low number of records in the broader locality in the last 20 years (100 km radius of Study Area). Nearest records are west of the Study Area within 30km of the Study Area however the records are undated and have a spatial uncertainty of 2,000 m; • Flight height does occur within the RSA; and • Study Area lacks preferred breeding, roosting and foraging habitat in the form of riverine Eucalypt communities, open woodlands, grasslands, and acacia shrublands near tree-lined watercourses, • Small and low-density population Although unlikely to occur, the species is known to have extensive home ranges and the Study Area is within the known distribution so the likelihood of the event is Rare. Due to the species low population size, a collision event will constitute an ecologically significant proportion of the population and constitute a major loss in numbers of individual. Thus, the risk rating for this species has been assessed as Low.
Painted Honeyeater (*Grantiella picta*)	V, VU	Rare	Low	**Negligible**	• This species has been considered as having the potential to occur within the Study Area. This is because the Study Area occurs partly within the distribution for the species. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • Low (only two) records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • Flight height does not occur within the RSA as the species is known to fly in the tree canopy; and • There is a distinct lack of mistletoe in woodlands, or associated with tall eucalypts in riverine communities, and so the habitat is

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					generally unsuitable for the species and so site utilisation is unlikely to be impacted by the Proposed Action. Therefore, it is considered rare that the Proposed Action will provide a collision risk for this species and there is a low consequence of this happening due to the species listed status. Thus, the risk rating for this species is negligible.
Black-breasted button-quail (*Turnix melanogaster*)	V, VU	Rare	Low	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. This is because the Study Area is within the distribution for the species and suitable habitat is present. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • Low number of records exist within the broader locality in the last 20 years (100 km radius of the Study Area), cloest occurring 50 km east of the Study Area within Coominglah State Forest; • Does not fly within RSA heights; and • Low density of suitable quality habitat in the Study Area. Therefore, it is considered rare that the Proposed Action will have an impact upon this species through collision with the WTGs, and it is considered that this impact would be low if it were to occur due to the Vulnerable listing of the species. Thus, the risk rating for this species is negligible.
Southern squatter pigeon (*Geophaps scripta scripta*)	V, VU	Unlikely	Low	**Negligible**	This species has been confirmed to occur within the Study Area. Squatter pigeon (southern) habitat is generally defined as open-forests to sparse, open-woodlands and scrub that are mostly dominated by Eucalyptus, Corymbia or Callitris species, within 3 km of waterbodies. The following information was also considered for the risk rating: • Records exist for the species within the Study Area and locality; • Moderate amounts of records exist within the broader locality in the last 20 years (100 km radius of the Study Area);

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• Flight height generally does not occur within the RSA; and • Breeding, foraging and dispersal habitat occurs within the Study Area, particularly in association with permanent water bodies. The squatter pigeon is unlikely to be at risk of collision with the WTG as the species is not known to fly within the RSA and the consequence of this collision is low due to the species status. Thus, the risk rating for this species is negligible.
White-throated needletail (*Hirundapus caudacutus*)	V and Mi, VU	Likely	Moderate	**Moderate**	This species is considered potential to occur within the Study Area with no observation of the species during field surveys. The following information was also considered for the risk rating: • No records exist for the species within the Study Area and locality; • Low-moderate amounts of records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • Flight height generally occur within the RSA (known to fly 1-300m above ground); • The species is known to form large flocks of up to 1000s of individuals; and • The species is considered to be exclusively aerial, with no roost habitat mapped within the Study Area. It is assumed that the species will utilised the entire Study Area aerially. The white-throated needletail is considered unlikely to be impacted by the windfarm in terms of collision risk and changes in site utilisation due to records in the wider Locality. Due to the species being listed as vulnerable and migratory under the EPBC Act, the consequences of this impact have been considered Moderate as a precautionary approach to reflect the potential for large flocking events within the Study Area. Thus, the risk rating for this species is Low.
Star finch (eastern) (*Neochmia*	E, EN	Rare	Moderate	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. This is because the Study Area is within the

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
ruficauda ruficauda)					distribution for the species and suitable habitat is present. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • Unlikely to fly within RSA heights; and • Potential foraging and breeding habitat of Eucalypt dominated habitat adjacent to the riparian areas (*Eucalyptus crebra nand E. melanophloia*), and partially cleared grasslands/grassy woodlands. Therefore, it is considered rare that the Proposed Action will have an impact upon this species and it is considered that this impact would be moderate if it were to occur due to the endangered listing of the species. Thus, the risk rating for this species is negligible.
Australian painted snipe (*Rostratula australis*)	E, EN	Rare	Moderate	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. This is because the Study Area is within the distribution for the species and suitable habitat is present. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area) (several either undated or outdated records exist within 100 km of the Study Area); • Flight height is normally greater than the RSA; and • Potential foraging and roosting habitat in the form of farm dams present. Therefore, it is considered rare that the Proposed Action will have an impact upon this species through collision with the WTG, and it is considered that this impact would be moderate if it were to occur due to the endangered listing of the species. Thus, the risk rating for this species is negligible.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Fork-tailed swift (*Apus pacificus*)	Mi, -	Unlikely	Moderate	**Low**	This species is considered to have the potential to occur within the Study Area. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • Low amounts of records exist within the broader locality in the last 20 years; • Flight height does occur within the RSA; • The species is known to form large flocks of 1000s of individuals; • The species is known to be highly manoeuvrable; and • Potential aerial foraging habitat over dry open habitats present. There is a lack of preferred coastal and riparian heathland or swamp habitat. The Fork-tailed Swift is considered unlikely to be impacted by the Proposed Action due to an absence of records within the Study Area. The likelihood of the collision event has therefore been assessed as Unlikely. As the species is known to form very large flocks during favourable conditions, there is potential that flocking events will occur within the Study Area resulting in collision events leading to a moderate loss of individuals and minor reductions in localised or regional populations. The consequence of this collision event has been assessed to be Moderate as a conservative approach. Thus, the overall risk rating for the species is Low.
Rufous fantail (*Rhipidura rufifrons)*	Mi, -	Rare	Negligible	**Negligible**	This species has been concluded as likely to occur within the Study Area. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area) (several either undated or outdated records exist within 100 km of the Study Area); • The species is rarely observed flying >15 m above the ground (Cameron 1985).

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• There is a lack of preferred species in the tree canopy of eucalypt forests present, and an absence of wet sclerophyll forests for roosting and foraging habitat. General movement habitat exists along densely vegetated gully lines within the Study Area. Therefore, it is considered rare that the Proposed Action will have an impact upon this species through collision with the WTGs, and negligible consequence of event due to the species being listed as migratory. Thus, the risk rating for this species is negligible.
Common sandpiper (*Actitis hypoleucos*)	Mi, -	Rare	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • One record exist within the broader locality in the last 20 years (100 km radius of the Study Area), approximately 40 km north-west at Moura; • Flight height does not normally occur within the RSA; and • Potential foraging and roosting habitat present within the Study Area associated with farm dams. It is therefore considered rare that the species will be impacted by the windfarm through collision with the WTGs, with a negligible consequence due to the species migratory listing. Thus, the overall risk rating for the species is negligible.
Sharp-tailed sandpiper (*Calidris acuminata*)	Mi, -	Rare	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. Potential habitat is present in the form of farm dams, creeks and Proserpine Lake which fringes the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • One record exist within the broader locality in the last 20 years (approximately 80 km east of the Study Area); • Flight height does occur within the RSA; and

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• Potential foraging and roosting habitat present within the Study Area associated with farm dams It is therefore considered rare that the species will be impacted by the windfarm through collision with the WTGs, with a negligible consequence due to the species migratory listing. Thus, the overall risk rating for the species is negligible.
Curlew sandpiper (*Calidris ferruginea*)	CE and Mi,	Rare	High	**Low**	This species has been concluded as having the potential to occur within the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • One record exists within the broader locality in the last 20 years (100 km radius of the Study Area), north-west from the Study Area along the Dawson River; • Flight height does occur within the RSA; • The species is listed as Critically Endangered under the EPBC Act; and • Potential foraging habitat in the form of farm dams is present. Due to a lack of suitable critical habitat and an absence of records within the Study Area the likelihood of a collision is Rare. Despite this a collision event is likely to constitute an ecologically significant proportion of the population and constitute a major loss in numbers of individuals relative to regional or state popualtions, and so the consequence of the collision is rated as High. Thus, the collision risk rating is Low.
Pectoral sandpiper (*Calidris melanotos*)	Mi, -	Rare	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area) – closest record is over 200km south of the Study Area;

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• Flight height does occur within the RSA; and • No wetland habitats, however, potential foraging and roosting habitat present within the Study Area associated with farm dams. It is therefore considered rare that the species will be impacted by the windfarm through collision with the WTGs, with a negligible consequence. Thus, the overall risk rating for the species is negligible.
Oriental cuckoo (*Cuculus optatus*)	Mi, -	Unlikely	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was considered for the risk rating: • No recent records exist for the species within the Study Area or locality; • One record exist within the broader locality, only one sighting in the last 20 years (100 km radius of the Study Area); • Unlikely to fly within RSA; and • There is limited potential roosting and foraging habitat of monsoonal rainforest or vine thickets present within the Study Area. Therefore, it is considered unlikely that the Proposed Action will have an impact upon this species and that there is a negligible consequence of this happening. Thus, the risk rating for this species is negligible.
Latham's snipe (*Gallinago hardwickii*)	Mi, -	Rare	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was also considered for the risk rating: • No records exist for the species within the Study Area or locality; • One record exist within the broader locality in the last 20 years (within a 100 km radius of the Study Area), 70 km east of the Study Area); • Flight height does occur within the RSA; and • Potential foraging and roosting habitat present within the Study Area associated with farm dams

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					It is therefore considered rare that the species will be impacted by the windfarm through collision with the WTGs, with a negligible consequence. Thus, the overall risk rating for the species is negligible.
Black-faced monarch (*Monarcha melanopsis*)	Mi, -	Rare	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was also considered for the risk rating: • No recent records exist for the species within the locality; • Moderate amount of records exist within the broader locality in the last 20 years (100 km radius of the Study Area), mainly within Kroombit Tops National Park; • Flight height does occur within the RSA; and • Low density of foraging and roosting habitat is present in the Study Area in the form of vine thickets/forests and dry rainforest It is therefore considered rare that the species will be impacted by the windfarm through collision with the WTGs, with a negligible consequence. Thus, the overall risk rating for the species is negligible.
Yellow wagtail (*Motacilla flava*)	Mi, -	Unlikely	Negligible	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • Flight height potentially entering the RSA during migration to Australia, however it is unlikely that the species will utilise this space after finishing passage. Suspected flight behaviour to be similar to other wagtails. • Potential breeding and foraging habitat of open grasslands associated with farm dams present within the Study Area. Therefore, it is considered unlikely that the Proposed Action will have an impact upon this species and there is a negligible consequence of this happening. Thus, the risk rating for this species is negligible.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Satin flycatcher (*Myiagra cyanoleuca*)	Mi, -	Unlikely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area. The following information was considered for the risk rating: • The species has been recorded within the Study Area during field surveys; • Low-moderate amount of records exist within the broader locality in the last 20 years (closest record 30 km from the Study Area within Shankeen Nature Refuge); • Flight height potentially entering the RSA during migration to Australia, however it is unlikely that the species will utilise this space after finishing passage; • There is low abundance of suitable foraging habitat of densely vegetated wet eucalypt gullies within the Study Area. Therefore, it is considered unlikely that the Proposed Action will have an impact upon this species and there is a negligible consequence of this happening. Thus, the risk rating for this species is negligible.
Non-listed Bird Species					
Australasian Darter (*Anhinga novaehollandiae*)	-	Unlikely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying above 50m during surveys but is known to flyer at higher heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Australasian little pied cormorant (*Microcarbo melanoleucos melanoleucos*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA but only on one occasion. Therefore, there is an unlikely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Australian Bustard (*Ardeotis australis*)		Rare	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Moderate number of records exist within the locality (20km buffer) and high records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA during field surveys. Therefore, there is a rare likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Australian Great Pied Cormorant	-	Unlikely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating:

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
(*Phalacrocorax varius hypoleucos*)					• Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA during field surveys, with the highest record observed at 50m. Therefore, there is a rare likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Australian Magpie (*Gymnorhina tibicen*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying above 50m during surveys but is known to flyer at higher heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is low.
Australian Wood Duck (*Chenonetta jubata*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Moderate number of records exist within the locality (20km buffer) and high records exist within the broader locality in the last 20 years (100km buffer); and

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• The species was not recorded flying within the RSA during field surveys, with the highest record observed at 50m. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Black Kite (*Milvus migrans*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying above 50m during surveys but is known to flyer at higher heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is low.
Black-faced Cuckoo-shrike (*Coracina novaehollandiae*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying above 50m during field surveys, however is known to fly at higher heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					high number of historically relevant records within the broader locality. Thus, the risk rating for this species is negligible.
Black-faced woodswallow (*Artamus cinereus*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • Although this species was not recorded flying within the RSA during field surveys, the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event. Thus, the risk rating for this species is low.
Black-shouldered kite (*Elanus axillaris*)	-	Likely	Low	**Low**	This species is known to occur within the Study Area. The following information was considered for the risk rating: • Multiple records of the species exist within the Study Area and locality (1 individuals were sighted during bird surveys); • Moderate number of records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • The species was not recorded flying through the RSA within the Study Area during field surveys, however the species is known to fly at these heights; and • This species is known to occur within and flying over wooded, forests and open land. Although this species was not recorded within the RSA during field surveys, the species is known to fly at these heights and therefore, to be conservative, it has been concluded that the likelihood of the species colliding with the turbines is 'likely'. Due to the species non-threatened status, it is concluded that the consequence of this event will be low and is unlikely to result in any significant change in local

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					abundance. Therefore, this species is considered to be at a low risk of being impacted by the windfarm.
Brown falcon (*Falco berigora*)	-	Almost certain	Low	**Low**	This species is known to occur within the Study Area. The following information was considered for the risk rating: • Multiple records of the species exist within the Study Area and locality (10 individuals were sighted during bird surveys, 6 of which were within the RSA); • High number of records exist within the broader locality in the last 20 years (100 km radius of the Study Area); and • This species is known to occur within and flying over wooded, forests and open land. This species has been seen in the RSA and to be conservative it has been concluded that the likelihood of it colliding with the turbines is 'almost certain', however due to its non-threatened status it is concluded that the consequence of this event will be low, and is unlikely to result in any significant change in local abundance. Therefore, this species is considered to be at a low risk of being impacted by the windfarm.
Brown Goshawk (*Accipiter fasciatus*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the RSA; • Moderate-high number of records exist within the broader locality (100 km); and • The species wasn't recorded within the RSA during field surveys. The species is known to occur within and flying over wooded, forests and open land, as its hunting tactic aligns with wait and pounce methods. However, the species has been observed reaching heights of over 100m during prospecting runs.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					Therefore, there is a likely likelihood of collision due to species behaviour. Due to moderate-high historically relevant records within the broader locality the consequence of such an event is low. Thus, the risk rating for this species is low
Fairy martin (*Petrochelidon ariel*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA during field surveys, with the highest record observed at 50m. Therefore, there is a rare likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Galah (*Eolophus roseicapilla*)	-	Almost Certain	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA during field surveys on 10 occasions. Therefore, there is a almost certain likelihood of collision due to the species records within the RSA and a low consequence of such an event. Thus, the risk rating for this species is low.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Grey Teal (*Anas gracilis*)	-	Likely	negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded within the RSA during field surveys, however the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the high number of historically relevant records within the broader locality. Thus, the risk rating for this species is negligible.
Hardhead (*Aythya australis*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded within the RSA during field surveys, however the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the high number of historically relevant records within the broader locality. Thus, the risk rating for this species is negligible.
Intermediate Egret (*Ardea intermedia*)	-	Unlikely	Negligible	**Negligible**	This species is known to occur within the Project Area. The following information was considered for the risk rating: • The presence of this species was confirmed during field surveys. • There are moderate-high records within the broader locality.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• The species was not recorded at heights above 30m during field surveys. • Suitable habitat has been identified within the Project Area. Therefore, it is considered unlikely that the species will collide with the WTGs due to the species behaviour, distribution and records, and there is a negligible consequence of this happening due to the species threatened listing and population size. Thus, the risk rating for this species is negligible.
Little black cormorant (*Phalacrocorax sulcirostris*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA, but only on 2 occasions. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Nankeen kestrel (*Falco cenchroides*)	-	Almost certain	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying above 50m during surveys but is known to flyer at higher heights.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is low.
Noisy Miner (*Manorina melanocephala*)	-	Unlikely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA, with the max height of the species recorded at 50 m. Therefore, there is an unlikely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the high number of historically relevant records within the broader locality. Thus, the risk rating for this species is negligible.
Pacific baza (*Aviceda subcristata*)	-	Almost certain	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the RSA; • High amounts of records exist within the broader locality in the last 20 years (100 km radius of the Study Area) and few records within the Locality (20km from the Study Area); and • This species often moves in family groups concealed within the canopy and hunts within the canopy layer. Although the species was not observed within the RSA during field surveys, during breeding season, males are known to do aerial displays where they fly up high and do aerial manoeuvres and dives.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					Therefore, with an assumption of breeding behaviours occurring every season, it is almost certain likelihood of collision. Due to high historically relevant records within the broader locality the consequence of such an event is low. Thus, the risk rating for this species is low.
Pacific Black Duck (*Anas superciliosa*)	-	Likely	negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was no recorded within the RSA during field surveys, however the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the high number of historically relevant records within the broader locality. Thus, the risk rating for this species is low.
Peregrine falcon (*Falco peregrinus*)	-	Almost Certain	Low	**Low**	This species is known to occur within the Study Area. The following information was considered for the risk rating: • Multiple records of the species exist within the Study Area and locality (1 individuals were sighted during bird surveys); • Low- moderate number of records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • The species was recorded flying through the RSA on one occasion within the Study Area during field surveys; and • This species is known to occur within and flying over wooded, forests and open land. This species has been seen in the RSA and to be conservative it has been concluded that the likelihood of it colliding with the turbines is 'almost certain', however due to its non-threatened status it is

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					concluded that the consequence of this event will be low, and is unlikely to result in any significant change in local abundance. Therefore, this species is considered to be at a low risk of being impacted by the windfarm.
Pied Currawong (*Strepera graculina*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded within the RSA during field surveys, however the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the high number of historically relevant records within the broader locality. Thus, the risk rating for this species is negligible.
Pink-eared Duck (*Malacorhynchus membranaceus*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and low-moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA during field surveys, with the highest record observed at 50m. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is low.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Plumed whistling-duck (*Dendrocygna eytoni*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate-high records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA during field surveys, however the species is known to reach these heights Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Rainbow Bee-eater (*Merops ornatus*)	-	Likely	Low	**Low**	This species is known to occur within the Project Area. The following information was considered for the risk rating: • The presence of this species was confirmed during field surveys. • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded within the RSA during field surveys, however the species is known to fly at these heights. • Suitable habitat has been identified within the Project Area. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event. Thus, the risk rating for this species is low.
Rainbow Lorikeet (*Trichoglossus moluccanus*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area;

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA on four occasions during BBUS surveys. Therefore, there is an almost certain likelihood of collision due to the species behaviour and a low consequence of such an event due to the high value of observations within the RSA during surveys. Thus, the risk rating for this species is negligible.
Red-winged Parrot (*Aprosmictus erythropterus*)		Unlikely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA, however this was only observed on one occasion (60m). Therefore, there is an unlikely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the high number of historically relevant records within the broader locality. Thus, the risk rating for this species is negligible.
Spotted harrier (*Circus assimilis*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and low-moderate records exist within the broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA during field surveys, however only on two occasions.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is low.
Straw-necked Ibis (*Threskiornis spinicollis*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low number of records exist within the locality (20km buffer) and moderate-high records exist within the broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA during field surveys (max 18 m). Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is low.
Sulphur-crested Cockatoo (*Cacatua galerita*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Moderate-high number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA on 13 occasions during BBUS surveys. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event. Thus, the risk rating for this species is low.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
Torresian Crow (*Corvus orru*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA on 29 occasions during BBUS surveys. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event. Thus, the risk rating for this species is low.
Tree Martin (*Petrochelidon nigricans*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Low-moderate number of records exist within the locality (10 records) (20km buffer) and broader locality (70 records) (100km buffer); and • The species was not recorded within the RSA during field surveys, however the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to the number of observations within the RSA during field surveys. Thus, the risk rating for this species is low.
Wedge-tailed eagle (*Aquila audax*)	-	Almost certain	Low	**Low**	This species is known to occur within the Study Area. The following information was considered for the risk rating: • Multiple records of the species exist within the Study Area and locality (99 individuals were sighted in the Study Area during bird surveys, 70 of which were within the RSA);

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• High number of records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • The species was recorded on multiple occasions flying throughout the RSA within the Study Area; and • This species is known to occur within and flying over wooded, forests and open land. This species has been seen in the RSA and to be conservative it has been concluded that the likelihood of it colliding with the turbines is 'almost certain', however due to its non-threatened status it is concluded that the consequence of this event will be low, and is unlikely to result in any significant change in local abundance. Therefore, this species is considered to be at a low risk of being impacted by the windfarm.
Welcome Swallow (*Hirundo neoxena*)	-	Unlikely	Low	**Negligible**	This species has been concluded as known to occur within the Project Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Project Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA (max 5 m). Therefore, there is an unlikely likelihood of collision due to the species behaviour and a low consequence of such an event. Thus, the risk rating for this species is negligible.
Whistling kite (*Haliastur sphenurus*)	-	Almost certain	Low	**Low**	This species is known to occur within the Study Area. The following information was considered for the risk rating: • Multiple records of the species exist within the Study Area and locality (3 individuals were sighted during bird surveys, all of which were observed within the RSA); • High number of records exist within the broader locality in the last 20 years (100 km radius of the Study Area);

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• The species was recorded on multiple occasions flying throughout the RSA within the Study Area; and • This species is known to occur within and flying over wooded, forests and open land. This species has been seen in the RSA and to be conservative it has been concluded that the likelihood of it colliding with the turbines is 'almost certain', however due to its non-threatened status it is concluded that the consequence of this event will be low, and is unlikely to result in any significant change in local abundance. Therefore, this species is considered to be at a low risk of being impacted by the windfarm.
White-Breasted Woodswallow (*Artamus leucorynchus*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Project Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Project Area; • High number of records exist within the locality (20km buffer) and broader locality in the last 20 years (100km buffer); and • The species was not recorded flying within the RSA (max 50m), however the species is known to fly at these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event. Thus, the risk rating for this species is low.
White-faced Heron (*Egretta novaehollandiae*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Moderate number of records exist within the locality (20km buffer) and high records exist within the broader locality in the last 20 years (100km buffer); and

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					• The species was recorded flying within the RSA during field surveys, however only on one occasions. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
White-necked heron (*Ardea pacifica*)	-	Likely	Negligible	**Negligible**	This species has been concluded as known to occur within the Study Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Study Area; • Moderate number of records exist within the locality (20km buffer) and high records exist within the broader locality in the last 20 years (100km buffer); and • The species was recorded flying within the RSA during field surveys, however it is known to reach these heights. Therefore, there is a likely likelihood of collision due to the species behaviour and a negligible consequence of such an event due to the species non-threatened listing and population size in the locality. Thus, the risk rating for this species is negligible.
Yellow-tailed black-cockatoo (*Zanda funereal*)	-	Likely	Low	**Low**	This species has been concluded as known to occur within the Project Area as observations occurred during field surveys. The following information was considered for the risk rating: • Species was directly observed during field survey efforts within the Project Area; • Moderate-High number of records exist within the locality (20km buffer) and broader locality (100km buffer); and • The species was not recorded flying within the RSA on during BBUS surveys (max 20m), however, the species is known to fly at these heights.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					Therefore, there is a likely likelihood of collision due to the species behaviour and a low consequence of such an event due to population size and density of the species within the area. Thus, the risk rating for this species is low.
Listed Threated Bats					
Grey-headed flying fox (*Pteropus poliocephalus*)	V, -	Unlikely	Low	**Negligible**	This species has been concluded as likely to occur within the Study Area. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • The Study Area is approximately 180 km north-west from the closest active colony with recent GHFF activity (per the interactive flying-fox viewer of the Department of Environment). This colony is located near Mundubbera. • Flight height unlikely to reach the RSA; and • Favoured habitat is mapped to exist in the Study Area in the form of box, ironbark, brigalow and forest red gum woodland communities. This species has an unlikely likelihood WTG collision, and as a vulnerable EPBC Act listed species, the consequence risk is concluded to be low. Therefore, the species has been considered to be at a negligible risk of being impacted by the windfarm.
Corben's long-eared bat (*Nyctophilus corbeni*)	V, VU	Unlikely	Low	**Negligible**	This species has been concluded as having the potential to occur within the Study Area. The following information was considered for the risk rating: • No records exist for the species within the Study Area or locality; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • Flight height unlikely to reach the RSA; and • Potential foraging and roosting habitat of ironbark woodland is present in areas within the Study Area.

Species	Threatened Species Status EPBC Act	Likelihood of Event	Consequence of Event	Risk Rating	Comments
					This species has an unlikely likelihood WTG collision, and as a vulnerable EPBC Act listed species, the consequence risk is concluded to be low. Therefore, the species has been considered to be at a negligible risk of being impacted by the windfarm.
Large-eared pied-bat (*Chalinolobus dwyeri*)	E, EN	Unlikely	Moderate	**Low**	This species has been concluded as known to occur within the Study Area. The following information was considered for the risk rating: • Several 'probable' recordings of the species were detected within the Study Area through Anabat recordings; • No records exist within the broader locality in the last 20 years (100 km radius of the Study Area); • Flight height unlikely to reach the RSA; and • Potential foraging habitat is present in areas within the Study Area. This species has an unlikely likelihood WTG collision, and as a endangered EPBC Act listed species, the consequence risk is concluded to be moderate. Therefore, the species has been considered to be at a low risk of being impacted by the windfarm.

Status listing per EPBC Act, NC Act: CE, CR = Critically Endangered; E, EN= Endangered; V, VU = Vulnerable; Mi = Migratory, - = no listing

APPENDIX H SPECIES LISTS

	Order	Family	Genus	Species
Birds	16	49	94	115
Amphibians	1	1	1	1
Mammals (including micro-bats)	7	15	21	29
Reptiles	1	3	4	4
Flora	21	41	67	96

Birds										
Order	Family	Genus	Scientific Name	Common Name	NCA	EPBC	Field Survey Records	WildNet Records	Last Recorded	Invasive Species?
Accipitriformes	Accipitridae	*Accipiter*	*Accipiter fasciatus*	Brown goshawk			1			
		Aquila	*Aquila audax*	Wedge-tailed Eagle			82			
		Aviceda	*Aviceda subcristata*	Pacific Baza			2			

Birds										
		Elanus	*Elanus axillaris*	Black Shouldered Kite			1			
		Haliastur	*Haliastur sphenurus*	Whistling Kite			1			
		Milvus	*Milvus migrans*	Black Kite			3			
Anseriformes	Anatidae	*Anas*	*Anas gracilis*	Grey Teal			241			
			Anas superciliosa	Pacific Black Duck			121			
		Aythya	*Aythya australis*	Hardhead			24			
		Chenonetta	*Chenonetta jubata*	Australian Wood Duck			500			
		Dendrocygna	*Dendrocygna eytoni*	Plumed Whistling-Duck			89			
		Malacorhynchus	*Malacorhynchus membranaceus*	Pink-eared duck			8			
Casuariiformes	Casuariidae	*Dromaius*	*Dromaius novaehollandiae*	Emu			2			
Accipitriformes	Accipitridae	*Accipiter*	*Accipiter fasciatus*	Brown goshawk			1			

Birds										
Casuariiformes	Casuariidae	*Dromaius*	*Dromaius novaehollandiae*	Emu			2			
Charadriiformes	Charadriidae	*Elseyornis*	*Elseyornis melanops*	Black-fronted Dotterel			22			
		Vanellus	*Vanellus miles*	Masked Lapwing			66			
	Recurvirostridae	*Himantopus*	*Himantopus leucocephalus*	Pied Stilt			1			
	Turnicidae	*Turnix*	*Turnix varius*	Painted Button-quail						
Columbiformes	Columbidae	*Geopelia*	*Geopelia placida*	Peaceful Dove			14			
		Geophaps	*Geophaps scripta*	squatter pigeon	V	V	1			
		Ocyphaps	*Ocyphaps lophotes*	Crested Pigeon			105			
		Phaps	*Phaps chalcoptera*	Common Bronzewing			5			
Coraciiformes	Alcedinidae	*Dacelo*	*Dacelo novaeguineae*	Laughing Kookaburra			58			

Birds										
		Todiramphus	*Todiramphus macleayii*	Forest kingfisher			5			
			Todiramphus sanctus	Sacred Kingfisher			1			
	Coraciidae	*Eurystomus*	*Eurystomus orientalis*	Oriental Dollarbird			18			
	Meropidae	*Merops*	*Merops ornatus*	Rainbow Bee-eater			13			
Cuculiformes	Cuculidae	*Cacomantis*	*Cacomantis variolosus*	Brush Cuckoo			2			
			Cacomantis flabelliformis	Fan-tailed Cuckoo			1			
		Centropus	*Centropus phasianinus*	Pheasant Coucal			26			
		Chrysococcyx	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo			2			
			Chrysococcyx lucidus	Shining Bronze-cuckoo			1			
		Eudynamys	*Eudynamys orientalis*	Eastern Koel			1			

Birds										
		Scythrops	*Scythrops novaehollandiae*	Channel-billed Cuckoo			5			
Falconiformes	Falconidae	*Falco*	*Falco berigora*	Brown Falcon			11			
			Falco cenchroides	Nankeen Kestrel			27			
			Falco peregrinus	Peregrine falcon			1			
Galliformes	Megapodiidae	*Alectura*	*Alectura lathami*	Australian Brush-turkey			1			
	Phasianidae	*Coturnix*	*Coturnix ypsilophora*	Brown quail			2			
	Rallidae	*Porphyrio*	*Porphyrio porphyrio*	Purple Swamphen			1			
Otidiformes	Otididae	*Ardeotis*	*Ardeotis australis*	Australian Bustard			7			
Passeriformes	Acanthizidae	*Gerygone*	*Gerygone olivacea*	White-throated Gerygone			38			
		Sericornis	*Sericornis magnirostra*	Large-billed Scrubwren			3			

Birds										
		Smicrornis	*Smicrornis brevirostris*	Weebill			26			
	Alaudidae	*Mirafra*	*Mirafra javanica*	Horsfield's bushlark			11			
	Artamidae	*Artamus*	*Artamus leucorynchus*	White-breasted woodswallow			8			
		Cracticus	*Cracticus torquatus*	Grey Butcherbird			23			
			Cracticus nigrogularis	Pied Butcherbird			41			
		Gymnorhina	*Gymnorhina tibicen*	Australian Magpie			149			
		Strepera	*Strepera graculina*	Pied Currawong			47			
	Campephagidae	*Coracina*	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			22			
			Coracina papuensis	White-bellied cuckoo-shrike			1			

Birds										
		Lalage	*Lalage tricolor*	White-winged Triller			3			
	Cisticolidae	*Cisticola*	*Cisticola exilis*	Golden-headed Cisticola			10			
	Climacteridae	*Climacteris*	*Climacteris picumnus*	Brown treecreeper			3			
	Corcoracidae	*Struthidea*	*Struthidea cinerea*	Apostlebird			148			
	Corvidae	*Corvus*	*Corvus orru*	Torresian Crow			258			
	Dicaeidae	*Dicaeum*	*Dicaeum hirundinaceum*	Mistletoebird			1			
		Dicrurus	*Dicrurus bracteatus*	Spangled Drongo			3			
	Estrildidae	*Taeniopygia*	*Taeniopygia bichenovii*	Double-barred Finch			8			
			Taeniopygia castanotis	Zebra finch			9			
	Hirundinidae	*Hirundo*	*Hirundo neoxena*	Welcome swallow			1			

Birds										
		Petrochelidon	*Petrochelidon ariel*	Fairy Martin			38			
			Petrochelidon nigricans	Tree martin			44			
	Locustellidae	*Cincloramphus*	*Megalurus cruralis*	Brown Songlark			2			
	Maluridae	*Malurus*	*Malurus melanocephalus*	Red-backed Fairy-wren			32			
			Malurus cyaneus	Superb Fairy-wren			24			
				Fairwren sp.			2			
	Meliphagidae	*Entomyzon*	*Entomyzon cyanotis*	Blue-faced Honeyeater			31			
		Gavicalis	*Lichenostomus virescens*	Singing honeyeater			1			
		Lichmera	*Lichmera indistincta*	Brown Honeyeater			1			
		Manorina	*Manorina melanocephala*	Noisy Miner			125			
		Meliphaga	*Meliphaga lewinii*	Lewin's Honeyeater			2			

Birds										
		Melithreptus	*Melithreptus albogularis*	White-throated Honeyeater			12			
		Philemon	*Philemon citreogularis*	Little Friarbird			21			
			Philemon corniculatus	Noisy Friarbird			78			
		Plectorhyncha	*Plectorhyncha lanceolata*	Striped honeyeater			2			
	Monarchidae	*Grallina*	*Grallina cyanoleuca*	Magpie-lark			70			
		Myiagra	*Myiagra rubecula*	Leaden Flycatcher			6			
			Myiagra inquieta	Restless flycatcher			11			
			Myiagra cyanoleuca	Satin flycatcher		M	3			
	Motacillidae	*Anthus*	*Anthus novaeseelandiae*	Australasian pipit			30			
	Neosittidae	*Daphoenositta*	*Daphoenositta chrysoptera*	Varied Sittella			5			

Birds										
	Oriolidae	*Oriolus*	*Oriolus sagittatus*	Olive-backed Oriole			2			
	Pachycephalidae	*Colluricincla*	*Colluricincla harmonica*	Grey Shrike-thrush			2			
		Pachycephala	*Pachycephala rufiventris*	Rufous Whistler			13			
	Pardalotidae	*Pardalotus*	*Pardalotus rubricatus*	Red-browed Pardalote						
			Pardalotus striatus	Striated Pardalote			74			
	Petroicidae	*Petroica*	*Petroica goodenovii*	Red-capped robin						
	Pomatostomidae	*Pomatostomus*	*Pomatostomus temporalis*	Grey-crowned babbler			40			
			Pomatostomus superciliosus	White-browed Babbler			2			
	Ptilonorhynchidae	*Ailuroedus*	*Ailuroedus crassirostris*	Green catbird			1			
		Chlamydera	*Chlamydera maculata*	Spotted bowerbird			3			

Birds										
	Rhipiduridae	*Rhipidura*	*Rhipidura albiscapa*	Grey Fantail			4			
			Rhipidura leucophrys	Willie wagtail			43			
	Sturnidae	*Acridotheres*	*Acridotheres tristis*	Common Myna			44			Yes
Pelecaniformes	Ardeidae	*Ardea*	*Ardea intermedia*	Intermediate Egret			1			
			Ardea pacifica	White-necked Heron			2			
		Egretta	*Egretta novaehollandiae*	White-faced heron			96			
		Nycticorax	*Nycticorax caledonicus*	Nankeen Night-Heron			1			
	Threskiornithidae	*Platalea*	*Platalea regia*	Royal Spoonbill			6			
		Threskiornis	*Threskiornis spinicollis*	Straw-necked Ibis			13			
Podicipediformes	Podicipedidae	*Poliocephalus*	*Poliocephalus poliocephalus*	Hoary-headed Grebe			2			

Birds										
		Tachybaptus	*Tachybaptus novaehollandiae*	Australasian Grebe			135			
Psittaciformes	Cacatuidae	*Cacatua*	*Cacatua galerita*	Sulphur-crested Cockatoo			71			
		Eolophus	*Eolophus roseicapilla*	Galah			184			
		Nymphicus	*Nymphicus hollandicus*	Cockatiel			9			
	Psittaculidae	*Aprosmictus*	*Aprosmictus erythropterus*	Red-winged Parrot			25			
		Platycercus	*Platycercus adscitus*	Pale-headed Rosella			117			
		Trichoglossus	*Trichoglossus moluccanus*	Rainbow Lorikeet			161			
			Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet			2			
Strigiformes	Tytonidae	*Tyto*	*Tyto javanica*	Eastern Barn owl			1			
Suliformes	Anhingidae	*Anhinga*	*Anhinga novaehollandiae*	Australasian darter			8			

Birds										
	Phalacrocoracidae	*Microcarbo*	*Microcarbo melanoleucos*	Australasian little pied Cormorant			1			
			Microcarbo melanoleucos	Little Pied Cormorant			12			
		Phalacrocorax	*Phalacrocorax varius*	Ausrrailan Great pied Cormorant			4			
			Phalacrocorax sulcirostris	Little black cormorant			27			
Pelecaniformes	Ardeidae	*Ardea*	*Ardea intermedia*	Intermediate Egret			1			
			Ardea pacifica	White-necked Heron			2			
		Egretta	*Egretta novaehollandiae*	White-faced heron			96			
		Nycticorax	*Nycticorax caledonicus*	Nankeen Night-Heron			1			
	Threskiornithidae	*Platalea*	*Platalea regia*	Royal Spoonbill			6			

Birds										
		Threskiornis	*Threskiornis spinicollis*	Straw-necked Ibis			13			
Podicipediformes	Podicipedidae	*Poliocephalus*	*Poliocephalus poliocephalus*	Hoary-headed Grebe			2			
		Tachybaptus	*Tachybaptus novaehollandiae*	Australasian Grebe			135			
Psittaciformes	Cacatuidae	*Cacatua*	*Cacatua galerita*	Sulphur-crested Cockatoo			71			
		Eolophus	*Eolophus roseicapilla*	Galah			184			
		Nymphicus	*Nymphicus hollandicus*	Cockatiel			9			
	Psittaculidae	*Aprosmictus*	*Aprosmictus erythropterus*	Red-winged Parrot			25			
		Platycercus	*Platycercus adscitus*	Pale-headed Rosella			117			
		Trichoglossus	*Trichoglossus moluccanus*	Rainbow Lorikeet			161			

Birds										
			Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet			2			
Strigiformes	Tytonidae	*Tyto*	*Tyto javanica*	Eastern Barn owl			1			
Suliformes	Anhingidae	*Anhinga*	*Anhinga novaehollandiae*	Australasian darter			8			
	Phalacrocoracidae	*Microcarbo*	*Microcarbo melanoleucos*	Australasian little pied Cormorant			1			
			Microcarbo melanoleucos	Little Pied Cormorant			12			
		Phalacrocorax	*Phalacrocorax varius*	Ausrrailan Great pied Cormorant			4			
			Phalacrocorax sulcirostris	Little black cormorant			27			

Amphibians										
Order	Family	Genus	Scientific Name	Common Name	NCA	EPBC	Field Survey Records	WildNet Records	Last Recorded	Invasive Species?
Amphibia	Bufonidae	*Rhinella*	*Rhinella marina*	Cane toad				1		Yes

Mammals (including Micro-bats)										
Order	Family	Genus	Scientific Name	Common Name	NCA	EPBC	Field Survey Records	WildNet Records	Last Recorded	Invasive Species?
Carnivora	Canidae	*Canis*	*Canis familiaris*	Dingo			1	1		
			Canis lupus familiaris	Dog			1			Yes
	Felidae	*Feline*	*Feline catus*	Cat			1			Yes
Lagomorpha	Leporids	*Oryctolagus*	*Oryctolagus cuniculus*	Rabbit			1			Yes
Rodentia	Muridae	*Mus*	*Mus musculus*	House mouse			1			Yes
Diprotodontia	Phascolarctidae	*Phascolarctos*	*Phascolarctos cinereus*	Koala	EN	E	Scat detected			

Mammals (including Micro-bats)										
	Pseudocheiridae	*Petauroides*	*Petauroides volans*	Greater glider (southern & central)	EN	E	14			
	Macropodidae	*Macropus*	*Macropus giganteus*	Eastern grey kangaroo			1			
Artiodactyla	Suidae	*sus*	*sus scrofa*	Wild pig			1			Yes
Monotremata	Tachyglossidae	*Tachyglossus*	*Tachyglossus aculeatus*	Short-beaked echidna	SLC		1			
Chiroptera	Emballonuridae	*Saccolaimus*	*Saccolaimus flaviventris*	yellow-bellied sheath-tailed bat			Definite		1/03/2023	
Chiroptera	Emballonuridae	*Saccolaimus*	*Saccolaimus flaviventris*	yellow-bellied sheath-tailed bat			Definite		1/03/2023	
	Miniopteridae	*Miniopterus*	*Miniopterus australis*	little bent-wing bat			Definite		1/03/2023	
	Molossidae	*Austronomus*	*Miniopterus orianae oceanensis*	Australasian bent-wing bat			Probable		1/03/2023	

Mammals (including Micro-bats)									
	Molossidae	*Austronomus*	*Austronomus australis*	White-striped free-tailed bat			Definite		1/03/2023	
		Chaerephon	*Chaerephon jobensis*	Northern freetail bat			Definite		1/03/2023	
		Ozimops	*Ozimops lumsdenae*	northern free-tailed bat			Possible		1/03/2023	
		Setirostris	*Ozimops ridei*	eastern free-tailed bat			Definite		1/03/2023	
	Rhinolophidae	*Setirostris*	*Setirostris eleryi*	Bristle-faced free-tailed bat			Possible		1/03/2023	
	Rhinolophidae	*Rhinolophus*	*Rhinolophus megaphyllus*	smaller horseshoe bat			Definite		1/03/2023	
	Vespertilionidae	*Chalinolobus*	*Chalinolobus dwyeri*	Large-eared pied bat			Probable		1/03/2023	
			Chalinolobus gouldii	Gould's wattled bat			Definite		1/03/2023	
			Chalinolobus morio	Chocolate wattled bat			Definite		1/03/2023	

Mammals (including Micro-bats)										
			Chalinolobus nigrogriseus	Hoary wattled bat			Definite		1/03/2023	
		Myotis	*Chalinolobus picatus*	Little pied bat			Definite		1/03/2023	
		Myotis	*Myotis macropus*	Southern myotis			Possible		1/03/2023	
		Nyctophilus	*Nyctophilus sp*				Possible		1/03/2023	
		Scotorepens	*Scotorepens balstoni*	Inland broad-nosed bat			Definite		1/03/2023	
			Scotorepens greyii	little broad-nosed bat			Probable		1/03/2023	

Reptiles										
Order	Family	Genus	Scientific Name	Common Name	NCA	EPBC	Field Survey Records	WildNet Records	Last Recorded	Invasive Species?
Reptilia	Carphodactylidae	*Nephrurus*	*Nephrurus asper*	spiny knob-tailed gecko	C			2	31/12/1996	

Reptiles										
	Elapidae	*Brachyurophis*	*Brachyurophis australis*	Coral Snake	C			1	31/12/1996	
		Suta	*Suta dwyeri*	Dwyer's snake	C			1	31/12/1996	
	Scincidae	*Egernia*	*Egernia striolata*	Tree skink	C			1	31/12/1996	

Flora List						
Order	Family	Genus	Scientific Name (Confirmed species)	NCA	EPBC	Invasive Species?
Apiales	Apocynaceae	*Carissa*	*Carrissa ovata*			
	Pittosporaceae	*Bursaria*	*Bursaria spinosa*			
	Pittosporaceae	*Pittosporum*	*Pittosperum angustifolium*			
Asparagales	Asparagaceae	*Lomandra*	*Lomandra confertifolia*			
			Lomandra longifolia			
Asterales	Asteraceae	*Ageratum*	*Ageratum houstonianum*			Yes
		Bidens	*Bidens pilosa*			Yes

Flora List						
		Calocephalus	*Unidentified*			
		Conyza	*Unidentified*			
		Parthenium	*Parthenium hysterophorus*			Yes
		Rhaponticum	*Rhaponticum australe*			
		Xanthium	*Xanthium strumarium*			
			xanthium occidentale			Yes
Brassocales	Capparaceae	*Capparis*	*Unidentified*			
Caryophyllasles	Anacardiaceae	*pleiogynium*	*pleiogynium timorense*			
	Cactaceae	*Opuntia*	*Unidentified*			
			Opuntia stricta			Yes
			Opuntia tomentosa			Yes
	Chenopodiaceae	*Einadia*	*Einadia nutans*			
Celastrales	Celastraceae	*Denhamia*	*Denhamia oleaster*			
Ericales	Lechythidaceae	*Planchonia*	*Planchonia careya*			
Fabales	Fabaceae	*Acacia*	*Acacia harpophylla*			

Flora List						
			Acacia stenophylla			
			Acacia salicina			
			Acacia melanoxylon			
			Acacia dictyophleba			
			Acacia implexa			
			Acacia rhodoxylon			
		Erythrina	*Erythrina vespertilio*			
	Leguminosae	*Vachellia*	*Vachellia bidwillii*			Yes
	Surianaceae	*Cadellia*	*Cadellia pentastylis*			
Fagales	Casuarinaceae	*Casuarina*	*Casuarina cunninghamiana*			
Gentianales	Apocynaceae	*Gomphocarpus*	*Gomphocarpus fruticosus*			
			Gomphocarpus physocarpus			Yes
	Aristolochiaceae	*Aristolochia*	*Aristolochia elegans*			Yes
	Rubiaceae	*Everistia*	*Everistia vacciniifolia*			
Lamiales	Acanthaceae	*Xerothamnella*	*Xerothamnella herbacea*			

Flora List						
	Bignoniaceae	*Dolichandra*	*Dolichandra unguis-cati*			Yes
	Lamiaceae	*Mentha*	*Mentha suaveolens*			
		Teucrium	*Teucrium junceum*			
	Oleaceae	*Notalaea*	*Notalaea microcarpa*			
	Scrophulariaceae	*Eremophila*	*Eremophila mitchelli*			
	Verbenaceae	*Lantana*	*Lantana camara*			Yes
		verbena	*verbena bonariensis*			
Malpighiales	Picrodendraceae	*Petelastigma*	*Petelastigma pubescens*			
Malvales	Malvaceae	*Abutilon*	*abutilon grandiflorum*			
		Brachychiton	*Unidentified*			
		Grewia	*Grewia latifolia*			Yes
		Sida	*Sida cordifolia*			Yes
			Sida rhombifolia			
	Sterculiaceae	*Brachychiton*	*Brachychiton australis*			
			Brachychiton rupestris			

Flora List						
Myrtales	Myrtaceae	*Angophora*	*Angophora floribunda*			
		Callistemon	*Callistemon viminalis*			
		Corymbia	*Corymbia citriodora*			
			Corymbia clarkson			
			Corymbia dallachiana			
			Corymbia erythrophloia			
			Corymbia tessellaris			
		Eucalyptus	*Eucalyptus moluccana*			
			Eucalyptus camaldulensis			
			Eucalyptus crebra			
			Eucalyptus melanophloia			
			Eucalyptus populnea			
			Eucalyptus fibrosa			
			Eucalyptus tereticornis			
		Melaleuca	*Melaleuca bracteata*			

Flora List						
			Melaleuca decora			
			Melaleuca trichostachya			
Piperales	Amaranthaceae	*scleroleana*	*scleroleana muricata*			
Poales	Cyperaceae	*Cyperus*	*Cyperus gracilis*			
	Juncaceae	*Juncus*	*Juncus acutus*			
	Poaceae	*Aristida*	*Aristida queenslandica*			
		Chloris	*Chloris gayana*			Yes
		Cymbopogon	*Cymbopogon refractus*			
		Echinopogon	*Echinopogon ovatus*			
		Eragrostis	*Unidentified*			
		Heteropogan	*Heteropogon contortus*			
		Imperata	*Unidentified*			
		Melinis	*Melinis repens*			Yes
Proteales	Proteaceae	*Grevillea*	*Grevillea striata*			
Rosales	Moraceae	*Ficus*	*Ficus opposita*			

Flora List						
			Ficus pumila			
	Rhamnaceae	*Alphatonia*	*Alphatonia excelsa*			
Santalales	Santalaceae	*Santalum*	*Santalum lanceolatum*			
Sapindales	Apiaceae	*Aegopodium*	*Aegopodium podagraria*			
	Meliaceae	*Melia*	*Melia azedarach*			
		Toona	*Toona ciliata*			
	Rutaceae	*Flindersia*	*Unidentified*			
		Geijera	*Geijera parviflora*			
	Sapindaceae	*Alectryon*	*Alectryon diversifolious*			
			Alectryon diversifolius			
		Cossinia	*Cossinia australiana*			
Solanales	Solanaceae	*Solanum*	*Unidentified*			
			Solanum dissectum			
			Solanum seathorthianum			Yes

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