Hopeland Solar Farm

MNES Impact Assessment Report

17 October 2023

Project No.: 0690924

The business of sustainability

ERM

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Hopeland Solar Farm

MNES Impact Assessment Report

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ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
AC	Alternating current
ALA	Atlas of Living Australia
BESS	Battery Energy Storage System
BoM	Bureau of Meteorology
DAF	Department of Agriculture and Fisheries (Qld)
DAMS	Development Assessment Mapping System (Qld)
DAWE	Department of Agriculture, Water and the Environment
DC	DC Direct current
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australian)
DEHP	Department of Environment and Heritage Protection (Qld)
DES	Department of Environment and Science (Qld)
DoR	Department of Resources (Qld)
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERM	Environmental Resources Management Australia Pty Ltd
Fisheries Act	*Fisheries Act 1994* (Qld)
Flora Survey Guidelines	Flora Survey Guidelines – Proposed Development Plants, *Nature Conservation Act 1992* (Qld)
FMP	Fauna Management Plan
GES	General Ecological Significance
HES	High Ecological Significance
HEV	High Ecological Value
IBA	Important Bird and Biodiversity Areas
Km/h	Kilometres per hour
kV	Kilovolt
LC	Least Concern

LoO	Likelihood of Occurrence
IBAs	Important Biodiversity Areas
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* (Qld)
NP	National Park
OC	Of Concern
PA	*Planning Act 2016* (Qld)
PCU	Power Conversion Units
PMST	Protected Matters Search Tool
PR	Planning Regulation 2017 (Qld)
Qld	State of Queensland
RE	Regional Ecosystem
REZ	Renewable Energy Zone
SARA	State Assessment and Referral Agency
SDAP	State Development Assessment Provisions
SPRAT	Species Profile and Threats Database
SIG 1.1	Significant Impact Guidelines 1.1 – Matters of National Environmental Significance
SRI	Significant Residual Impacts
TEC	Threatened Ecological Communities
VM Act	*Vegetation Management Act 1999* (Qld)
VMP	Vegetation Management Plan
The Proponent	Hopeland Solar Farm Pty Ltd
Water Act	*Water Act 2000* (Qld)
WDRC	Western Downs Regional Council
WN	WildNet

WONS	Weeds of National Significance
WPAMP	Weed and Pest Animal Management Plan

EXECUTIVE SUMMARY

Overview

Hopeland Solar Farm Pty Ltd (the Proponent) proposes to develop the Hopeland Solar Farm (the proposed action). The proposed action is a 312MWdc / 250MWac solar photovoltaic (PV) power station intended to connect into the 275kV Western Downs Substation, which is located approximately 1.2km east of the proposed action. The required transmission powerline connecting the PV power station to the Western Down Substation is not part of the proposed action and will be developed by another proponent. It is therefore not considered in this Impact Assessment Report.

The proposed action is located between Dalby and Chinchilla, approximately 230km west of Brisbane and is within the Western Downs Renewable Energy Zone (REZ) and the Western Downs Regional Council (WDRC) local government area and zoned as Rural under the WDRC Planning Scheme (2019). REZs aim to coordinate development in areas of high renewable potential, simplifying renewable generation, transmission and storage and supporting the transition from traditional coal fired energy generation.

The proposed action is an important renewable energy facility that is a key element in the transition to renewable energy by retiring and replacing coal-fired electricity generation in Queensland. In particular, the location of the proposed action is located within close proximity to the Kogan Creek coal-fired power station and associated coal mining activities. The proposed action takes advantage of existing transmission and substation infrastructure associated with the Kogan Creek power station and will contribute to energy demand from the retirement of this facility.

The proposed action and areas surrounding are predominantly used for agriculture and mining, with Kogan Creek coal mine being east of the proposed action. The proposed action is in proximity to the Western Downs Substation, being east of the Project Area boundary.

The Project Area for the proposed action and for the purposes of this MNES impact assessment report is the property described as Lot 2 on RP117442 and is approximately 656 hectares (ha) in area.

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Hopeland Solar Farm Pty Ltd (the Proponent) to undertake an ecological survey and impact assessment for the proposed action.

This report has been prepared to summarise the findings of the ecological assessment and to assess whether matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are likely to be significantly impacted by the proposed action.

Ecological Assessment and Survey Events

The ecological assessment was undertaken to describe the ecological values of the Project Area and to identify potential impacts to MNES. The ecological assessment consisted of desktop investigations using various publicly available databases, mapping, and aerial imagery, and a field survey conducted in May 2023 by two ecologists over four days and three nights.

Data collected from the initial field surveys were utilised to identify seven broad habitat types within the Project Area, classified based on vegetation community type and structure present within the Project Area. The broad habitat types have been considered as providing respective foraging, breeding, or dispersal functions for listed threatened species that are ‘Potential’ to occur within the Project Area. The ground-truthed habitat mapping has been utilised to identify areas of potential habitat for listed threatened species that are identified as MNES.

The seven broad habitat types are:

- Remnant eucalypt open forest;
- Regrowth eucalypt woodland or open forest;
- Cleared agricultural land with scattered Acacia regrowth and eucalypts;
- Brigalow (*Acacia harpophylla*) regrowth (TEC);
- Brigalow (*Acacia harpophylla*) regrowth (Non-TEC);
- Acacia, Allocasuarina and Callitris regrowth;
- Cleared agricultural land; and
- Maintained dwellings.

The Project Area is predominantly used for agricultural purposes including cattle grazing, with areas of Eucalyptus and Acacia dominated woodlands and forest, occurring on alluvial plains and terraces, and an understory of perennial tussock grasslands. No major rivers or creeks run through the Project Area, however located approximately 5 km east of the Project Area's most eastern boundary is Cooranga Creek that flows east, connecting to the Condamine River.

A search of the EPBC Act Protected Matters Search Tool (PMST) database using a 10km radius from the boundary of the Project Area initially identified the potential presence of 37 listed threatened species, 11 listed migratory species and five threatened ecological communities protected under the EPBC Act. Following field surveys and refinement of desktop information based on ground truthed survey results to identify habitat values, 10 species (painted honeyeater, white-throated needletail, fork-tailed swift, koala, grey-headed flying fox, grey snake, yakka skink, Dunmall's snake, Brigalow woodland snail, and Corben's long-eared bat) were assessed as having 'Potential' to occur within the Project Area. No species were assessed as being 'Known' or 'Likely' to occur within the Project Area.

One EPBC Act listed Threatened Ecological Community (TEC) - Brigalow (*Acacia harpophylla* dominant and co-dominant), was identified as occurring within the Project Area and was confirmed via field targeted surveys. No other EPBC Act listed threatened species were observed during the May 2023 survey effort, nor were any migratory species identified during the May 2023 survey effort.

Potential Impacts and Measures to Avoid Environmental Impacts

The proposed action layout (including location of solar panels, access tracks, substations) has been through multiple iterations. The objective of the design phase has been to enable the layout to avoid impacts yet maximise solar resources, whilst generally limiting impact to ecological values of the Project Area.

Potential impacts from construction, operation, and decommissioning phases have been identified and evaluated, with numerous proposed management measures to avoid, minimise and mitigate environmental impacts. A significant process is that of pre-clearance surveys prior to construction of the proposed action to support micro-siting and adjustments of infrastructure to avoid further impact to ecological values of the Project Area.

Based on the development footprint (476 ha), the proposed action will lead to:

- Avoidance of all areas of remnant eucalypt open forest and Brigalow TEC;
- A maximum disturbance to 73% of the Project Area, with the disturbance area comprised of non-native (63%) and regrowth (37%) vegetation;
- The clearing of up to 99.3 ha of potential koala foraging and breeding habitat, consisting of regrowth eucalypt open forest (39.1% of potential foraging and breeding habitat in the Project Area);

- The clearing of up to 99.3 ha of potential Corben's long-eared bat foraging and breeding habitat, consisting of regrowth eucalypt open forest (39.1% of potential foraging and breeding habitat in the Project Area);
- The clearing of up to 99.3 ha of potential grey-headed flying-fox foraging and breeding habitat (39.1% of potential foraging and breeding habitat in the Project Area);

The proposed layout for the Project has resulted in the avoidance of most areas of highest ecological value and supporting habitat for MNES, with 100% of Brigalow TEC and 100% of remnant eucalypt woodland avoided and retained.

Significant Impact Assessment

Impact assessments were undertaken against the relevant MNES impact assessment guidelines under the EPBC Act which concluded:

- That a significant impact is unlikely due to direct disturbance to 99.3 ha of potential foraging and breeding Koala habitat within the Project Area comprising regrowth eucalypt woodland. Habitat critical to the survival of the species under the EPBC Act, includes habitat types that the species rely on to avoid or halt decline and the proposed actions avoids all areas of higher quality remnant eucalypt open forest and woodlands. Although, it is noted that there was an absence of koala utilisation within the Project Area during the field survey effort, the significant impact assessment for the koala identifies that disturbance of 99.3 ha of potential foraging and breeding Koala habitat in the form of clearing, will remove potential habitat for the species. This assessment applied the precautionary principle by mapping potential koala habitat, acknowledging that there is no evidence of koala utilisation in the Project Area, nor is there any evidence of recent koala records within the Project Area locality and the proposed action will not results in habitat fragmentation or limited dispersal functions across the landscape for koala;
- That a significant impact is unlikely due to the removal of 99.3 ha of potential foraging and breeding habitat for Corben's long-eared bat, however the identification and mapping of this habitat applies the precautionary principle by classifying areas of regrowth eucalypt open forest and woodland as potential habitat. All areas of remnant eucalypt open forest and woodland have been retained as part of the proposed action, and these areas contain better quality habitat for Corben's Long-eared Bat that is considered more likely to contribute to the maintenance of a potential population in the locality; and
- The proposed action is unlikely to result in a significant residual impact to grey-headed flying-fox, painted honeyeater, grey snake, Dunmall's snake, yakka skink, Brigalow woodland snail and the Brigalow threatened ecological community due to the avoidance of all areas of potential habitat.

Management and mitigation measures have been proposed to further reduce potential impacts and will include:

- Preparation and implementation of a Vegetation Management Plan (VMP), Fauna Management Plan (FMP), Weed and Pest Animal Management Plan (WPAMP);
- Adoption of a biosecurity protocol that involves the requirement of vehicle weed washdowns and weed monitoring and reporting;
- Clear demarcating of clearing boundaries and no-go areas;
- Erosion and sediment control measures;
- Measures to minimise disturbance of noise, dust, and light; and
- Reducing risk of vehicle collision with fauna by implementing vehicle speed restrictions and signage.

1. INTRODUCTION

1.1 Project Background and Description

Environmental Resource Management Australia Pty Ltd (ERM) has been engaged by Hopeland Solar Farm Pty Ltd (the Proponent) to undertake a Matters of National Environmental Significance (MNES) impact assessment to support a referral to the Federal Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Hopeland Solar Farm Pty Ltd proposes to develop the Hopeland Solar Farm Project (referred to as the proposed action). The proposed action is a 312MWdc / 250MWac solar photovoltaic (PV) power station intended to connect into the 275kV Western Downs Substation. The required transmission powerline connecting the PV power station to the Western Down Substation, which is located approximately 1.2km east. The required transmission powerline connecting the PV power station to the Western Down Substation is not part of the proposed action and will be developed by another proponent.

As the Project has been progressed through the planning and design phase, the layout has been refined to avoid impacts to MNES as much as is possible.

- Upon purchase of the site it was intended that the entire Project Area would be developed to maximise project yield due to its location for generation of solar power;
- Following issuance of the 28 South Report in 2017, the layout issued with the local government Development Approval was amended to avoid disturbing the fully mapped extent of the MSES; which comprised predominantly Remnant eucalypt open forest. Avoidance of this area significantly reduced potential project yield which was accepted to reduce the environmental impact of the development and to avoid impacts to high value remnant eucalypt open forest that provides foraging and breeding habitat to MNES species;
- In April 2023, ERM conducted the required field studies to support this MNES Impact Assessment and EPBC Act referral. This fieldwork identified a potential area of Brigalow TEC. Following this fieldwork and subsequent mapping of the Brigalow TEC, through design revisions the layout was further updated to avoid this area and further reduce impact to MNES;
- Further reduction of developable area cannot be accommodated without impact to the sustainability and energy supply benefits of the PV power station, as the grid connection studies commenced in Q4 2022 were based on a specific yield and nameplate capacity to establish PV power station capacity. This capacity has been locked into the offtaker's forecast supply and is necessary to support decommissioning of fossil fuel generated power.

Such habitat within the Project Area has been avoided as much as feasible through the design phase of the proposed action. Additionally, following the design phase (during the pre-construction phase) each location of proposed infrastructure will undergo detailed site-specific pre-clearance surveys to inform micro-siting and further avoidance of ecological values as part of the final design of the proposed action.

The second stage of disturbance mitigation deals with the potential disturbances that may occur despite the avoidance measures undertaken in Stage 1. These potential disturbances will be managed and mitigated in a manner consistent with the approaches for solar farm activities.

Briefly, the disturbance mitigation and management measures will include:

- Preparation and implementation of a Vegetation Management Plan (VMP), Fauna Management Plan (FMP), Weed and Pest Animal Management Plan (WPAMP);
- Adoption of a biosecurity protocol that involves the requirement of vehicle weed washdowns and weed monitoring and reporting;
- Clear demarcating of clearing boundaries and no-go areas;

- Erosion and sediment control measures;
- Measures to minimise disturbance of noise, dust, and light; and
- Reducing risk of vehicle collision with fauna by implementing vehicle speed restrictions and signage.

These, and additional measures are detailed in Table 6-1 in Section 6.2.

This Impact Assessment Report has been prepared to summarise the findings of the desktop and field ecological assessment and to assess MNES under the EPBC Act which have the potential to be impacted by the proposed action.

Specifically, this report:

- identifies the relevant biodiversity features and values in the Project Area, with a specific focus on MNES that are listed threatened species and communities under the EPBC Act;
- will inform measures to avoid environmental impacts throughout the design phase;
- will inform measures to mitigate impacts during the construction and operation phases of the proposed action; and
- completes an assessment of the significance of potential impacts in accordance with the requirements of the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (SIG 1.1) (DoE, 2013).

Such habitat within the Project Area has been avoided as much as practicable through the design phase of the proposed action. Additionally, following the design phase (during the pre-construction phase) each location of proposed infrastructure will undergo detailed site-specific pre-clearance surveys to inform micro-sitting and further avoidance of ecological values as part of the final design of the proposed action.

1.2 Project Area and Context

The Project Area for the purposes of this MNES assessment report is the property described as Lot 2 on RP117442 and is approximately 656 ha. The Project Area in a regional context is presented in Figure 1-1, with the Project Area for the proposed action is shown in more detail on Figure 1-3 Project Area and Proposed action Layout..

The Project Area is located between Dalby and Chinchilla, approximately 230km west of Brisbane and is within the Western Downs Renewable Energy Zone (REZ). Renewable Energy Zones aim to coordinate development in areas of high renewable potential, simplifying renewable generation, transmission and storage and supporting the transition from traditional coal fired energy generation. (Department of Energy and Public Works, 2023).

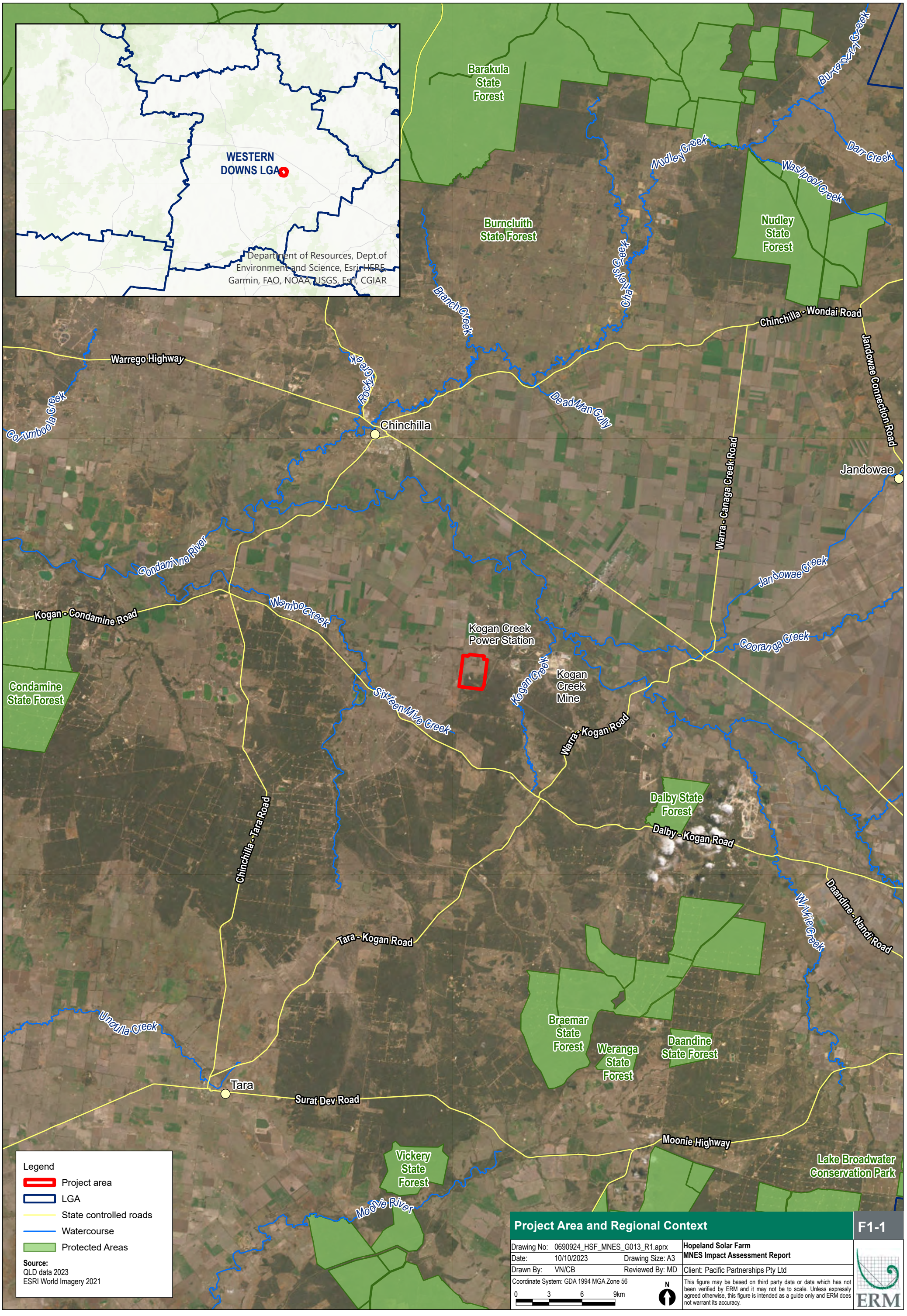
The Project Area occurs within the Brigalow Belt South (BBS) bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) framework. The Project Area includes a range of ecological and landscape features that are typical of the region; including *Eucalyptus* and *Acacia* dominated woodlands and forest, occurring on alluvial plains and terraces, an understory consisting of perennial tussock grasslands, and areas of flat to gently undulating plains of weathered sandstone. The Project Area does not see any major rivers or creeks run through the site, however located approximately 6 km east of the Project Area's most eastern boundary is Cooranga Creek that flows east, connecting to the Condamine River. The Project Area does include several artificial dams that are scattered, these dams primarily used for agricultural / pastural uses.

Much of the Project Area is in a disturbed ecological condition, with 317.4 ha (48.4%) of cleared agricultural land, dominated by exotic groundcovers and 192 ha (30.4%) of regrowth woodlands and open forest communities. Remnant eucalypt open forest occurs in discrete and isolated patches across 138.9 ha (21.2%) of the Project Area, largely concentrated on the southern and eastern boundary.

The Project Area is located within the Western Downs Regional Council (WDRC) local government area and zoned as Rural under the Western Downs Regional Council Planning Scheme (2019). The Project Area and areas surrounding it are currently and predominantly used for agricultural purposes and mining, with Kogan creek coal mine located 5 km east of the Project Area. The Project Area is in proximity to the Western Downs Substation, located approximately 1 km east of the Project Area boundary. Access to the Project Area is from Sixteen Mile Hall Road to the west, N Kogan Road to the south, and Whyalla Road to the north, turning off Sixteen Mile Hall Road.

The proposed action is an important renewable energy facility that is a key element in the transition to renewable energy by retiring and replacing coal-fired electricity generation in Queensland. In particular, the location of the proposed action is located within close proximity to the Kogan Creek coal-fired power station and associated coal mining activities. The proposed action takes advantage of existing transmission and substation infrastructure associated with the Kogan Creek power station and will contribute to energy demand from the retirement of this facility.

A wider study area was utilised for the desktop assessment and the likelihood of occurrence assessment to identify potential MNES species and their habitats that may occur in the Project Area. For the purposes of this assessment, the locality is classified as a 10 km radius buffer around the Project Area, used to account for the potential movement of fauna species in and around the Project Area.


WESTERN DOWNS LGA
Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, CGIAR
Barakula State Forest
Burncluith State Forest
Nudley State Forest
Nudley Creek
Washpool Creek
Darr Creek
Burncluith Creek
Charleys Creek
Branch Creek
Chinchilla - Wondai Road
Jandowae Connection Road
Warrego Highway
Rocky Creek
Dead Man Gully
Chinchilla
Columboola Creek
Jandowae
Warra - Canaga Creek Road
Jandowae Creek
Condamine River
Wambo Creek
Kogan - Condamine Road
Kogan Creek Power Station
Kogan Creek
Kogan Creek Mine
Cooranga Creek
Sixteen Mile Creek
Warra - Kogan Road
Condamine State Forest
Dalby State Forest
Dalby - Kogan Road
Chinchilla - Tara Road
White Creek
Daandine - Nandi Road
Tara - Kogan Road
Braemar State Forest
Weranga State Forest
Daandine State Forest
Unotila Creek
Tara
Surat Dev Road
Moonie Highway
Vickery State Forest
Moonie River
Lake Broadwater Conservation Park
Legend
Project area
LGA
State controlled roads
Watercourse
Protected Areas
Source:
QLD data 2023
ESRI World Imagery 2021
Project Area and Regional Context
F1-1
Drawing No: 0690924_HSF_MNES_G013_R1.aprx
Date: 10/10/2023
Drawing Size: A3
Drawn By: VN/CB
Reviewed By: MD
Coordinate System: GDA 1994 MGA Zone 56
0 3 6 9km
N
Hopeland Solar Farm
MNES Impact Assessment Report
Client: Pacific Partnerships Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Kummerows Road

16 Mile Hall Road

Legend

- Project area
- Substation
- Roads
- Cadastre
- Avoidance Area
- Disturbance Footprint

Source:
QLD data 2023
ESRI World Imagery 2021

Hopeland Solar Farm Project Area

F1-2

Drawing No:	0690924_HSF_MNES_G001_R1.aprx		**Hopeland Solar Farm** **MNES Impact Assessment Report**
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

1.2.1 Proposed Action Specifications

The indicative layout of the proposed action is shown in Figure 1-3 and will broadly consist of:

- Solar arrays; including Solar PV modules totalling up to 312MWdc / 250MWac;
- Temporary infrastructure such as laydown areas and site accommodation;
- Access tracks, underground cabling and conduits;
- Electrical connections and substations;
- Central operational and maintenance facility;
- Minor widening of Sixteen Mile Hall Road in accordance with Development Approval conditions, that will not require any clearing of native vegetation, listed TECs or potential habitat for MNES species.

At this stage of the Project design, these elements are considered to be preliminary and will be further refined as the design progresses. The layout provided in Figure 1-3 is to be considered indicative at this stage of the Project and has been developed to provide a 'worst case' disturbance footprint and avoidance area to identify options to avoid and minimise impacts to MNES and to assess impacts. As such, impacts from the proposed action will reduce during design optimisation.

Each of these specifications are considered in further detail in the following subsections.

The proposed action disturbance footprint (Figure 1-2) has been refined through numerous design iterations, regarding combinations of environmental considerations, ecological values, constructability, legislative considerations, and network considerations. The design refinement process focuses upon avoidance and minimisation of environmental impacts through various stages of layout planning. The design refinement process to avoid MNES is detailed further in Section 6.2. Approximately 479 ha will be cleared to construct the proposed action, comprised of non-native (63%) and relatively young regrowth (37%) vegetation contributing to 99.97% of the disturbance footprint, with remnant vegetation totalling 0.03%. Of the 479.1 ha of disturbance required for the proposed action, 478.9 ha will occur in non-native or regrowth vegetation communities and 0.15 ha in remnant eucalypt open forest. Nonetheless, consideration of the potential for regrowth vegetation to meet threatened ecological community criteria (i.e. brigalow) has been included in this impact assessment.

1.2.2 Proposed Action Components

1.2.2.1 Solar PV modules

The bi-facial solar PV panels will be mounted above ground on the ground mounted single axle solar tracking system. From each bi-facial solar PV panel there will be above ground DC cabling and combiner boxes. Power Conservation Units (PCU) will be mounted to concrete footings.

1.2.2.2 Temporary infrastructure

The preliminary layout includes the construction of a construction laydown area and a logistics yard. These areas will be subject to rehabilitation to establish vegetation cover, including application of natural regeneration to encourage native vegetation cover.

1.2.2.3 Access tracks, underground cabling, and conduits

Construction of site access will be erected at the corner of Kummerows Road and Sixteen Mile Hall Road, to allow access to the site for construction and operational traffic. Considerations in the establishment of access sites and routes, both leading to and within the site, have considered load requirements, turning radii, topography of the landscape, soil types, watercourse crossings, vegetation clearing, and best routes for both construction and operational purposes.

1.2.2.4 Electrical connections and substations

Via each bi-facial solar PV panel a 33kV cable system (both above and below ground cables) will be installed to transfer power to a collection substation. The PV panels generate direct current (DC) electricity that will be inverted to alternating current (AC) via power conversion units (PCU). The PCUs will feed the electricity generated into an onsite 33kV AC reticulation system before the power is collected at the proposed action's 33kV Collector station, that contains the 33kV switchgear, 33kV switch room, 33kV/275kv 160MVa power transformer, 33kV/400V auxiliary transformer and associated protection, control, and metering equipment.

1.2.2.5 Central operations and maintenance facility

The preliminary layout includes a site fence that is along the perimeter of the site and around electrical infrastructure. The proposed action will additionally see an operations and maintenance building built within the 'Disturbance Area', accompanied by a site carparking space. The site will include internal access tracks to and from important electrical infrastructure for both constructive and operation usages.

1.2.3 Sixteen Mile Hall Road upgrades

Surrounding approved renewable energy developments in the area being developed by other, as well as the Hopeland Solar Farm, include conditions to upgrade Sixteen Mile Hall Road to provide for construction and operational access improvements. These upgrades are anticipated to be provided with no impacts to native vegetation or impacts to MNES habitats and are not considered part of the proposed action.

1.2.4 Grid connection

The grid connection is not part of the proposed action being referred for the Hopeland Solar Farm, as this will be developed and owned by separate proponent. The grid connection point for the proposed action is at the 33kV Collector station at the Project site.

It is assumed that the transmission line may be up to 850m between collector station near the northeast boundary of the Hopeland Solar Farm, to its connection point at the Western Downs Substation or existing adjacent transmission towers. Given Western Downs substation is 275kV substation, a 275kV transmission connection will be required. According to Powerlink Queensland easement guidelines an easement width of 60m is appropriate. Therefore, the total approximate footprint of this transmission line and easement will be approximately 5ha and likely to traverse mostly cleared agricultural landscape. Due to the relatively small footprint and ability to avoid or minimise clearing for the easement, development of the short transmission connection is unlikely to constitute a significant impact in accordance with the definition prescribed under the SIG 1.1.

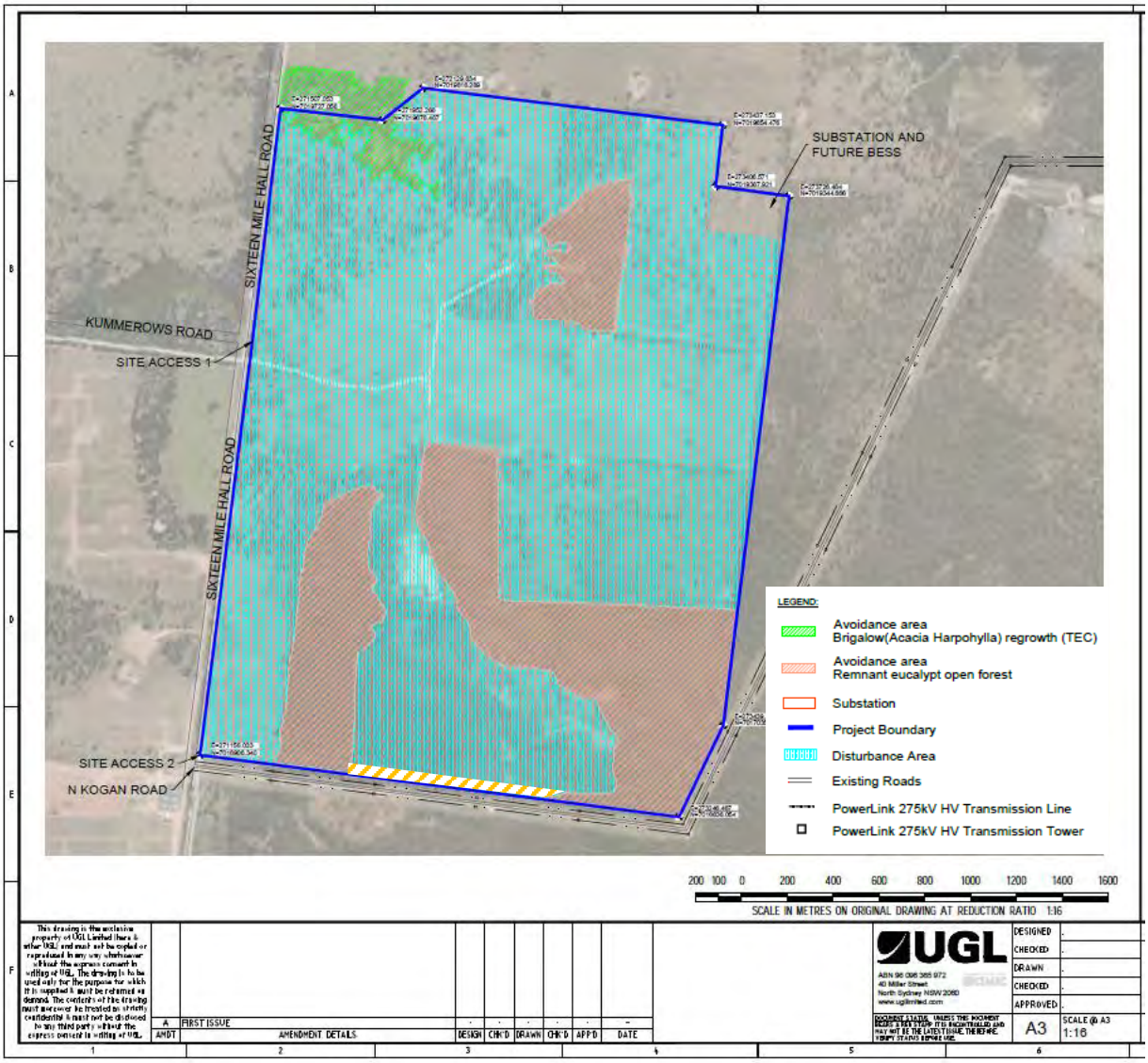


Figure 1-3 Project Area and Proposed action Layout

2. LEGISLATIVE AND POLICY CONTEXT

This MNES assessment has been undertaken in consideration of Commonwealth, State and Local regulatory frameworks and associated legislation relevant to the regulation of biodiversity features that pertain to the Project Area. Table 2-1 summarises legislation and polices that are relevant to this Project.

Table 2-1 Biodiversity Legislation and Policies

Act / Policy	Administering Authority	Purpose
Commonwealth Legislation		
EPBC Act	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	The EPBC Act provides a framework for the protection of MNES: ■ World heritage properties; ■ National heritage place; ■ Wetlands of international importance; ■ Threatened species and ecological communities; ■ Listed migratory species; ■ Commonwealth marine areas; ■ The Great Barrier Reef Marine Park; ■ Nuclear Actions (including Uranium mines); and ■ A water resource, in relation to coal seam gas development and large coal mining development.
EPBC Act Environmental Offsets Policy 2012	DCCEEW	This policy applies where a significant residual impact on MNES is expected to occur because of a proposed action. The policy provides guidance on the role of offsets and when a proposed offset is considered suitable.
Queensland and Local Government Legislation		
Planning Act 2016 (Planning Act)	Western Downs Regional Council State Assessment and Referral Agency	The Project has obtained approval under the *Planning Act 2016* for a Material Change of Use to establish a public utility (solar farm) The Project was initially assessed under the repealed *Sustainable Planning Act 2009* on 21 September 2017. The initial Development Permit approved the Project Area across Lot 2 on RP117442 and Lots 1, 3 and 4 on RP176346. The following changes have been made to the approved Development Permit. ■ 28 September 2021 – change application to remove Lots 1, 3 and 4 from the approval; and ■ 10 May 2022 – extension application to extend the currency period of the Development Permit to 7 November 2026. ■ 15 December 2022 – minor change application to allow staging of a separate battery energy storage system (BESS). It is noted that the BESS is a separate action and is not considered as part of this MNES Impact Assessment.
Planning Act *2016* and *Vegetation Management Act 1999* (VM Act	State Assessment and Referral Agency Department of Resources	A native vegetation clearing permit is required if the proposal is to be clearing any vegetation that's classified as Category B as per the VM Act. There is mapped Category B (remnant) vegetation within the Project Area. Approval to clear native vegetation is included in the Development Permit. The Technical Agency Response (Vegetation) Plan (TARP) SDA- 0717-040730 outlines the areas of vegetation approved to be disturbed. This approval provides for the retention of all

Act / Policy	Administering Authority	Purpose
		mapped Category B (remnant) vegetation as defined under the VM Act.
Nature Conservation Act 1992	Department of Environment and Science (DES)	The NC Act regulates impacts on plants and animals through the protected plants framework and species management program requirements. The relevant approvals that may be required under the NC Act include an exempt clearing notification or protected plants permit for clearing endangered, vulnerable, or near-threatened plants listed under the NC Act. The Project Area is not located within the high-risk trigger area for protected plants, pursuant to the NC Act, so no further flora surveys, exempt clearing notifications or clearing permits are required. Restrictions apply to impacts animal breeding places, with a permit may be required to enable certain intrusive activities that may impact on animal breeding places which is separate to the development application. A 'High Impact' Species Management Program (SMP) is required to be submitted to DES for approval if it has been identified that there are habitats of species that are considered high risk. A 'Low Impact' SMP is required from DES in order to authorise interference with all animal breeding places for 'Least concern' animals.

3. ASSESSMENT METHODOLOGY

3.1 Overview

This section outlines the methodology implemented to identify ecological values pertaining to MNES in the Project Area, inform avoidance measures, and assess likely impacts so that appropriate avoidance and mitigation measures can be determined and proposed as part of the assessment of significance.

The assessment consisted of a desktop review to identify values that may be present in the Project Area (including a 10 km buffer). The desktop review was then used to guide development of field survey sampling techniques and then was followed by a field survey program that collected data to describe on-ground conditions. This information was used to assess the ecological values to be considered as part of an impact assessment associated with the proposed action.

3.2 Desktop Review

Numerous desktop sources were reviewed to identify ecological values that may occur within the Project Area. The databases and other sources considered included the 28 South Ecological Assessment Report completed in 2018, and various open State, Federal and public information sources; these are listed in Table 3-1. A search area containing the Project Area and a minimum of a 10 km buffer was used for database searches.

The Project Area is a large irregular shaped polygon, so a bounding rectangle was used (and buffered) for database searches requiring coordinate inputs. As a result, records may be further than 10 km from the Project Area. The Protected Matters Search Tool (PMST) and WildNet database (WN) results were crossed checked using Atlas of Living Australia (ALA) database locations of records in the context of the actual Project Area boundary.

The desktop review was used to produce a preliminary Likelihood of Occurrence analysis for significant species, as detailed in Appendix A.

This preliminary Likelihood of Occurrence analysis informed the targeted survey approach and field program, specifically as it relates to listed threatened species. The preliminary Likelihood of Occurrence was refined to produce a final Likelihood of Occurrence (Appendix A) based on field verified data from targeted field surveys and availability of habitat present throughout the Project Area. This provides information on species “Known”, ‘Likely”, or “Potential” to occur within the Project Area, based on species records, the availably of suitable habitat (e.g. breeding, roosting, foraging, dispersal) and targeted field survey results.

Table 3-1 Data Sources for Desktop Analysis

Information Source	Name	Data Description
DCCEEW	Protected Matters Search Tool (PMST)	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 B). The PMST is available as Appendix C. Search Area: Proposed action Boundary shapefile (with a 10 km buffer around this area drawn in the PMST interactive search map).
Queensland Government	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 *Vegetation Management Act 1999* (VM Act).
Queensland Government	Matters of State Environmental Significance (MSES) version 6.13 mapping	This product maps areas of MSES as defined under the Qld State Planning Policy.
Queensland Government	Queensland Globe	A Google Earth based product that allows viewing of spatial data and imagery covering Queensland.
DES	Wildlife Online	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: Lots comprising the Project Area
ala.org.au	Atlas of Living Australia (ALA)	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 Project 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 ■ Preferred and general species habitat The conservation advice documents are particularly important for assessing TECs found in field surveys, against the listed TEC guidelines.
DCCEEW	National Flying-fox Monitoring Viewer	Online tool that maps flying-fox camps across Australia and reports on observed numbers of each species present in each camp across relevant monitoring years.
28 South	Ecological Assessment Report – Proposed Western Downs Solar Farm Hopeland (2017)	The Ecological Assessment Report written by 28 South regarding Hopeland solar farm (2017) was consulted as it provided background information about the ecological values of the site. The report delineated data from a field survey effort of the site in 2017. The survey involved; ■ fauna habitat assessments, ■ vegetation mapping and flora surveys, ■ fauna surveys The report is provided in Appendix E, with the key findings from this assessment regarding MNES, including: ■ No direct observations of any listed threatened species or communities;

Information Source	Name	Data Description
		■ The majority of the site contains habitat in a modified or degraded condition, with the exception of the areas of remnant open eucalypt forest in the south and north of the Project Area; ■ Given the condition of the habitats on the Project Area, this assessment considered it unlikely that any listed threatened species would rely on the habitat in the Project Area for core functions of foraging and breeding. ■ The remnant vegetation in the south of the Project Area provided a higher quality habitat with a good vegetative strata and complexity expected from remnant vegetation; however, these areas are thin and suffering edge impacts from quarrying and grazing. Given these findings the previous ecology survey completed by 28 South concluded that the Project is unlikely to result in a significant impact to MNES.

3.3 Field Surveys

3.3.1 Survey Techniques and Effort

Field surveys were undertaken within the Project Area in May 2023. This provides adequate representative sampling across Project Area to describe the ecological values relative the occurrence of MNES flora and fauna species, and their potential habitats.

Two ERM ecologists undertook a four-day field assessment of the Project Area from 22nd May to 25th May 2023, with a total of 80 person hours on the ground. This survey involved vegetation and habitat assessments to identify and classify areas of potential habitat for MNES species and communities, and a suite of targeted threatened species surveys designed to detect presence of these species.

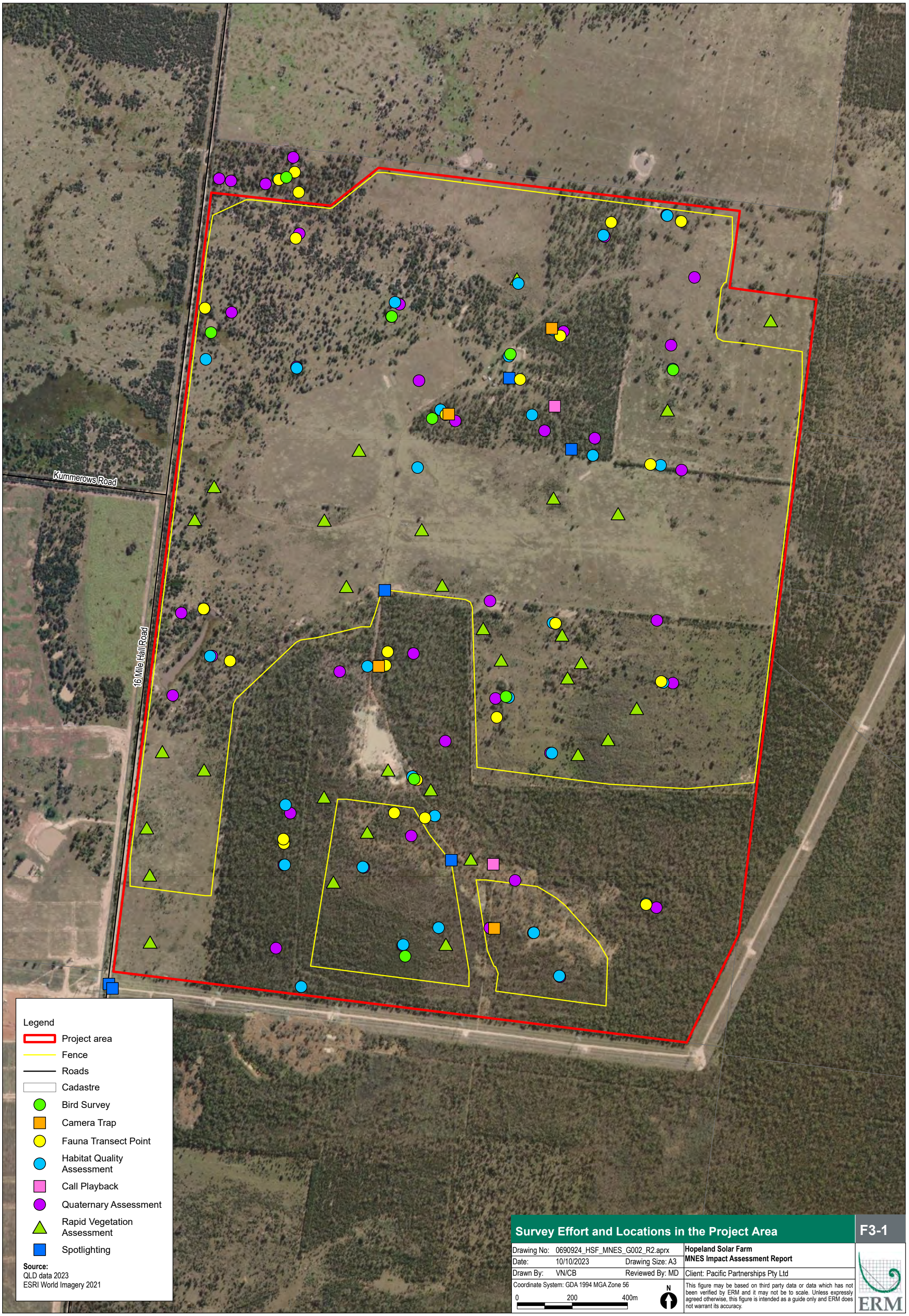
The purpose of the field surveys was to identify and describe the ecological values in the Project Area, to inform the assessment of ecological impacts of the proposed action. The methodology adopted for the field studies was based on Commonwealth survey guidelines, and focused on describing the vegetation communities present, flora and fauna habitats and their conditions, completing targeted surveys for listed threatened species, particularly those species and fauna groups vulnerable to solar farm impacts. Table 3-2 summarises the techniques used, and the number of surveys completed. The locations of surveys completed within the Project Area are displayed in Figure 3-1.

Field surveys were undertaken across the Project Area, including at proposed areas of disturbance and adjacent areas that will be avoided. This included areas subject to potential direct and indirect impacts. The ecological findings that resulted from the May 2023 field surveys (together with the information obtained from desktop investigations), provide a robust description of the ecological values of the Project Area.

Habitat mapping was prepared for those listed species known, likely or with potential to occur to inform impact assessments. Habitat mapping was produced based on suitable habitat outlined for each species in the Project Area, identified from desktop analysis and verified throughout the field survey periods. Habitat mapping for species concluded to be known, likely or having potential to occur is presented in Section 4.

Table 3-2 Field Surveys Undertaken within the Project Area

Dates	Target	Techniques	Survey effort
22 – 35 May 2023	Vegetation and habitat assessment (including targeted threatened species surveys)	■ Review of vegetation community mapping and assessment of habitat distribution. ■ 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 ■ Targeted surveys for threatened species identified with potential to occur, as described in the likelihood of occurrence analysis (*Appendix A*), including targeted searches for birds, mammals, and reptiles.	■ 34 x habitat assessments ■ 40 x Quaternary vegetation assessments (Meanders were undertaken for threatened flora species during Quaternary assessments) ■ 32 x Rapid Vegetation assessments ■ 10 x targeted species searches ■ 15 x Koala Spot Assessment Technique (SAT) surveys
	TEC Community field verification	■ Review of vegetation community mapping against the TEC thresholds and criterion ■ Verifying if areas mapped as potential TEC, conform to the TEC thresholds.	■ Undertaken at each potential TEC location in the Project Area
	Bird surveys	■ Targeted threatened bird species	■ Nine individual survey locations
	Camera traps	■ Undertaken for nocturnal species (particularly small mammals) in areas identified as potential habitat.	■ Four camera traps deployed for three nights
	Spotlighting	■ Spotlighting undertaken for nocturnal species (particularly arboreal mammals) in targeted areas (with hollow bearing trees and mature forests) and along tracks throughout the Project Area	■ Two ecologists surveying for three hour per night for three nights



Survey Effort and Locations in the Project Area

F3-1

Drawing No:	0690924_HSF_MNES_G002_R2.aprx		**Hopeland Solar Farm** **MNES Impact Assessment Report**
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

3.3.2 Vegetation and Habitat Assessments

Vegetation community assessments and habitat assessments were undertaken to describe the type and condition of the vegetation communities in the Project Area. The outcomes of the vegetation and habitat field assessments were used to inform a final Likelihood of Occurrence assessment of listed threatened species and threatened ecological communities or other ecological significance.

The assessments undertaken included:

- Representative sampling of Regional Ecosystems. This included quaternary assessments in accordance with Neldner *et al.* (2022);
- Assessments of water features (such as dams) and habitat values;
- Recording of topographical features; and
- Defining the barriers of both disturbed and undisturbed areas.
- The parameters measured during habitat assessments, critical to identify potential MNES, included;
- Context regarding landscape features (connectivity, proximity to water);
- Condition (weeds, evidence of disturbance, invasive species);
- Breeding and roosting habitat features (hollows, nest, 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).

3.3.3 Targeted Surveys for Listed Flora Species

Targeted surveys were undertaken during field surveys in May 2023 for listed flora species identified from desktop analysis. Six species were identified from the desktop assessment; however, only four were targeted for assessment and verification throughout the survey period due to the preliminary likelihood of occurrence assessment suggesting the other two species were “Unlikely” to occur within the Project Area, due to a lack of suitable habitat and lack of recent records within the Locality. The full Likelihood of Occurrence assessment can be found in Appendix A

Species subsequently targeted throughout the field surveys were:

- Winged Peppercress (*Lepidium monoplocoides)*
- Bluegrass (*Dichanthium setosum)*
- Austral Toadflax (*Thesium australe)*
- Queensland white gum (*Eucalyptus argophloia)*

Survey effort for each species were assessed against the survey guidelines outlined in Table 3-3. These species were targeted based on the desktop identification (through PMST and WN searches) and field validated Likelihood of Occurrence assessment.

Targeted surveys for threatened flora identified with “Potential” to occur in the Project Area were undertaken at the same location as vegetation and habitat assessments. The survey locations are shown in Figure 3-1.

Table 3-3 Flora Survey Adequacy

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
Winged Peppercress (*Lepidium monoplocoides)*	E, E	There are no specific survey guidelines for this species, however information regarding the species from SPRAT profiles was consulted before field surveys. Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DES, 2020) The Project Area is not within the high-risk trigger area for protected plants, as defined by the NC Act. Meander surveys to be conducted when and where the species is present. This is based om undertaking surveys during flowering (if applicable) and where habitat is available. Timed meander surveys must be undertaken to identify threatened plants. Habitat must be traversed and searched randomly until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.	■ 34 x habitat assessments ■ 40 x Quaternary vegetation assessments (Meanders were undertaken for threatened flora species during Quaternary assessments)	This species was not recorded during the survey period. The Project Area contained areas of Allocasuarina / Eucalyptus woodlands (suitable habitat); however ground cover was in poor condition due to extensive utilization of cattle grazing and other agricultural activities.
Bluegrass (*Dichanthium setosum*)	V, V	There are no specific survey guidelines for this species, however information regarding the species from SPRAT profiles was consulted before field surveys.	■ 34 x habitat assessments ■ 40 x Quaternary vegetation assessments (Meanders were undertaken for threatened flora species during Quaternary assessments)	This species was not recorded during the survey period. The grasslands observed within the Project Area were in poor condition due to

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
		Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DES, 2020). Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available. Timed meander searches must be undertaken to identify threatened or near threatened plants. Habitat must be traversed and searched randomly until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.		extensive cattle grazing and effects of drought.
Austral Toadflax (*Thesium australe)*	V, V	There are no specific survey guidelines for this species, however approved conservation advice and SPRAT profile was consulted before field surveys. Approved Conservation Advice for Thesium australe (Austral Toadflax) (DEWHAa, 2013). Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DES, 2020). Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during	■ 34 x habitat assessments ■ 40 x Quaternary vegetation assessments (Meanders were undertaken for threatened flora species during Quaternary assessments)	This species was not recorded during the survey period. The Project Area contained areas of remnant and regrowth eucalyptus woodlands, however due to cattle grazing and drought effects the ground layer condition was poor quality.

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
		flowering (if applicable) and where habitat is available. Timed meander searches must be undertaken to identify threatened or near threatened plants. Habitat must be traversed and searched randomly until no new plant species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.		
Queensland White Gum (*Eucalyptus argophloia)*	V, CE	There are no specific survey guidelines for this species, however information such as it approved conservation advice and SPRAT profile was consulted before field surveys. Approved Conservation Advice for Eucalyptus argophloia (Queensland White Gum) (DEWHAa, 2008). Flora Survey Guidelines – Protected Plants NC Act (Flora Survey Guidelines) (DES, 2020). Meander surveys to be conducted when and where the species is present. This is based on undertaking surveys during flowering (if applicable) and where habitat is available. Timed meander searches must be undertaken to identify threatened or near threatened plants. Habitat must be traversed and searched randomly until no new plant	■ 34 x habitat assessments ■ 40 x Quaternary vegetation assessments (Meanders were undertaken for threatened flora species during Quaternary assessments)	This species was not observed during the survey period. The Project Area contained areas of eucalyptus woodland; however this species was not seen present throughout the area.

Target Species	Status (EPBC and NC Act)	Survey Guidelines and Requirements	Sampling Technique / Effort	Comment on Survey Adequacy
		species has been recorded for 30 minutes, or when the entire site/habitat has been surveyed.		

3.3.4 Targeted Surveys for Listed Fauna Species

The Protected Matters Search Tool report identified thirty-eight species; following the preliminary Likelihood of Occurrence assessment 24 fauna species that were identified as potentially occurring within the Project Area and were targeted for assessment and verification throughout the May 2023 survey effort. Results from fieldwork subsequently informed a final Likelihood of Occurrence assessment, whereby further assessment is made on species presence due to observations within the Project Area (Figure 1-1)

Targeted surveys were undertaken during field survey events in May 2023 for listed fauna species identified as “Potential”, “Likely” or “Known” from the desktop analysis. The species identified and subsequently targeted throughout the field surveys are illustrated in Table 3-4. Survey effort for each species were assessed against the survey guidelines outlined in Table 3-5. These species were targeted based on the desktop identification (through PMST and WN searches) and field validated Likelihood of Occurrence assessment.

Table 3-4 Listed Fauna Species Targeted

Common name	Scientific name
Birds	
Red Goshawk	*Erythrotriorchis radiatus*
South-Eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami lathami*
Painted Honeyeater	*Grantiella picta*
Diamond Firetail	*Stagonopleura guttata*
Brown Treecreeper (south-eastern)	*Climacteris picumnus victoriae*
Southern Whiteface	*Aphelocephala leucopsis*
Squatter Pigeon	*Geophaps scripta scripta*
White-Throated Needletail	*Hirundapus caudacutus*
Grey Falcon	*Falco hypoleucos*
Black-Breasted Button-Quail	*Turnix melanogaster*
Birds (Migratory)	
Rufous Fantail	*Rhipidura rufifrons*
Satin Flycatcher	*Myiagra cyanoleuca*
Fork-Tailed Swift	*Apus pacificus*
Mammals	
Koala	*Phascolarctos cinereus*
Greater Glider (southern and central)	*Petauroides volans*
Corben’s Long-Eared Bat (south-eastern long-eared bat)	*Nyctophilus corbeni*
Yellow-Bellied Glider (south-eastern)	*Petaurus australis australis*
Grey-Headed Flying Fox	*Pteropus poliocephalus*
Reptiles and Snails	
Grey Snake	*Hemiaspis damelii*
Dulacca Woodland Snail	*Adclarkia dulacca*
Brigalow Wood Snail	*Adclarkia cameroni*
Dunmall’s Snake	*Furina dunmalli*

Common name	Scientific name
Yakka Skink	*Egernia rugosa*
Adorned Delma, Collared Delma	*Delma torquate*

The following information summaries the main techniques targeting listed threatened mammals, avifauna and reptiles within the Project Area, with detail on the listed species targeted during field surveys, their survey guideline requirements, and demonstration that the survey effort has met guideline requirements, in included in Table 3-5.

3.3.4.1 Terrestrial and Arboreal Mammals

The likelihood of occurrence assessment identified the koala, greater glider, Corben's long-eared bat (south-eastern long-eared bat), yellow-bellied glider, and grey-headed flying fox as having potential to occur within the Project Area. A targeted survey approach has been implemented to assess the presence of these species within the Project Area.

Scat and scratch marks searches were undertaken for koala as per the *Survey Guidelines for Australia's Threatened Mammals* (DSEWPC), 2011) (as listed under the EPBC Act). Scat searches are not a specific survey guideline recommendation for locating greater gliders. However, have been listed in the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* to locate cryptic and nocturnal species. Other relevant guidelines and their recommended survey method and extent for the koala are as follows:

- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (Eyre et al., 2018):
  - Requires two-person 30-minute spotlight searches of 100 x 100 survey site: and
  - Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 quadrats of the survey site.
- Relevant guidelines and requirements specific to the koala also include:
- *DCCEEW referral guidance for the endangered koala* (DCCEEW, 2022):
  - Strip transects which involve diurnal distance sampling and density searches;
  - Nocturnal spotlighting for smaller sites to determine presence and density; and
  - Faecal pellet (scat) surveys – Spot Assessment Technique, which involves searching for scats for 2 minutes (or until the first scat is detected) within a 1 m radius of the base of a central tree and its nearest 29 neighbouring trees. All trees must be at least 10 cm diameter at breast height (dbh), and, if available, the central tree should be a species considered to be important for koalas.

Spotlighting was undertaken per guideline requirements focusing on arboreal species, particularly targeting Koala, Greater Glider and Yellow-bellied Glider. Two ecologists spotlighted by foot and slow vehicle within suitable habitat and vegetation communities across three nights (total of 18 person hours spotlighting). Large and small tracts of vegetation were targeted for spotlight surveys, and sampling occurring within linear fragments of vegetation associated with roadside vegetation to the west of the Project Area, to adequately sample the vegetation communities and habitats that occur across the Project Area

3.3.4.2 Reptiles and Snails

Searches for listed reptiles and snails identified in the desktop searches, were also undertaken in accordance with the following guidelines:

- *Survey guidelines for Australia's threatened reptiles* (DSEWPC, 2012); and

- *EPBC Act – Draft Referral guidelines for the nationally listed Brigalow Belt Reptiles* (DSEWPC, 2012).
- Targeted species survey guidelines: grey snake (Hemiaspis damelii) (Rowland, J., 2012).
- *Yakka skink, Egernia rugosa. Targeted species survey guidelines (Ferguson, 2014)*

Searches for reptiles and snails involved microhabitat identification and searches for signs of the species. This occurred throughout the Project Area in areas identified as potential habitat for the two listed snail species and four listed reptiles flagged in desktop searches. Other searches involved active searches in suitable habitat areas, including overturning of rocks, searching of barks and logs, and disturbance of leaf litter.

3.3.4.3 Birds

Targeted bird surveys were utilized during the survey effort to identify avian species within the Project Area. The presence of any bird's species within the Project Area can be established via direct sighting or identification through vocalisation made by a specific species that is heard by the surveyor. The detection method will change in accordance with the habitat that the targeted bird survey is being completed in, for example, identification of bird species in a dense woodland will be primarily through species vocalisation (calls), whilst in more open habitats direct observation will provide better identification of species. Indirect evidence of species presence can additionally be affirmed via distinctive droppings, regurgitated pellets, feathers, tracks, and nests.

When searching for specific species during targeted bird surveys, the amount of time spent searching quantifies into person hours, equating to survey effort. Due to the nature of birds, they can vary in distribution and abundance over time and seasons, therefore, to maximise detection survey effort should be completed at the time of day / night that the species is most active.

Targeted bird surveys additionally put extra survey effort into searching preferred habitat, in the form of particular resources or specific habitat features that the bird species utilises. Habitat features that are sort after could include fruiting trees, water sources, or hollow bearing trees. The absence or local extinction of a species cannot be completely regarded unless exhaustive survey effort has been replicated across the Project Area, therefore, if a species is not directly observed or identified through vocalisation the species should not be recorded as absent rather be not detected. Targeted searches focused on listed bird species which potential to occur within the Project Area.

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

- *Survey Guidelines for Australia's threatened birds* (DEWHA, 2011):

The bird surveys were conducted in accordance with the time and effort required by the survey guideline requirements.

Point Surveys

Point surveys were conducted to target diurnal woodland and riparian bird species. Two ecologists during each survey period traversed suitable woodland and riparian habitats and conducted 20-minute timed surveys for all bird species present in the area.

Waterbody surveys

Waterbody surveys were conducted to target the aquatic and woodland species utilising the waterbody. Observations were made from a stationary position, and birds were identified by call detection and visual observations. The Project Area contained several artificial waterbodies, likely to act as important water sources in the landscape, particularly during dry conditions.

Birds of Prey Surveys

Birds of prey surveys were undertaken to target the listed threatened species such as the red goshawk (*Erythrotriorchis radiatus)* and grey falcon *(Falco hypoleucos),* and generally occurring birds of prey. Birds of prey surveys were undertaken at vantage points (i.e., extensively cleared areas) at mid-morning when birds of prey become increasingly active.

Table 3-5 Fauna Survey Adequacy

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
Birds				
Red goshawk (*Erythrotriorchis radiatus*)	E, V	Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA, 2017). Searches were undertaken for the Red goshawk's characteristic nests within patches of the tallest forest. In sub-coastal woodland, these areas can initially be identified from aerial photos and then searched during follow-up ground surveys. Further inland requires ground searches along riverbanks for nests within the tallest trees. Driving slowly through tropical woodland tracks and scanning groups of tall trees for nests can also be effective. In eastern Australia's ranges, searching for nests is more difficult but soaring birds can sometimes be located from vantage points such as mountain tops. Some success has been had surveying this species using call playbacks during the breeding season. Requirements: 80 hours / 10 days	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	The broad habitat groups within the Project Area are predominantly eucalypt open forest and regrowth of acacia (including brigalow species) and eucalyptus species. Surveys were conducted amongst the entire site including all habitats; however, more intense searchers were done within suitable habitat that was present with the Project Area. During the survey effort no individuals were observed, or any nest spotted. *Survey effort sufficient considering the lack of preferred habitat in the form of tall emergent nest trees and preferred ecotone habitats.*
South-eastern glossy black cockatoo *(Calyptorhynchus lathami lathami)*	V, V	*Targeted species survey guidelines: Glossy black-cockatoo (Calyptorhynchus lathami)* (Hourigan, C., 2012) Diurnal bird surveys are to be conducted via on foot walking transects through the Project Area, particularly in areas (but not restricted to) with *Allocasuarina* tree species, water bodies suitable for drinking sites, and large hollow bearing eucalyptus (during breeding seasons).	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations ■ Five ort search transects	Surveys were completed throughout the Project Area for the South-eastern glossy black cockatoo, completing 9 individual targeted species survey locations and undergoing 5 ort search transects. These surveys were completed in suitable habitat typical of the species, within areas that contained *Allocasuarina* tree species, water bodies suitable for drinking sites, and eucalypts open forest. During the survey

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		Surveys should be conducted within dawn and dusk hours. Presence of the species can be reliably indicated from foraging signs. Orts can be detected through searches or walking transects through areas with *Allocasuarina* trees. During the breeding season, areas with large hollow bearing trees should also be surveyed for the presence of nesting birds within the Project Area. Nest may be found by the following breeding birds from water points or by listening for the calls of begging females and young. Diurnal bird surveys minimum effort 5 hours over 1 day. Searches for foraging and nesting signs minimum effort 20 hours over 4 days.		effort no individuals were observed, nor were any chewed orts identified. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area. Survey effort also included searches for suitable hollow bearing trees and evidence of feeding (orts).*
Painted honeyeater *(Grantiella picta)*	V, V	*Targeted species survey guidelines: Painted honeyeater (Grantiella picta)* (Rowland, J., 2012) Area searches (during breeding season) involve systematically searching for birds and signs of their presence (e.g. nesting habitat), and listening for their calls, throughout the Project Area (DEWHA, 2010). Surveys for this species should be conducted on foot and targeted foraging and breeding habitat, which includes woodlands where mistletoes are abundant, and, when they are in fruit (Watson, 2012). There is currently no published information on detection probabilities for painted honeyeater. However, the recommended level of effort below is based on published data from systematic surveys of the species (Oliver et al. 2003; Barea	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	Surveys were conducted in habitats that are typical of the species, with particular focus within habitats that had mistletoe as a foraging resource. During the survey effort no individuals were observed. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		and Watson 2007). This suggest effort may be provided reasonable opportunities to detect painted honeyeater, during optimal survey conditions, if suitable habitat is present within the Project Area. Important to note that detectability of this species in the breeding season differs from the non-breeding season. In the non-breeding season, birds show up in random areas outside core habitat ranges (usually in association with fruiting mistletoes) either singly or in small groups. Areas searches minimum effort is 4 hours over 4 days.		
Diamond firetail *(Stagonopleura guttata)*	V, V	There are no targeted survey guidelines for this species. This species normally occurs within eucalypt, acacia or casuarina woodlands, open forest, and other timbered habitats, including farmland and grassland with scattered trees. These habitat types should be targeted throughout survey effort for the Project Area.	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	Surveys for the species were undertaken in eucalypt, acacia or casuarina woodlands, open forest, and other timbered habitats, including farmland and grassland. No individuals were observed during the survey effort. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
Brown treecreeper (south-eastern) *(Climacteris picumnus victorae)*	V, V	There are no targeted survey guidelines for this species. The species commonly occurs in dry open eucalypt forest and woodlands. Optimal habitat for the species is an area that has experienced some form of disturbance, that restricts that ground layer from becoming too dense and uniform. Surveys should be diurnal, with particular focus on the ground layer is dry open eucalypt forest and woodlands habitats that have seen some form of disturbance.	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	Surveys for the brown treecreeper (south-eastern) were conducted in habitat that is typical of the species, eucalypt open forest and disturbed habitat (farmland). The survey effort saw no observation of the species within the Project Area. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Southern whiteface *(Aphelocephala leucopsis)*	V, V	There are no targeted survey guidelines for this species. The species are found within a large range of open woodlands and shrublands where there is an understory of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. The species is almost exclusively on the ground. Survey effort should be focused upon habitat that contains habitat alike above, and be diurnal, to ensure adequate time is allowed to detect presence of the species.	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	Surveys were conducted in areas most utilized by the species, open woodlands, or forest. During the survey period no individuals were observed or identified. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Squatter pigeon *(Geophaps scripta scripta)*	V, 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.	■ 34 x habitat assessments and targeted bird surveys ■ and targeted bird surveys ■ Nine individual targeted species survey locations	Surveys were completed in habitat types that are used by the squatter pigeon, primarily disturbed farmland. Surveys did not observe any individuals during the survey period. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
White-throated needletail *(Hirundapus caudactus)*	V, V	*Species Profile and Threats Database: Hirundapus caudacutus – White throated needletail* (DCCEEW, 2019).	■ 34 x habitat assessments and targeted bird surveys	The May 2023 survey effort completed targeted species searches at each survey location. No individuals were observed within the survey period.

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		There are no targeted survey guidelines for this specie however DCCEEW have advice of surveying efforts. The species occurs at great elevations, being primarily aerial, when flying at lower altitudes are readily detectable. Systematic surveys are difficult due to the species mobility and ability to cover immense distances in a day. Any surveys must be conducted between October and April in northern and eastern Australia, and between December and March In south-eastern Australia.	■ Nine individual targeted species survey locations	*The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Grey falcon *(Falco hypoleucos)*	V, V	There are no targeted survey guidelines for this species. This species is rare with a very large distribution. They normally are found in treeless areas except along watercourses and often are found over grasslands (Venn, 2003). Nests are located in tall eucalypts close to watercourses	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	The broad habitat groups within the Project Area are predominantly eucalypt open forest and regrowth of acacia (including brigalow species) and eucalyptus species. Surveys were conducted amongst the entire site including all habitats; however, more intense searches were done within suitable habitat present with the Project Area. During the survey effort no individuals were observed. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Black-breasted button-quail *(Turnix melanogaster)*	V, 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. Also search for platelets, although not conclusive unless birds also sighted. Usually detected by observation of birds that flush or walk away after being disturbed. May also be detected by their scratching when foraging in the	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations	Surveys were conducted on foot throughout habitat commonly used by the species. After 34 habitat assessments and 9 individual targeted species searches throughout the Project Area no individuals were observed. *The May 2023 survey effort meets required 15 hours over 3 days survey effort.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		leaf litter. Platelets may indicate presence of this taxon but is not conclusive as these are also made by other button quail (M. Mathieson & G. Smith, pers. comm.). Call playback has been used to survey for black-breasted button quail, but the effectiveness of this method is uncertain. Land-based area searches effort should consist of 15 hours over 3 days.		
Birds (Migratory)				
Rufous fantail *(Rhipidura rufifrons)*	-, MI	*Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) No survey guidelines specific to the Rufous fantail – however it is recommended that surveys to be conducted in breeding habitat is an area survey, preferably a two-hectare survey in 20 minutes, over sufficient survey plots to estimate a density, and hence the population size across the proposed action area.	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations Nine individual targeted species survey locations	The Project Area had limited suitable breeding habitat typical of the species. Surveys were still conducted in areas that presented woodland habitat; however, no individuals were observed during the survey effort. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Satin flycatcher *(Myiagra cyanoleuca)*	SL, MI	*Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015) There are no specific guidelines for the Satin flycatcher – however it is recommended that surveys to be conducted in breeding habitat is an area survey, preferably a two-hectare survey in 20 minutes, over sufficient survey plots to estimate a density, and hence the population size across the proposed action area.	■ 34 x habitat assessments and targeted bird surveys ■ Nine individual targeted species survey locations Nine individual targeted species survey locations	The survey effort undertook 34 habitat assessments and 9 individual targeted species surveys to detect the species. Surveys were still conducted in areas that presented woodland habitat; however, no individuals were observed during the survey effort. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Fork-tailed swift *(Apus pacificus)*	SL, MI	*Draft referral guidelines for 14 birds listed as migratory species under the EPBC Act* (DoE, 2015)	■ 34 x habitat assessments and targeted bird surveys	Surveys that were conducted throughout the May survey period, searched within areas that were typical habitat of the species, alike

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		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.	■ Nine individual targeted species survey locations Nine individual targeted species survey locations	woodland areas. No individuals were observed during the survey period. *The survey effort meets the required survey guidelines through 34 habitat assessments and 9 individual targeted species surveys throughout the Project Area.*
Mammals				
Koala *(Phascolarctos cinereus)*	E, E	*Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (DES, 2018) Requires two-person, 30-minute spotlight searches of 100 x 100 m survey site. 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 100 m 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 which involves looking at food trees for presence of koala scats.	■ 34 x habitat assessments and scat/scratch mark searches ■ 15 x Koala Spot Assessment Technique (SAT) surveys ■ Two ecologists surveying for three hours per night for three nights	During the survey effort 15 separate SAT searches were conducted to indicate species presence. Habitat assessments additionally searched for scats and scratches from koalas during the survey effort. No individuals were spotted during any habitat assessments, SAT survey or spotlighting. Neither were any scat nor scratched on trees observed throughout the Project Area. *Guideline requirements are met through the survey effort.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
Greater glider (southern and central) *(Petauroides Volans)*	E, E	*Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (DES, 2018)* Requires two 30-person 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.	■ 34 x habitat assessments ■ Two ecologists surveying for three hours per night for three nights	Diurnal searches during habitat assessments were conducted to find evidence of species presence. Spotlighting was additionally conducted to search for individuals. No individuals were spotted during spotlighting effort, nor were any signs of presence found during habitat assessments, as habitat assessments illustrated the Project Area lacks large hollow bearing trees. *Survey guidelines have been met from the survey effort in determining species presence.*
Corben's long-eared bat (south-eastern long-eared bat) *(Nyctophilus corbeni)*	V, V	*Survey guidelines for Australia's threatened bats* (DEWHA, 2010) The eastern greater long-eared bat should be surveyed using capture techniques. Passive acoustic detection. Bat detectors can be used to identify areas used by long-eared bats, even if they cannot be identified to species level. If *Nyctophilus spp.* are detected acoustic detection can then be followed up with an appropriate level of trapping. Trapping. Mist nets and harp traps should be placed in woodland, mallee and forest, given that the species forages below the tree canopy, often to ground level. Equipment	■ 34 x habitat assessments	*Survey completed in May 2023, outside the optimal time for detection of the species due to decreased bat activity in cooler months. The precautionary principle has been applied and areas of potential Corben's long-eared bat has been mapped within the Project Area and considered in the impact assessment.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		should be placed both in open fly-ways and within cluttered vegetation.		
Yellow-bellied glider (south-eastern) *(Petaurus australis Australia)*	V, V	*Survey guidelines for Australia's threatened mammals:* For Areas up to 5 ha in size (which represents 10% of a typical foraging range) of suitable habitat the following is recommended: Identify key Eucalypt species such as *E. resinifera* and *E grandis*, diurnal searches for hollow bearing trees, stage watching at potential den sites, call playback; and spotlighting along transects by foot or vehicle. 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.	■ 34 x habitat assessments ■ Two ecologists surveying for three hours per night for three nights	The survey effort in May 2023 saw searched for signs of presence, scat and feeding mark scratches, during each diurnal habitat assessment. Spotlighting was also undertaken over three nights, also conducting call play back for the species. No individuals were spotted or heard during surveys, nor were any signs of presence found (scats or feeding mark scratches). *Survey requirements have been met resulting from the May 2023 survey effort.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
Grey-headed flying fox *(Pteropus poliocephalus)*	V, V	Survey guidelines for Australia's threatened bats (DEWHA, 2010) The grey-headed flying fox occupies most areas in their distribution in highly irregular patterns, and therefore surveys based on animal sightings are unlikely to be reliable. A more effective survey method is to search appropriate databases and other sources for the locations of camps, and to conduct vegetation surveys to identify feeding habitat. A combination of survey techniques is recommended; daytime field surveys for camps, surveys of vegetation communities and food plants, and nighttime surveys (walking transects (100 m apart) looking for feeding and flying bats. Smell can also provide a sign of their presence. Alternative methods may include night time audio recordings made at selected sites or fruiting food plants within the .)	■ 34 x habitat assessments ■ Two ecologists surveying for three hours per night for three nights	The May 2023 surveys conducted recommended targeted surveys to detect the species. Habitat assessments were undertaken across the Project Area, searching for vegetation and food plants that are typical of the species. Spotlighting was conducted to spot individuals during foraging periods, and multiple camera traps were also deployed with bait to detect the species. No individuals were spotted or recorded during the field survey effort. *Survey requirements are met from May 2023 survey effort.*
Reptiles & Snails				
Grey snake *(Hemiaspis damelii)*	E, E	*Targeted species survey guidelines: grey snake (Hemiaspis damelii)* (Rowland, J., 2012) The recommended survey guidelines promote passive nocturnal searches and vehicle transects. Hemiaspis damelii is most likely to be encountered by searching around suitable cracking clay and gilgai habitat during optimal conditions, using headtorches and spotlights with a bright focussed beam. Suitable microhabitat features should be thoroughly scanned such as fallen logs, vegetation in and around water bodies (wetlands), soil cracks and rocks (DSEWPaC 2011). Nocturnal vehicle transects should be conducted on roads and well-maintained tracks with limited vegetation and debris, and on warm humid nights where roads/tracks bisect suitable habitat. Transects	■ 34 x habitat assessments and targeted reptile searches ■ 10 x targeted species searches ■ Two ecologists surveying for three hours per night for three nights	The May 2023 survey effort conducted field surveys that aligned with recommended survey methods. Habitat for the species was assessed and recorded during habitat assessments across the Project Area. 10 targeted species searches were conducted, and spotlighting took place to detect the species. No individuals were spotted during the survey effort. *Minimum survey effort has been met through May 2023 survey effort, via spotlighting over three nights, 10 targeted species surveys and 34 habitat assessments.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
		should be repeated multiple times over the same section(s) of road, where possible. Minimum effort for Passive nocturnal search 60 minutes per plot (2 plots per 5 ha), two 30 person-minute searches, 2 surveys Minimum effort for nocturnal vehicle transects ~250 km, spread over 2 nights, 2 surveys		
Dulacca woodland snail *(Adclarkia dulacca)*	E, E	There are no targeted survey guidelines for this species. The Dulacca woodland snail lives under rocks and timber. The Dulacca woodland snail is of limited mobility. However, it will move between areas of suitable microhabitat given the right environmental conditions, e.g. from one pile of timber to another.	■ 34 x habitat assessments and targeted reptile searches ■ 10 x targeted species searches	Surveys were conducted on foot throughout habitat commonly used by the species. After 34 habitat assessments and 10 individual targeted species searches throughout the Project Area no individuals were observed. *Survey effort is considered adequate in searching for the species.*
Brigalow wood snail *(Adclarkia cameroni)*	V, E	There are no targeted survey guidelines for this species. The brigalow woodland snail lives under logs (Stanisic et al., 2010), where it likely feeds on fungi, algae and other detritus, thereby recycling nutrients into the soil. The brigalow woodland snail is of very limited mobility. Under favourable conditions, such as rain, this species can move between suitable areas of microhabitat, but the extent to which this occurs will be limited by the spatial arrangement of habitat patches.	■ 34 x habitat assessments and targeted reptile searches ■ 10 x targeted species searches	Surveys were conducted on foot throughout habitat commonly used by the species. After 34 habitat assessments and 10 individual targeted species searches throughout the Project Area no individuals were observed. *Survey effort is considered adequate in searching for the species.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
Dunmall's snake *(Furina dunmalli)*	V, V	*Survey guidelines for Australia's threatened reptiles:* This species has no targeted survey guidelines. Recommended methods are active searching of sheltering sites (under large objects on the ground such as rocks, logs or human-made debris), pitfall trapping, or road driving at night (particularly after wet weather). However, all of these methods are likely to yield low returns Photo vouchers should be forwarded to the state fauna authority and appropriate state museum for positive identification and databasing of the record. A scale clip preserved in ethanol would also be of use as a genetic sample	■ 34 x habitat assessments and targeted reptile searches ■ 10 x targeted species searches	Surveys were conducted on foot throughout habitat commonly used by the species. After 34 habitat assessments and 10 individual targeted species searches throughout the Project Area no individuals were observed. *Survey effort is considered adequate in searching for the species.*
Yakka skink *(Egernia rugosa)*	V, V	*Survey guidelines for Australia's threatened reptiles,* Searching for burrow systems and communal defecation sites is the most reliable method of detection. The species can be confirmed by Elliott trapping around the burrows, by distant observation with binoculars or by shining a torch down the burrows at night. Burrows seem too often be in situations where excavation of the burrow system to locate the lizards is impractical. Potential records of the Yakka skink should be supported by a good quality colour photograph. Photo vouchers – including burrows (macro and microhabitat) and latrine sites – should be forwarded to the Queensland Museum for positive identification and databasing of the record. *Yakka skink, Egernia rugosa. Targeted species survey guidelines (Ferguson, 2014)*	■ 34 x habitat assessments and targeted reptile searches ■ 10 x targeted species searches	Surveys were conducted on foot throughout habitat commonly used by the species. After 34 habitat assessments and 10 individual targeted species searches throughout the Project Area no individuals were observed. *Survey effort is considered adequate in searching for the species.*

Target Species	Status (NC Act and EPBC)	Survey Guidelines and Requirements	Sampling Technique / Effort	Survey Adequacy
Collared delma *(Delma torquata)*	V, V	*Survey guidelines for Australia's threatened reptiles:* The recommended survey method for this species is one-off hand searches (including raking through leaf litter) in appropriate habitats, together with pitfall trapping during late spring to summer. The collared delma is similar in body shape and degree of limblessness to several burrowing skink species, but all lack the characteristic head markings of the collared delma.	■ 34 x habitat assessments ■ 10 x targeted species searches	Surveys were conducted across the Project Area in habitat that is typical of the species, alike under rocks, logs and in leaf litter. After 34 habitat assessments and 10 individual targeted species searches throughout the Project Area no individuals were observed. *Survey effort is considered adequate in searching for the species.*

3.3.5 Survey Conditions

Table 3-6 details the daily weather observations that were recorded at the Dalby Airport during the May 2023 field survey period (the Project Area is located approximately 60 km west of Dalby Airport).

Table 3-6 Weather Observations at Dalby Airport for May 2023 Survey Period

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max		Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C	mm	°C	%		km/hr	°C	%		km/hr
22/05/2023	0.8	20.6	0	10.6	65	SSW	4	20.1	26	SSE	13
23/05/2023	1.6	23.8	0	11.4	64	*SSE*	4	22.3	20	*SSE*	6
24/05/2023	1.5	24.5	0	13.4	54	*SSE*	2	23.4	19	*SSW*	6
25/05/2023	2.0	23.2	0	14.9	59	*NNE*	7	22.4	21	*SW*	11

Dir = wind direction
Spd = wind speed
RH = relative humidity
Source: Australian Government Bureau of Meteorology, www.bom.gov.au

3.4 Likelihood of Occurrence

A preliminary Likelihood of Occurrence assessment was undertaken using information gathered from desktop sources. Desktop sources identified 37 listed threatened species, 11 listed migratory species and five listed threatened ecological communities in the preliminary LoO, (i.e. PMST search) and NC Act that have previously been recorded or predicted to occur within a 10 km buffer of the Project Area. A final Likelihood of Occurrence (Appendix A) was refined from results of the field surveys, identifying 10 species as having the potential to occur within the Project Area. The PMST results are attached as Appendix C. The buffered area is from here on referred to as the locality. The 10 km buffer has been chosen as this is the standard buffer distance utilised and adopted for the EPBC Act referral process.

The Likelihood of Occurrence approach refines the desktop generated list using site-specific information and specific-species habitat information obtained from field surveys. Desktop sources are indicative only and likelihood rankings, particularly regarding the presence of preferred habitat, are conservative. The assessment ranks the likelihood of the species occurring within the Project 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 applied are outlined in Table 3-7.

According to the MNES terminology, suitable habitat are areas or a location which has 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 a population. Suitable 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.

Potential habitat for species is 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 foraging or dispersal) that is not restricted to that area. Habitat may be considered potential for a species, but not suitable, where there are some desired features but not all, and so a population may not be maintained; may have poor connectivity to known suitable 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, these were sourced from WN and/or ALA.

Table 3-7 Likelihood of Occurrence Criteria

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

1. *Habitat may be considered suitable, 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^2 buffer centred on the Project site (5km radius around the site).*

3.5 Habitat Mapping

Habitat for those listed threatened species "Known", "Likely" or "Potential" to occur have been mapped, based on ground-truthed vegetation communities and defined habitat preferences and conditions (as observed from field surveys) for species "Known" and "likely" to occur. Habitat maps were then used to inform quantification of impacts to habitats, to inform impact assessments. The vegetation communities used to underpin the broad habitat mapping for the listed threatened species and communities have been recorded in the Likelihood of Occurrence assessment found in Appendix A, informed by data obtained from desktop sources and field surveys (e.g. SPRAT and/or Conservation Advice where available, supplemented by other primary sources as required).

Vegetation and habitat mapping has been prepared based on the representative broad habitat groups that have been identified from fieldwork. Broad Habitat Types are described in Section 4.2. Mapped areas are reflective of observed conditions, with minor amendments as required as a result from field work.

Habitat mapping was prepared to reflect actual ground conditions (based on data collected from the May 2023 field observations) and using the criteria based on the breeding, foraging, roosting and dispersal requirements of threatened species identified as "Known", "Likely" or with "Potential" to occur in the Project Area, as detailed in the Likelihood of Occurrence assessment.

3.6 Impact Assessment

The significance of impacts to MNES are assessed in the impact assessment section against the *Significant Impact Guideline 1.1. – Matters of National Environmental Significance* (DoE, 2013), relevant to the applicable MNES and their EPBC Act conservation status. The impact assessment takes into account the controls and mitigation measure the proposed action will implement, assuming for the purpose of significant impact determination that those outlined Section 6 are implemented.

The impact assessments also consider whether habitat critical to the survival of a species occurs within the Project Area, and whether impacts to this defined aspect are significant. Habitat critical to the survival of a species can be defined as 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; or
- For the reintroduction of populations or recovery of the species or ecological community
- Such habitat may be, but not is 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. The impact assessment of MNES is outlined in Section 7, and detailed assessment against the SIG 1.1 (2013) is available as Appendix B.

3.7 Assumptions and Limitations

The field and desktop assessment undertaken provide an overview of the ecological values that exist within the Project Area. Surveys were undertaken throughout the Project Area to gain a general understanding of the types of species and habitat features that occur. Although a vast majority of the Project Area received survey effort, not all portions of the Project Area were able / were planned for surveying. The use of a combination of field survey data and desktop information is considered appropriate to identify areas on site as providing the highest probability of species detection, and potential key impacts for the current phase of the proposed action.

The absence of a species from a database list or observational studies does not necessarily confirm its complete historical or future absence from the Project Area. The lack of existing records from databases may indicate a low historic sampling effort in the region, as opposed to an absence of threatening processes and species. That said, given the project area and its surrounds are subject to coal seam gas mining exploration and production leases, it is likely that surveys have been conducted throughout the region. Nonetheless, to overcome these perceived limitations, the Likelihood of Occurrence assessment uses a precautionary approach and identifies species that have “Potential” to occur (considering habitat features conducive to their capacity to inhabit the feature in any event they were present), to assess potential impacts accordingly.

It must be noted that desktop reviews provided results of marine species in nearby marine environments, which is clearly improbable given the inland location of the proposed action. Species that exclusively use marine environments suggested to potentially occur in the Locality by modelled distribution databases have been omitted from the assessment due to the terrestrial nature of the Project Area.

4. ECOLOGICAL VALUES

The following section presents the ecological values of the Project Area based on the findings from both desktop and field survey data. General information of the Project Area within the landscape context and classification and descriptions of the vegetation communities and broad habitats are presented in Section 4.1 and Section 4.2 . Information specific to MNES is presented in Section 4.3

4.1 Landscape Context

The Project Area occurs within the Brigalow Belt South (BBS) bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) framework. The Project Area is largely flat and features a large proportion of remnant eucalypt woodland in the south of the Project Area.

The Project Area does not contain any major rivers or creeks running through the site, however approximately 5 km east of the Project Area's most eastern boundary Cooranga Creek flows east, connecting to the Condamine River. Given the distance from the Project Area and the construction environmental management measures which include erosion and sediment controls, there is unlikely to be any impacts to this waterway as a result of the proposed action.

The majority of the Project Area (199.6 ha or 30.4% of the Project Area) contains regrowth vegetation, with remnant vegetation covering 139 ha or 21%). The majority of remnant and regrowth vegetation is located towards the south of the Project Area, with areas of both Brigalow and Eucalypt remnant and regrowth woodland present in areas towards the north and east of the Project Area. Remnant vegetation is dominated by Poplar Box (*Eucalyptus populnea*), Gum-topped Box (*Eucalyptus moluccana*), Ironbark (*Eucalyptus crebra*) and Brigalow (*Acacia harpophylla*). Cleared agricultural land with scattered regrowth makes up 197 ha (29%) and cleared agricultural land with no regrowth covers 118ha or 18% of the Project Area. These areas of agricultural land are impacted by clearing and cattle grazing and contain occasional small patches of regrowth and sparse individual trees.

4.2 Vegetation Types and Broad Habitats

The Project Area has been classified into seven broad habitat types, based on vegetation type and structure. These broad habitat types have been considered as having foraging, breeding, roosting and dispersal attributes for listed threatened species that are "Known", "Likely" or have "Potential" to occur within the Project Area. This ground truthed habitat mapping has been informed by these seven broad habitat types and has been used to identify areas of habitat for listed threatened species.

The habitats in the Project Area are mostly in moderate to poor condition, consisting of areas of dense to open woodlands, cleared grasslands for agricultural uses, with presence of invasive flora species. Ground truthed vegetation community mapping has confirmed the Project Area consists of predominantly native vegetation communities, although incurs extensive habitat modification due to agricultural uses within and adjacent to the Project Area. Habitat structure is highly dependent upon intensity of disturbance, ranging from minimal to highly disturbed.

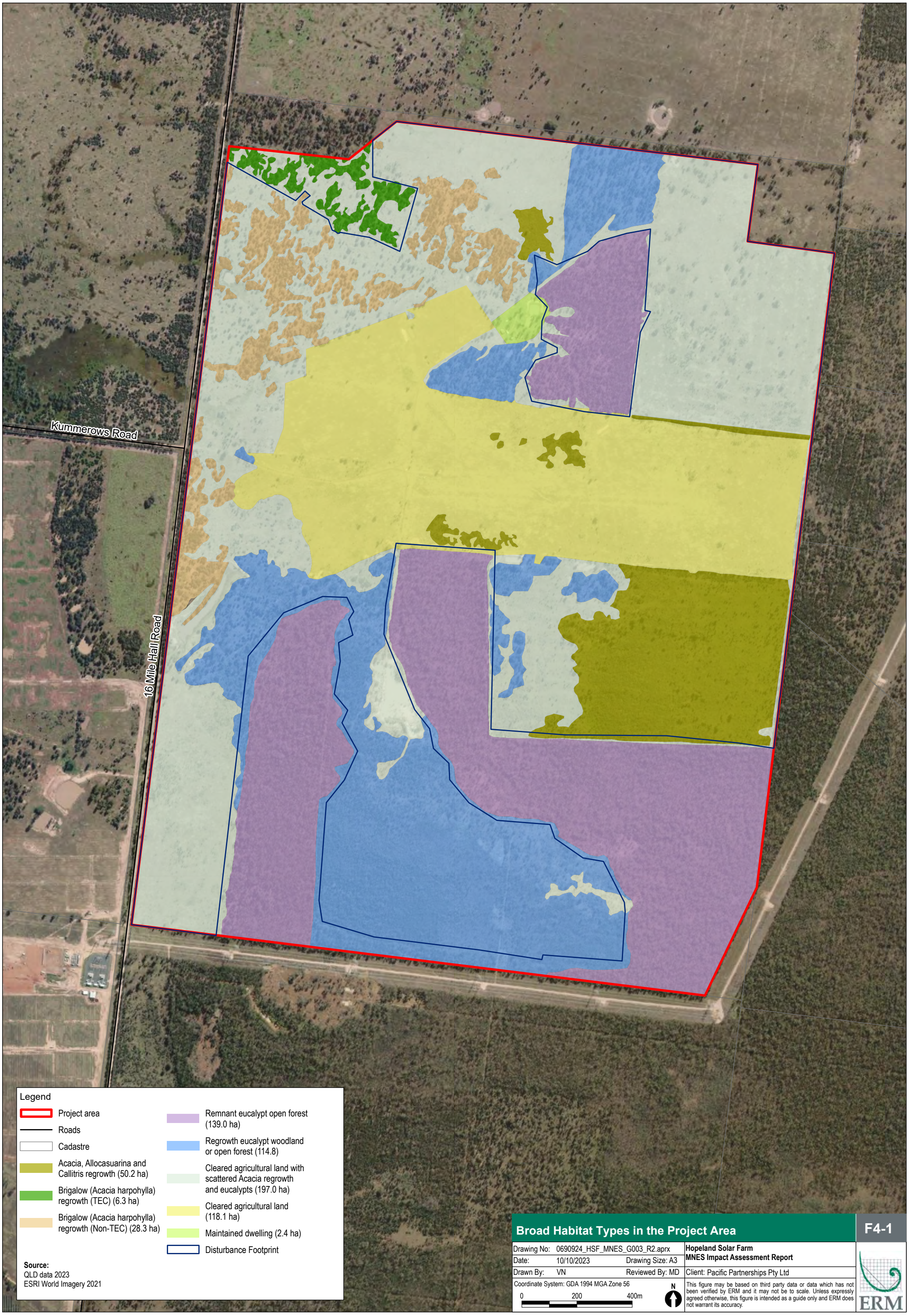
The current land use for agricultural grazing has limited the extent of regrowth native vegetation across the Project Area, with cattle grazing, vegetation clearing and thinning and other agricultural uses suppressing the extent of native regrowth.

A review of QImagery historical aerial photography provided by the Queensland Government, shows the majority of the Project Area has been subject to broad scale clearing by 1982, with the exception of the areas mapped as remnant eucalypt open forest and woodland, and areas of regrowth eucalypt open forest and woodland (Photograph 1). This demonstrates the historical impacts of agricultural land use that has contributed to the current limited ecological values observed in the Project Area. The historical aerial photograph from 2002 (Photograph 2) shows the clearing within the area of mapped regrowth eucalypt open woodland in the southern end of the Project Area, indicating the relatively young age of this community of approximately 22 years.

A summary of the seven identified broad habitat types, along with their vegetation communities' classifications and attributes is provided in Table 4-1. These vegetation communities are mapped across the Project Area, provided in Figure 4-1.

Photograph 1 1982 aerial photograph

Photograph 2: 2002 aerial photograph



Broad Habitat Types in the Project Area

F4-1

Drawing No:	0690924_HSF_MNES_G003_R2.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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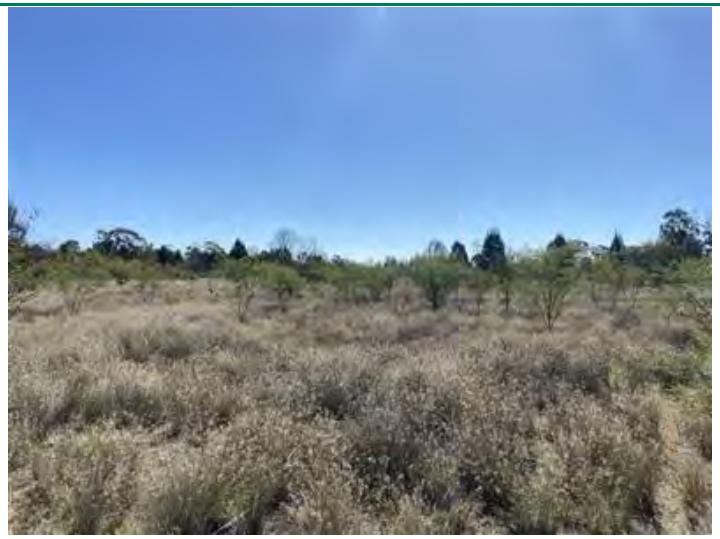
Table 4-1 Vegetation Communities with Associated Habitat Features in the Project Area

Broad Habitat Type	Structure	Habitat features / condition	Photographic example
***Acacia, Allocasuarina* and *Callitris* regrowth**. Found across the Project Area on sandy clay / loamy plains. This habitat type totals 50.2 ha within the Project Area	Tree Layer: Canopy height ranges between 8 and 13 m and most common tree species include *Allocasuarina luehmannii, Callitris glaucophylla* and *Acacia mearnsii.* Shrub Layer: Sparse shrub layer present, understory is predominantly regrowth acacia species. Juvenile trees ranging from 2-3 m in height. The most common species being *Acacia mearnsii, Allocasuarina luehmannii, Callitris glaucophylla*, *Opuntia* species were present within this habitat type. Ground microhabitat layer: The ground cover mostly consists of a grassy understory with lots of woody debris. The most common species found within the ground layer consist of Aristida species and Cyperus species	Hollows were absent from this broad habitat type, nor were any scratch marks present on any trees. The area did present adequate habitat for woodland birds, and potential foraging habitat for some mammal species. The ground cover saw areas of woody debris, presenting adequate microhabitat for ground dwelling species (particularly reptiles and snails). Food sources that were available included mistletoe and seeding grass cover.	

Broad Habitat Type	Structure	Habitat features / condition	Photographic example
Brigalow (*Acacia harpophylla*) regrowth (TEC) This habitat type totals 7.1 ha within the Project Area	Tree Layer: Canopy height in this habitat type ranged from 8-12m with a canopy dominated by *Acacia harpophylla*. *Eucalyptus moluccana* is also occasionally present within the canopy. Shrub Layer: Shrub layer is present and is predominantly regrowth brigalow. Ground microhabitat layer: The ground cover consists of a grassy understory with woody debris and gilgais present.	Hollows were largely absent from this broad habitat type, nor were any scratch marks present on any trees. The area presents a habitat for woodland birds. The ground cover saw areas of woody debris and gilgais, presenting microhabitat for ground dwelling species (particularly reptiles and snails). Food sources that were available included mistletoe and seeding grass cover.	

Broad Habitat Type	Structure	Habitat features / condition	Photographic example
Brigalow (*Acacia harpophylla*) regrowth (non-TEC) This habitat type totals 28.1 ha within the Project Area. This habitat type was delineated from Brigalow meeting TEC criteria due to its fragmented nature and significant presence of exotic perennial species.	Tree Layer: The tree layer in this habitat is generally sparse to absence, with occasional *Eucalypt* and *Acacia* species. Shrub Layer: Shrub height in this habitat type ranged from 4-6m characterised by scattered patches of *Acacia harpophylla.* Ground microhabitat layer: The ground cover consists of a grassy understory dominated by exotic pasture grasses with limited woody debris and gilgais present.	Hollows were absent from this broad habitat type, nor were any scratch marks present on any trees. The area presents a potential habitat for woodland birds. The ground cover contained very limited areas of woody debris, with a lack of large logs and gilgais, presenting limited microhabitat for ground dwelling species. Food sources that were available included seeding grass cover.	
Remnant Eucalypt Open Forest This habitat type totals 138.9 ha within the Project Area	Tree Layer: The canopy height in this habitat type ranges from 8 – 15m and is dominated by *Eucalyptus moluccana, Eucalyptus crebra,* and *Eucalyptus populnea.* With *Corymbia citriodora* also present. Shrub Layer: Shrub height ranged from 2-5m and features *Callitris glaucophylla, Acacia mearnsii, Allocasuarina luehmannii, Melaleuca spp* and *Dodonaea viscosa.* Ground microhabitat layer: The ground cover consists of a grassy understory featuring native grasses and forbs including *Dianella sp., Gahnia sp.* and *Solanum sp.* Woody	Occasional hollows were present in this broad habitat type, with scratch marks present on some canopy trees. The area provides habitat for woodland birds, and potential foraging habitat for arboreal mammal species. The ground cover contains areas of woody debris, presenting adequate microhabitat for ground dwelling species (particularly reptiles and snails). Food sources that were available included mostly mistletoe and seeding grass cover.	

Broad Habitat Type	Structure	Habitat features / condition	Photographic example
	debris is present throughout this habitat type.		
Regrowth Eucalypt Woodland or Open Forest This habitat type totals 114.8 ha within the Project Area	Tree Layer: The canopy height in this habitat type ranges from 8 – 12m and is dominated by *Eucalyptus moluccana* and *Eucalyptus populnea.* Shrub Layer: Shrub height ranged from 3-5m and features *Callitris glaucophylla, Acacia mearnsii, Allocasuarina luehmannii,* and *Dodonaea viscosa.* Ground microhabitat layer: The ground cover consists of a grassy understory featuring tussock grasses and occasional woody debris.	Very few hollows were present in this broad habitat type, due to the young age of the regrowth eucalypts (less than 25 years). The area presents habitat for woodland birds, and potential foraging habitat for arboreal mammal species. The ground cover contains areas of woody debris, presenting adequate microhabitat for ground dwelling species (particularly reptiles and snails), although in a much-reduced density and abundance than the area of remnant eucalypt woodland and open forest habitat type. Food sources that were available included mistletoe and seeding grass cover.	

Broad Habitat Type	Structure	Habitat features / condition	Photographic example
Cleared Agricultural Land with Scattered Acacia and Eucalypt Regrowth featuring scattered individual trees. This habitat type totals 197 ha within the Project Area.	Tree layer: Sparse to absent. Occasional E*ucalyptus spp., Corymbia spp.* Shrub layer: Sparse regrowth *Acacia mearnsii*. Ground microhabitat layer: Tussock grasses are present within the habitat type, gilgais are present particularly within the west of the Project Area.	Provides limited habitat value due to the extensive clearing and grazing that has occurred. Lack of hollow-bearing trees means limited to no habitat availability for arboreal mammals. Longer tussock grasses will provide some habitat for ground dwelling mammals and reptiles. Additionally, birds of prey may take advantage of limited tree cover to hunt for smaller animals	
Cleared Agricultural Land. This habitat type totals 118.1 ha within the Project Area	Tree layer: Sparse to absent. Occasional E*ucalyptus spp., Corymbia spp.* Shrub layer: Sparse to absent. Ground microhabitat layer: Tussock grasses are present within the habitat type, gilgais are present particularly within the west of the Project Area.	Provides limited habitat value due to the extensive clearing and grazing that has occurred. Lack of hollow-bearing trees means limited to no habitat availability for arboreal mammals. Longer tussock grasses will provide some habitat for common or non-threatened ground dwelling mammals and reptiles. Additionally, birds of prey may take advantage of limited tree cover to hunt for smaller animals	

4.3 Matters of National Environmental Significance

The MNES within the Project Area are summarised in Table 4-2, with detailed descriptions provided in the following sections below.

Nine listed threatened species and one migratory species were determined to potentially occur given the presence of suitable habitat and overlap of distribution with the Project Area, although no records or evidence of presence occur within the Project Area. No observations were made during the May 2023 field surveys. The full likelihood of occurrence for known, likely and potential species is attached in Appendix A

The following Sections detail the listed threatened and migratory species known, likely or with potential to occur in the Project Area together with habitat mapping for each species, or group of species where relevant. Table 4-3 provides a summary of potential habitat for EPBC Act listed species with potential to occur within the Project Area.

Table 4-2 Matters of National Environmental Significance in the Project Area

Matter	Relevance to the Project Area
World heritage properties	There are no world heritage properties within the Project Area.
National heritage properties	There are no national heritage properties within the Project Area
Wetlands of international importance	There are no wetlands of international importance associated with the Project Area.
Threatened species and ecological communities	There are no EPBC Act listed threatened species that are considered **known** or **likely** to occur within the Project Area, however there are 10 EPBC Act listed species that are considered as having the **potential** to occur within the Project Area, see Section 4.3. One TEC was confirmed to be present (Brigalow) within the Project Area.
Migratory species	Two EPBC Act listed migratory species are regarded as having "Potential" to occur within the Project Area. White-throated Needletail (*Hirundapus caudacutus*) Fork Tailed Swift (*Apus pacificus*)
Commonwealth marine area	There are no Commonwealth marine areas within the Project Area
The Great Barrier Reef Marine Park	The Great Barrier Reef is not associated with this Project Area
Nuclear actions	N/A to this proposed action
Water resources	N/A to this proposed action

Table 4-3: Summary of Potential Habitat for EPBC Act Listed Species with Potential to Occur within the Project Area

MNES	Total Potential Habitat in Project Area	Vegetation/Broad Habitat Group/s
EPBC Act Listed Species (Threatened and/or Migratory)		
Painted Honeyeater (*Grantiella picta*) Vulnerable	■ 145.3 ha potential foraging and breeding habitat.	■ Remnant Eucalypt open forest; and ■ Brigalow regrowth (TEC)
White-Throated Needletail (*Hirundapus caudacutus*) Vulnerable, Migratory	■ Aerial foraging species and no applicable terrestrial habitat for this species	■ None
Fork-Tailed Swift (*Apus pacificus*) Migratory	■ Aerial foraging species and no applicable terrestrial habitat for this species	■ None
Koala (*Phascolarctos cinereus*) Endangered	■ 253.8 ha of potential foraging and breeding habitat ■ 6.3 ha of potential dispersal habitat	Foraging and Breeding ■ Remnant Eucalypt open forest; and ■ Regrowth eucalypt woodland or open forest Dispersal ■ Brigalow regrowth (TEC);
Grey-Headed Flying-Fox (*Pteropus poliocephalus*) Vulnerable	■ 253.8 of potential foraging habitat	■ Remnant Eucalypt open forest; and ■ Regrowth eucalypt woodland or open forest
Grey Snake (*Hemiaspis damelii*) Endangered	■ 6.3 ha of potential foraging and breeding habitat	■ Brigalow regrowth (TEC)
Yakka Skink (*Egernia rugosa*) Vulnerable	■ 139 ha of potential foraging and breeding habitat	■ Remnant Eucalypt open forest
Dunmall's Snake (*Furina dunmalli*) Vulnerable	■ 145.3 ha of potential foraging and breeding habitat	■ Remnant Eucalypt open forest; and ■ Brigalow regrowth (TEC)
Brigalow Woodland Snail (*Adclarkia cameroni*) Endangered	■ 6.3 ha of potential foraging and breeding habitat	■ Brigalow regrowth (TEC)
Corben's Long-eared Bat (*Nyctophilus corbeni*) Vulnerable	■ 253.8 ha of potential foraging habitat	■ Remnant Eucalypt open forest; and ■ Regrowth eucalypt woodland or open forest

4.3.1 Listed Threatened Ecological Communities

The desktop review, of the EPBC Act PMST, identified the potential occurrence of five TECs listed under the EPBC Act in the Project Area. These were:

- Critically Endangered Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland;
- Endangered Weeping Myall Woodlands;
- Endangered Brigalow (Acacia harpophylla dominant and co-dominant);
- Endangered Poplar Box Grassy Woodland on Alluvial Plains; and
- Endangered Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions.

Following ground-truthing of vegetation mapping across the May 2023 field surveys, it has been confirmed that there is one TEC is present within the Project Area. The field surveys have identified approximately 6.3 ha of Brigalow that meets the TEC criteria and 28.3 ha that do not meet TEC criteria. (Figure 4-2).

Areas of Brigalow regrowth that do not meet the definition of the TEC were excluded based on patches not meeting the key diagnostic criteria or condition thresholds in the *Brigalow (Acacia harpophylla dominant and co-dominant) ecological community Approved Conservation Advice* (TSSC, 2013). Field-verified data from vegetation assessments identified that these areas of TEC did not meet the following criteria to be classified as a TEC:

- Evidence of complete clearing with the last 15 years;
- Patches that are less than 0.5 ha in size; and
- Areas with a total perennial native species cover less 50%, characterised by an absence of native species in the ground layer due to occurrence of exotic pasture grasses.

4.3.2 Listed Threatened Flora Species

No EPBC Act listed threatened flora species were identified during the May 2023 field surveys within the Project Area. The desktop review identified a total of seven EPBC Act listed threatened flora species with the potential to occur within 10 km of the Project Area. Desktop sources are indicative only and likelihood rankings, particularly in regard to the presence of suitable habitat, are conservative.

Following review of desktop information, and results from the May 2023 surveys, no EPBC Act listed threatened flora species, were considered likely or have potential to occur within the Project Area due to a lack of habitat suitability.

4.3.3 Listed Threatened Fauna Species

No listed threatened fauna species have been directly recorded in the Project Area from intensive field surveys completed by suitably qualified and experienced ecologists from 28 South in 2017 and ERM in 2023.

The desktop review identified a total of 27 EPBC Act listed threatened fauna species with the potential to occur within 10 km of the Project Area. Desktop sources are indicative only and likelihood rankings, particularly in regard to the presence of suitable habitat, are conservative. The likelihood of occurrence approach ranks the likelihood of a species occurring within the Project Area through analysis of species distribution information and the presence of specific habitat attributes as identified simultaneously through the desktop analysis and field surveys.

Following review of desktop information, and results from targeted field surveys and field-verification of habitats, 10 listed threatened or migratory species (Table 4-4) were determined as having the

potential to occur within the Project Area based on the presence of potential habitat and recent records within the 10km buffer. There was no evidence of the presence of these species from field surveys completed in 2017 and 2023, in the form of direct observations or signs.

Table 4-4 Threatened and Migratory Species with the Potential to Occur in the Project Area

Scientific Name	Common name	EPBC Act Status
Grantiella picta	painted honeyeater	V
Hirundapus caudacutus	white-throated needletail	V, Mi
Apus pacificus	fork-tailed swift	Mi
Phascolarctos cinereus	koala	E
Pteropus poliocephalus	grey-headed flying-fox	V
Hemiaspis damelii	grey snake	E
Egernia rugosa	yakka skink	V
Furina dunmalli	Dunmall's snake	V
Adclarkia cameroni	brigalow woodland snail	E
Nyctophilus corbeni	Corben's Long-eared Bat	V

Status listing per EPBC Act: CE = Critically Endangered; E = Endangered; V= Vulnerable; M =Migratory.

Brigalow TEC Mapping in the Project Area

F4-2

Drawing No:	0690924_HSF_MNES_G004_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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4.3.4 Terrestrial Mammals

4.3.4.1 Koala (Phascolarctos cinereus)

The koala is listed as Endangered under the EPBC Act (as of the 12th of February 2022). The koala (*Phascolarctos cinereus*) has one of the broadest distributions of threatened arboreal mammals' 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 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).

The Koala is generally found in temperate to tropical forests and 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, 2022). 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).

The Project Area consists of some suitable habitat that it typical of koala, those habitat types being remnant eucalypt open forest, regrowth eucalypt woodland or open forest, brigalow (*Acacia harpophylla)* regrowth (TEC), *Acacia, Allocasuarina* and *Callitris* regrowth. Most of the Project Area contains habitat types that are generally unsuitable for the koala species (cleared agricultural land with scattered acacia regrowth, brigalow (*Acacia harpophylla)* regrowth (Non-TEC), and general cleared agricultural land). A historical record exists within the Locality of the Project Area; however the May 2023 survey effort did not encounter or observe any koala individuals, or any signs of presence (scat or scratch marks on trees).

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*.

Despite the absence of any signs of Koala during field surveys and a lack of recent records in the locality, potential Koala habitat occurs in the Project Area. Potential habitat has been classified and mapped conservatively for the species, according to Koala habitat as defined as follows.

Koala habitat across the Project Area has been classified into breeding and foraging habitat, dispersal habitat and generally unsuitable area. This is due to the differing quality of the habitat, and the potential use of the habitat by the Koala.

Within the Project Area, appropriate vegetation stands that could be considered Koala habitat include the following broad habitat types:

- Breeding and foraging habitat:
  - Remnant eucalypt open forest
    - Associated commonly with, *Eucalyptus moluccana, Eucalyptus crebra,* and *Eucalyptus populnea* and scattered *Corymbia citriodora.*
  - Regrowth eucalypt woodland or open forest
    - Associated commonly with, regrowth of *Eucalyptus moluccana, Eucalyptus crebra,* and *Eucalyptus populnea.*
- Dispersal habitat:
  - Brigalow (*Acacia harpophylla)* regrowth (TEC).
- Generally unsuitable:
  - Brigalow *(Acacia harpophylla)* regrowth (non-TEC)
  - Cleared agricultural land with scattered Acacia regrowth and eucalypts;
  - Acacia, Allocasuarina and Callitris regrowth; and
  - Cleared agricultural land.

These areas mapped and classified as foraging and breeding habitat were considered potential Koala habitat due to the presence of food trees (*Eucalyptus, Corymbia, Angophora, Lophostemon* and *Melaleuca* spp). Areas of dispersal habitat may be used occasionally by Koalas as they move through the landscape and include areas that do not contain food trees, such as Brigalow TEC which contains larger *Acacia harpophylla* trees that can be used as shelter by dispersing individuals.

Targeted searches for the species were conducted in suitable habitat throughout the Project Area in 2023. Despite field surveys specifically targeting Koalas through faecal pellet searches, SATs and spotlighting, no direct sightings were recorded.

Additionally, a review of the historical species records within a 10 km buffer of the Project Area are absent, however, sparse records from 1990s exists only from beyond the 10 km buffer. There is no evidence of recent, direct Koala sightings in the Project Area or locality (10 km buffer) within the last 25 years. It's concluded that there is a general absence of Koalas in the Project Area, and it is considered that Koala occurrence in the Project Area is very rare, given the higher quality contiguous remnant vegetation to the southeast.

Potential Koala habitat has been mapped in Figure 4-3, and includes 253.8 ha of breeding and foraging habitat, and 7.1 ha of dispersal habitat. Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as breeding/foraging habitat, dispersal habitat and generally unsuitable based on ground-truthed vegetation communities.

Areas of potential foraging and breeding habitat within the Project Area are clearly delineated by the presence of remnant and regrowth eucalypt woodland or open forest.

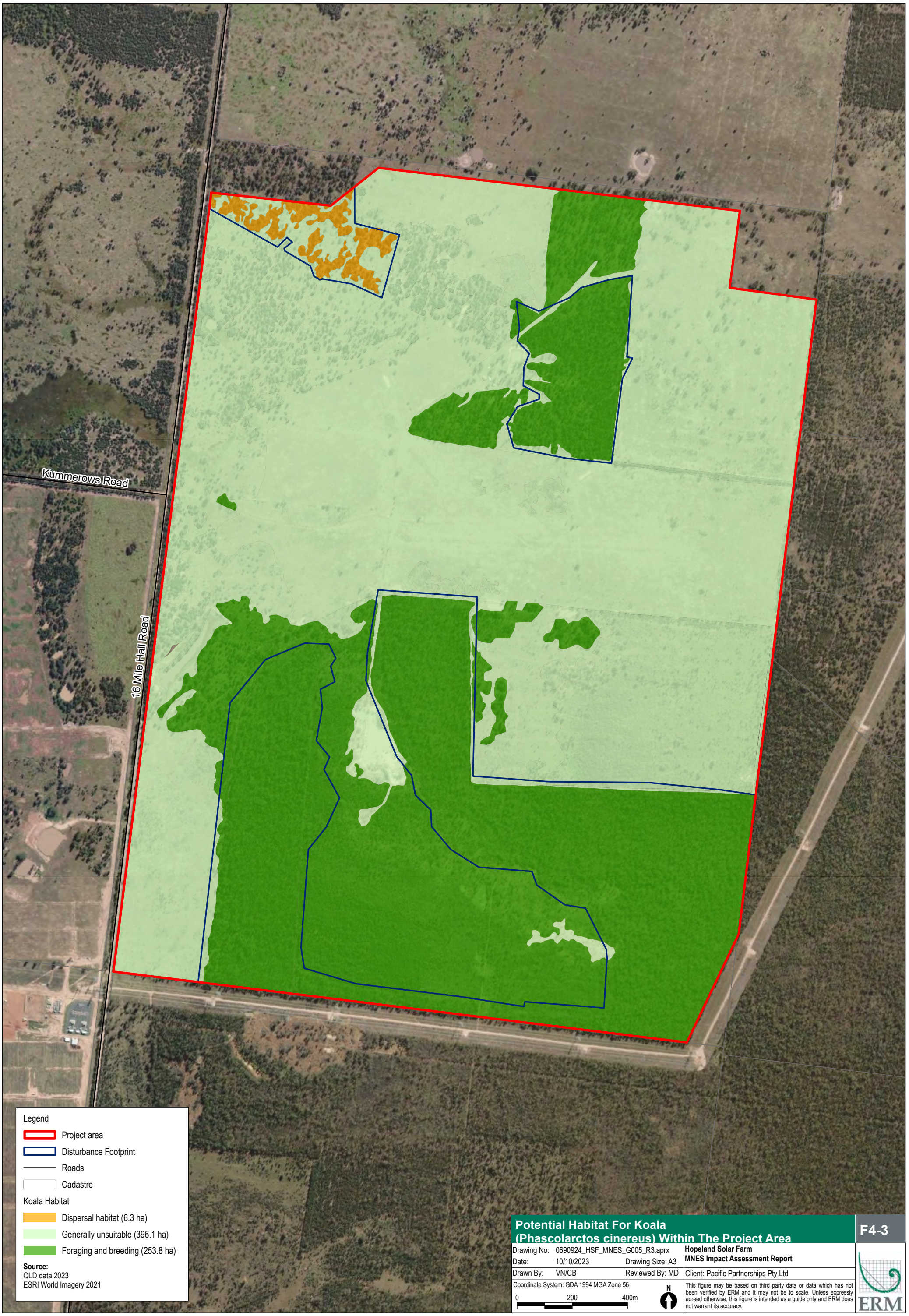
Dispersal habitat for Koala can include a range of habitat types, including cleared land with scattered suitable habitat trees that are used for shelter, with this habitat being defined as areas required for Koalas to move between areas of foraging and breeding habitat. Species of non-food trees that Koala have been observed utilising include rainforest species, white cypress pine (*Callitris glaucophylla*), *Callitris columellaris*, brigalow (*Acacia harpophylla*), and black tea-tree (*Melaleuca bracteate*). Shelter trees are often larger, mature trees that dispersing animals can seek refuge in from predation and, within the Project Area, these are located in the more mature Brigalow regrowth. The areas of Brigalow regrowth that are classified as non-TEC are composed of younger trees, that are generally between 2-4m in height and provide limited to no shelter opportunities for dispersing Koalas.

Given the species moves along the ground, the maintenance of dispersal opportunities between these areas of foraging and breeding habitats, defined broadly as eucalypt woodlands and open forests, is a key element in determining when open ground areas are considered dispersal habitat. The Queensland *Nature Conservation (Koala) Conservation Plan 2017* defines this dispersal habitat as a partially or completely cleared area used by koalas to cross between areas where Koalas live or areas that contain Koala primarily habitat trees where they could be reasonably assumed to live. To the south and east of the Project Area there are extensive areas of eucalypt open forest, however to the north and west historical clearing for agricultural has removed the majority of this foraging and breeding habitat (Figure 4-4).

The location of the Project Area on the edge of this cleared landscape limits the value of the generally unsuitable areas for Koala as there is limited dispersal functions for these areas for Koalas to disperse between areas of eucalypt woodlands across the Project Area. It is noted that Koalas will move across open ground to reach areas of foraging and breeding habitat, or during dispersal into new areas, however the value of cleared and non-eucalypt areas in the Project Area for dispersal is considered to be limited.

The value of areas as Koala dispersal habitat that do not contain eucalypt woodland or open forest also needs to be considered in a landscape context, with the function of these areas to connect between potential foraging and breeding habitat considered. Walking on the ground is how Koalas travel between trees, so the ground itself forms an essential component of Koala habitat, as without the ability to traverse the ground, movement between trees would be hindered or impossible (DCCEEW 2022). Koalas have been observed using lone paddock trees as shelter trees during dispersal, which constitutes cleared land with occasional Koala food or shelter trees (i.e., *Eucalyptus and Corymbia spp*.) as dispersal habitat (DAWE 2022).

For the abovementioned reasons area that have been classified as generally unsuitable for Koala, as they relate to the Project Area, consist of grass/bare ground and rural land-uses with very limited shelter components required for dispersing Koalas connectivity (sparse paddock trees that are young regrowth specimens). These habitat features contain vegetation generally not used frequently for foraging and breeding purposes by the species. When considered in the landscape context of koala habitat values surrounding the Project Area, these areas of habitat that will be disturbed for the proposed action area are unlikely to contribute to the maintenance of a viable koala population in the region.



Potential Habitat For Koala (Phascolarctos cinereus) Within The Project Area

F4-3

Drawing No:	0690924_HSF_MNES_G005_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

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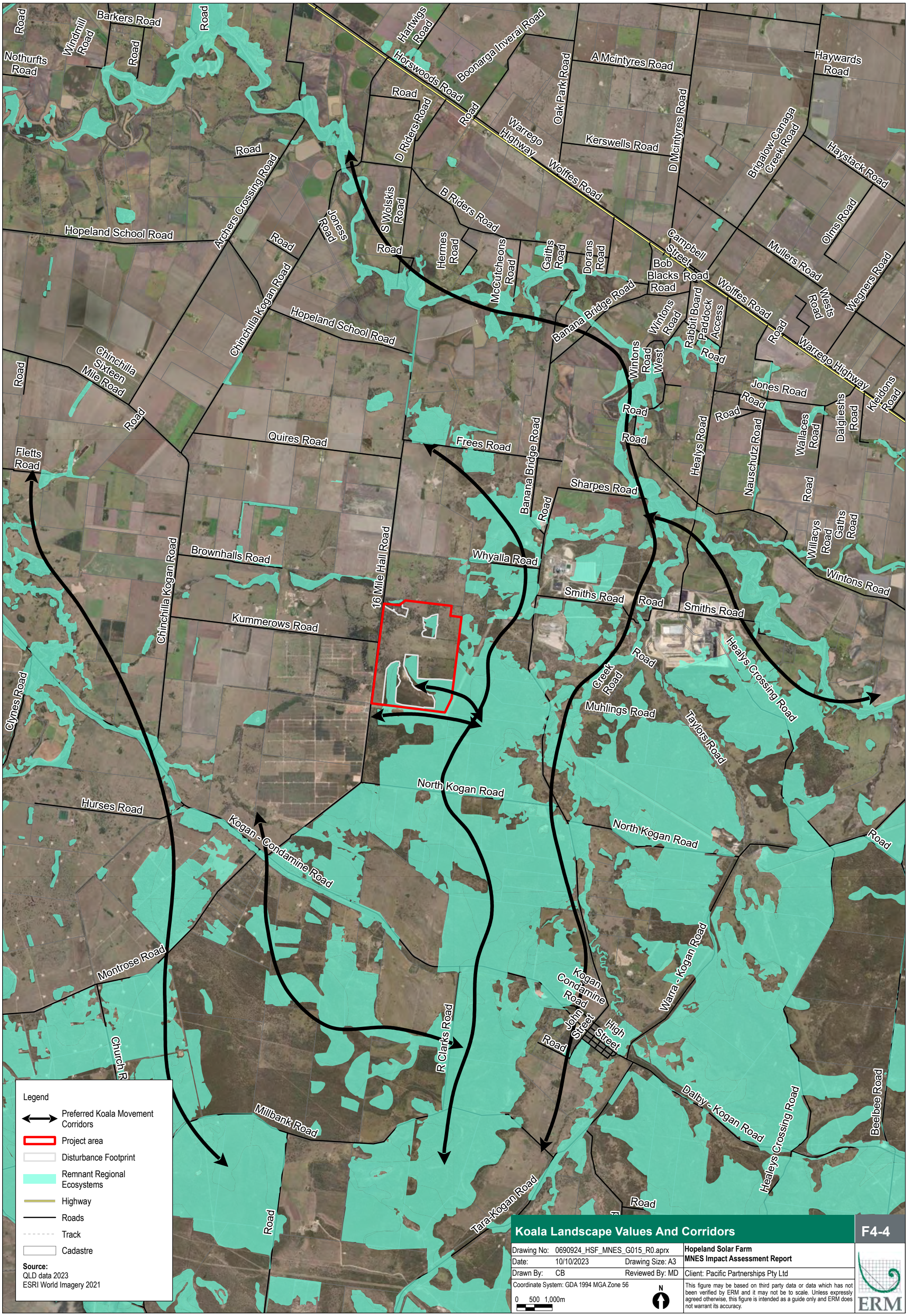
Nothurfts Road
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Oak Park Road
A Mcintyres Road
Haywards Road
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Kerswells Road
Brigalow-Canaga Creek Road
Haystack Road
Olms Road
Wegners Road
Wolffes Road
Campbell Street
Bob Blacks Road
Mullers Road
Wests Road
Warrego Highway
Road
Road
Archers Crossing Road
Hopeland School Road
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Jones Road
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B Riders Road
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Hermes Road
McCutcheons Road
Gaiths Road
Dorans Road
Banana Bridge Road
Wintons Road
Rabbit Board Paddock Access
Road
Wintons Road West
Road
Jones Road
Road
Road
Kleidons Road
Dalglieshs Road
Wallaces Road
Road
Nauschutz Road
Healys Road
Chinchilla Kogan Road
Hopeland School Road
Chinchilla Sixteen Mile Road
Road
Road
Quires Road
Frees Road
Banana Bridge Road
Sharpes Road
Road
Fletts Road
Willacys Road
Gaths Road
Wintons Road
Chinchilla Kogan Road
Brownhalls Road
16 Mile Hall Road
Whyalla Road
Smiths Road
Road
Smiths Road
Kummerows Road
Road
Healys Crossing Road
Clynes Road
Muhlings Road
Taylors Road
North Kogan Road
North Kogan Road
Hurses Road
Kogan - Condamine Road
Road
Montrose Road
Kogan Condamine Road
Warra - Kogan Road
John Street
High Street
Road
R Clarks Road
Dalby - Kogan Road
Healeys Crossing Road
Beelbee Road
Millbank Road
Road
Tara-Kogan Road
Road
Legend
Preferred Koala Movement Corridors
Project area
Disturbance Footprint
Remnant Regional Ecosystems
Highway
Roads
Track
Cadastre
Source:
QLD data 2023
ESRI World Imagery 2021
Koala Landscape Values And Corridors
F4-4
Drawing No: 0690924_HSF_MNES_G015_R0.aprx
Date: 10/10/2023
Drawing Size: A3
Drawn By: CB
Reviewed By: MD
Coordinate System: GDA 1994 MGA Zone 56
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Hopeland Solar Farm
MNES Impact Assessment Report
Client: Pacific Partnerships Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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4.3.4.2 Grey-headed flying-fox (Pteropus poliocephalus)

The grey-headed flying fox is listed vulnerable under the EPBC act. The grey-headed flying fox (*Pteropus poliocephalus)* has a wide distribution range extending from the coastal belt of Queensland to Melbourne. This distribution range is used selectively by the species, only utilizing small proportions of the range at a time, as the species is selective in foraging habitat.

The grey-headed flying fox is a canopy-feeding frugivore and nectivore, utilising habitats alike open forest, rainforest and open woodlands. The species distribution is associated with flowering and fruiting plants during different times of the year/seasons. The species is predominantly widespread through its distribution range during summer months, whilst in winter the species converges to areas that consist of flowering eucalypt species. Due to not having continuous foraging resources, the species uses these differing habitat types as an adopted migration trait in response to ephemeral and patchy food availability.

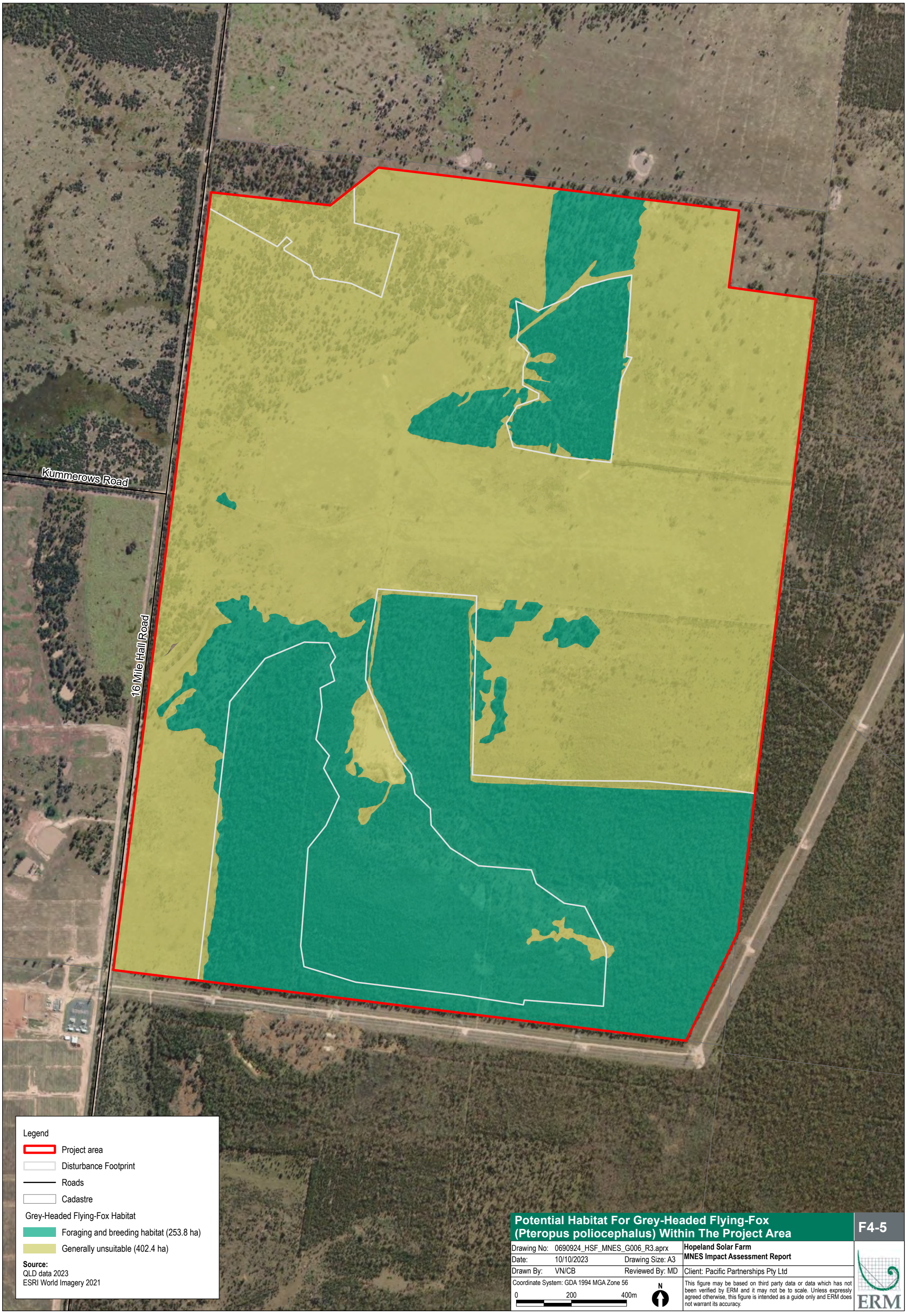
The Project Area only consists of two broad habitat types that pertain suitable habitat features that are typical of the species, those habitats including remnant eucalypt open forest, regrowth eucalypt woodland or open forest. Majority of the Project Area is generally unsuitable for any habitat functions that the species utilises, including both breeding, foraging and dispersal habitat. No historical records exist of the species being present within the Locality and the May 2023 survey effort did not observe any individuals or presence of the species. The Project Area is approximately 156 km south-west from the closest active colony with recent Grey-headed Flying-fox activity (per the interactive flying-fox viewer maintained by DCCEEW). This colony is located near Cooyar (The Palms National Park Flying-fox Camp). Other known flying-fox colonies that are monitored closer to the Project Area at Chinchilla and Dalby have recorded recent usage by Black Flying-fox and Little Red Flying-fox only.

Many myrtaceous tree species that make up the diet of the Grey-headed Flying-fox flower at different times of the year. Important winter and spring vegetation communities are those that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Corymbia citriodora, C. eximia, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera* (Eby & Law, 2008; Eby, 2016; Eby et al., 2019).

The Project Area contains myrtaceous species. Potential foraging habitat for the Grey-headed Flying-fox has been mapped as a total of 253.8 ha in the Project Area is displayed in Figure 4-5. It is difficult to predict which vegetation communities will produce foraging resources at certain times of the year, however a conservative approach was taken, and the broad habitat types included and mapped were:

- Remnant eucalypt open forest
  - Associated commonly with, *Eucalyptus moluccana, Eucalyptus crebra*, and *Eucalyptus populnea* and scattered *Corymbia citriodora.*
- Regrowth eucalypt woodland or open forest.
  - Associated commonly with, regrowth of *Eucalyptus moluccana, Eucalyptus crebra*, and *Eucalyptus populnea.*

Potential Grey-headed flying fox habitat has been mapped in Figure 4-5. Potential habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as foraging habitat based on these vegetation communities. Given the large distance (over 150km) from the nearest known Grey-headed Flying-fox colony, the importance of the potential foraging habitat within the Project Area is marginal, and it is likely that only occasional, vagrant individuals utilise the Project Area. The species is more common in coastal areas of the east coast of Australia, with sparse records west of the Great Dividing Range.



Potential Habitat For Grey-Headed Flying-Fox (Pteropus poliocephalus) Within The Project Area

F4-5

Drawing No:	0690924_HSF_MNES_G006_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

4.3.4.3 Corben's long-eared Bat (Nyctophilus corbeni)

Corben's Long-eared Bat (*Nyctophilus corbeni*) is currently listed as Vulnerable under the EPBC Act, effective 4 April 2001. Corben's Long-eared Bat is a relatively large bat species, with a head and body length of 50-75 mm, forearm length of 40-50 mm and a tail length of 35-50 mm (Reardon, 2012). Females are generally heavier than males, averaging 14-21 grams, whilst males average 11-15 grams. The species is light brown to dark grey-brown in colouration and exhibits long ears (30 mm length) that are generally folded but erect as a response to alerts, (TSSC, 2015b).

Corben's Long-eared Bat is distributed across eastern Australia, from southern-central Queensland, south to central-western New South Wales, north-western Victoria and eastern South Australia (TSSC, 2015b). Within its distribution, the species is rarely recorded except for in Nandewar and Brigalow Belt South Bioregions. Majority of species records were located inland of the Great Dividing Range (Parnaby, 2009). It is thought that approximately 30% of the species total distribution is in Queensland, however records exist for only fewer than 30 localities (TSSC, 2015b).

Typical QLD habitat for this species includes box, ironbark, cypress-pine woodlands in the western slopes and plains. However, in other states the species is known to live in other woodland communities, demonstrating that the habitats this species select are quite broad. It should be noted however, that the species prefers extensive stands of vegetation rather than smaller, fragmented patches. The species forages on a range of insects, and roosts (generally solitarily) in dead trees, or dead sprouts of live trees. The species often roosts in new trees, and generally, consecutive roost trees are around 4 km from one another, indicating the species is quite nomadic when foraging. Information about the breeding biology and ecology of the species is lacking (TSSC, 2016).

The recommended survey approach for this species involves acoustic monitoring via the use of bat detectors (DEWHA, 2010), however this method needs to be applied in warmer months between October and May when bats are more active. Due to the presence of suitable habitat in the Project Area and lack of targeted survey effort for this species, it cannot be ruled out from occurring in the Project Area, despite a lack of historical records of the species in the locality. Thus, Corben's long-eared bat is considered as having the potential to occur in the Project Area.

With the above in mind, potential foraging and roosting habitat within the Project Area consists of the following broad habitat types:

- Remnant eucalypt open forest;
- Regrowth eucalypt woodland or open forest.

As potentially suitable foraging habitat is located within the Project Area, the Corben's Long-eared Bat is considered to have a potential to occur. Habitat mapping for the Project Area identified 253.8 ha of potential Corben's Long-eared Bat habitat and is presented in Figure 4-6.

Kummerows Road

16 Mile Hall Road

Legend

- Project area
- Disturbance Footprint
- Roads
- Cadastre
- Potential Habitat for Corben's Long-eared Bat (253.8 ha)

Source:
QLD data 2023
ESRI World Imagery 2021

Potential Habitat for Corben's Long-eared Bat Within The Study Area

F4-6

Drawing No:	0690924_HSF_MNES_G014_R2.aprx		**Hopeland Solar Farm** **MNES Impact Assessment Report**
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

4.3.5 Reptiles and Snails

4.3.5.1 Grey snake (Hemiaspis damelii)

The grey snake is listed endangered under the EPBC Act. The grey snake (*Hemiaspis damelii*) distribution regarded as continuous from southern New South Wales to southern-eastern Queensland, however the species is fragmented along the entire distribution range with subpopulations through Queensland and New South Wales. Most records of the species in Queensland are recorded along the Macintyre and Condamine Rivers and the flood plains of the southern brigalow belt (ranging from Goondiwindi, Dalby, Darling Downs, western Lockyer Valley, and Currawinya). Across its range, the Grey Snake has been recorded to occur in altitudes from 70 m above sea level to 540 m above sea level (DCCEEW, 2022), however majority of records exist in regions below 300 m sea level.

In Queensland, the Grey Snake favours woodlands dominated by Brigalow (*Acacia harpophylla*) and Belah (*Casuarina cristata*), on cracking clay soils, and in association with water bodies, including small gullies and ditches, ephemeral wetlands, and floodplains (DCCEEW, 2022). Within these habitats, the species typically seeks shelter in floodplain environments beneath logs, rocks and soil cracks when required (DCCEEW, 2022).

The Project Area contains one habitat type that contains suitable habitat features that are utilised by the species, that habitat being brigalow (*Acacia harpophylla*) regrowth (TEC). The remaining habitat types within the Project Area inhibit or do not contain any habitat features that the species is able to use, therefore the remainder of the site is regarded as generally unsuitable. The species has not been recorded within the Locality, nor was the species observed during the May 2023 survey effort, however presence should not be discounted due to the availability of habitat.

For the purposes of defining potential grey snake habitat, 6.3 ha of the Project Area has been classified as foraging and breeding habitat, associated with broad habitat type Brigalow (*Acacia harpophylla*) regrowth (TEC).

Potential grey snake habitat has been mapped Figure 4-7. Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as foraging and breeding habitat based on these vegetation communities. This area of habitat for grey snake is located in a small isolated patch of Brigalow regrowth which meets the definition of a TEC in the north-western corner of the Project Area. This habitat is a relatively small, isolated patch that extends to the north of the Project Area boundary. Grey snake is unlikely to occur across the remainder of the Project Area, with no dispersal habitat within the cleared agricultural areas, due to an absence of preferred microhabitat requirements associated with gilgai and coarse woody debri.

Potential Habitat For Grey Snake (Hemiaspis damelii) Within The Study Area

F4-7

Drawing No:	0690924_HSF_MNES_G007_R3.aprx		**Hopeland Solar Farm** **MNES Impact Assessment Report**
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

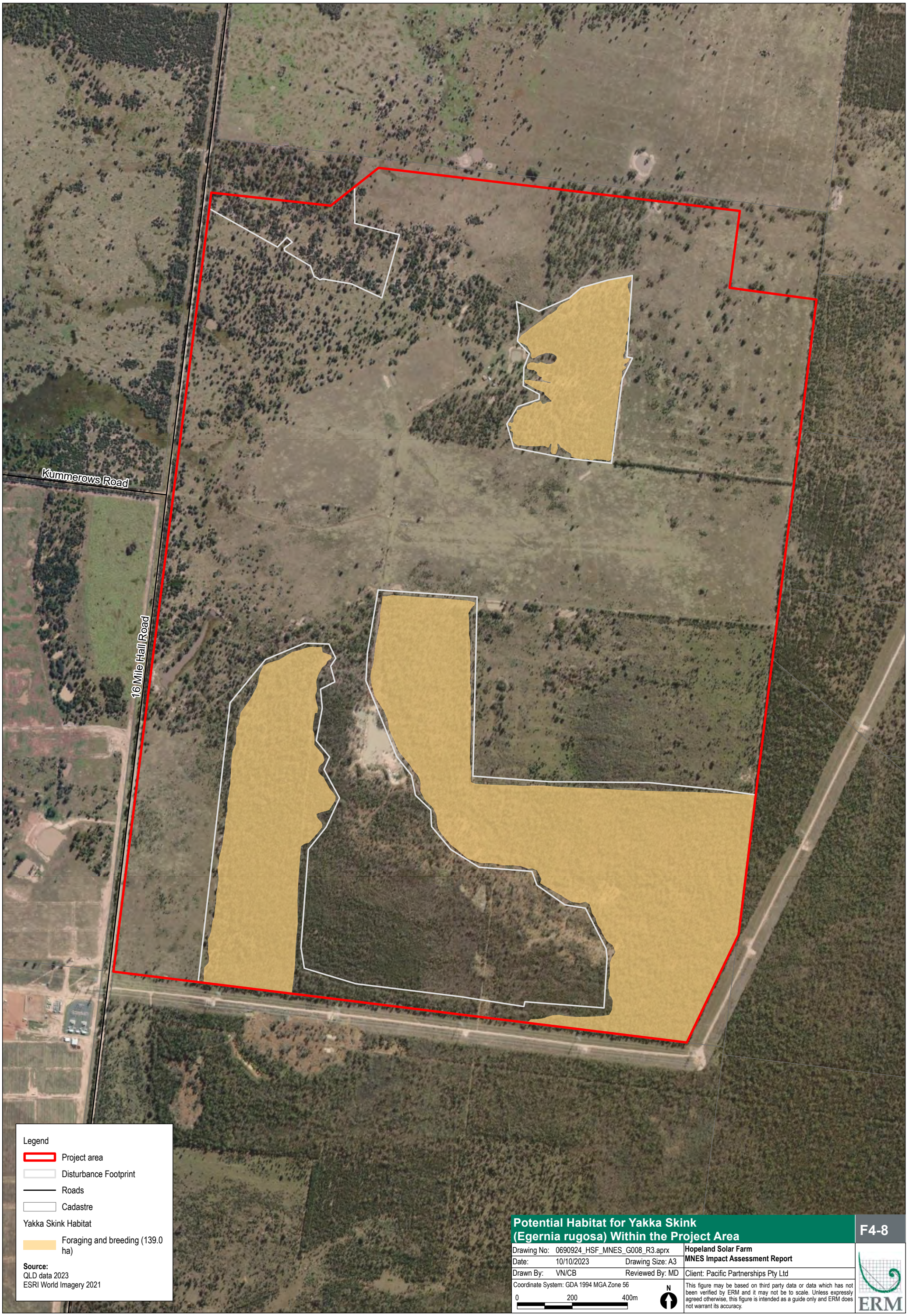
4.3.5.2 Yakka skink (Egernia rugosa)

The yakka skink is listed vulnerable under the EPBC Act. The yakka skink (*Egernia rugosa*) is endemic to Queensland, though its distribution throughout Queensland is patchy with isolated populations across subhumid regions from St George in the south to Cape York in the north. The core habitat however resides within the Mulga Lands and Brigalow Belt South Bioregions, with majority of the species distribution associated with the Brigalow (*Acacia harpophylla* dominant and co-dominant) EPBC Act listed threatened ecological community. The species can additionally be found in open dry sclerophyll forest or woodlands, utilising dense ground vegetation, large hollow logs and fallen trees as habitat features. The species presence is commonly confirmed or indicated via shared denning sites where they deposit droppings. (DoE, 2014).

The Project Area contains only one habitat type that contains suitable habitat features; remnant eucalypt open forest. Although the Project Area contains regrowth brigalow (*Acacia harpophylla*), the habitat condition of which within the Project Area is deemed not yet suitable for the species due to a lack of dense understory vegetation and coarse woody debris required for shelter. Historically there has been no records of the species within the Locality and during the May 2023 survey effort no individuals were observed, nor were any evidence of presence recorded (shared dropping sites).

For the purposes of defining potential yakka skink habitat, 139 ha of the Project Area has been classified as foraging and breeding habitat, associated with broad habitat type remnant eucalypt open forest.

Yakka skink habitat has been mapped in Figure 4-8. Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as foraging and breeding habitat based on these vegetation communities. The fragmented patch of mapped Yakka Skink habitat associated with the remnant open eucalypt forest in the north of the Project Area has limited habitat value for yakka skink due to the isolation of this habitat type. There is no microhabitat elements in the cleared agricultural lands in the Project Area, as they lack required shelter components. It is unlikely that yakka skink would disperse across the cleared and regrowth habitats within the Project Area to utililise this habitat. Notwithstanding, the precautionary principle has been applied and given presence of suitable habitat elements in this patch it has been mapped as yakka skink foraging and breeding habitat.



Potential Habitat for Yakka Skink (Egernia rugosa) Within the Project Area

F4-8

Drawing No:	0690924_HSF_MNES_G008_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

4.3.5.3 Dunmall's snake (Furina dunmalli)

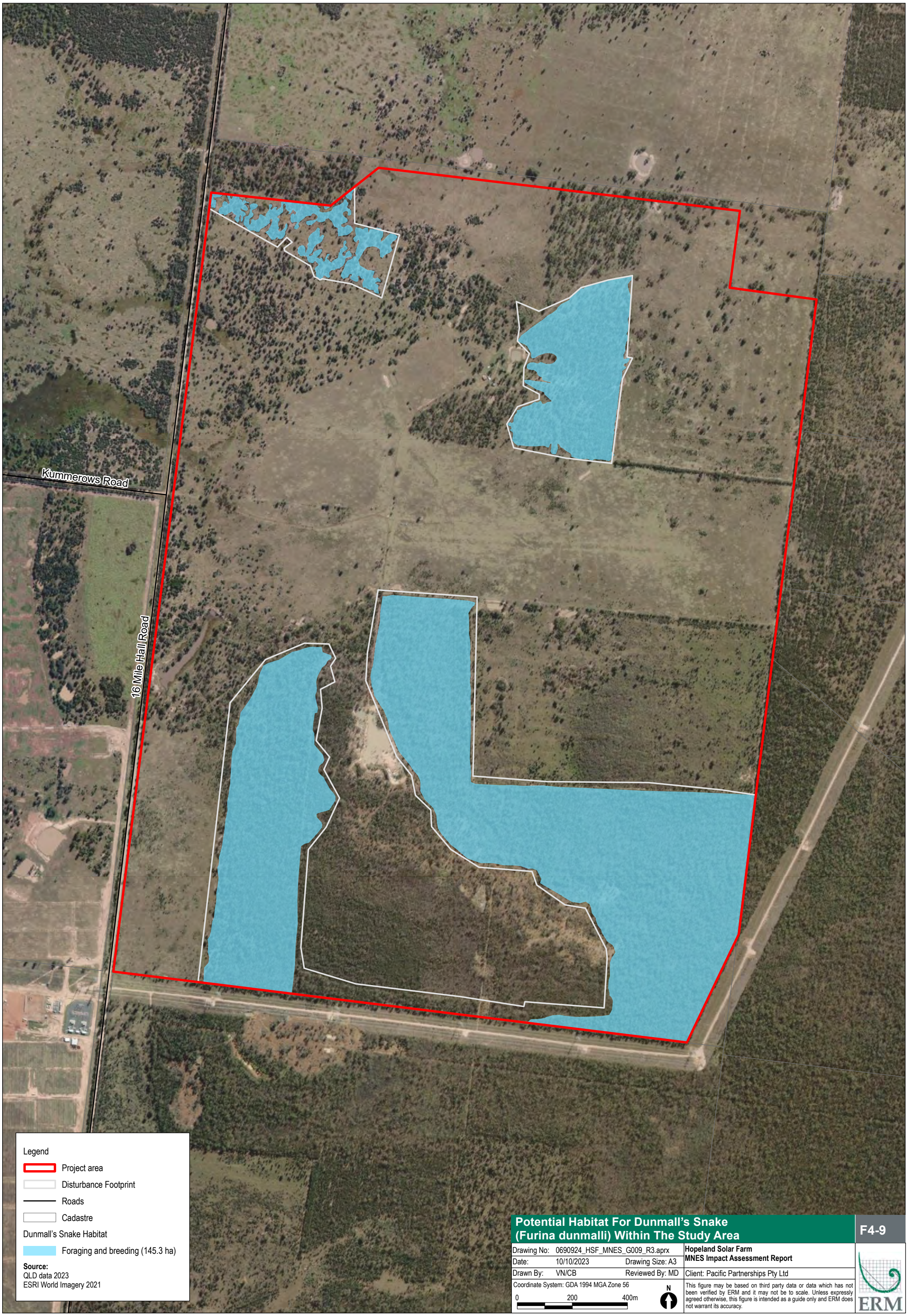
Dunmall's snake is listed as vulnerable under the EPBC Act. Dunmall's snake (*Furina dunmalli*) distribution in Queensland ranges from Yeppoon to Oakey, Glenmorgan and Inglewood in the south. Dunmall's Snake inhabits open forests, dominated by Brigalow (*Acacia harpophylla*), Wattles (*A. burowii, A. deanii, A. leiocalyx*), native Cypress (Callitris spp.) and/or Bulloak (*Allocasuarina luehmannii*), and woodlands on floodplains associated with deep, cracking clays and clay loam soils (Covacevich et al., 1988, Cogger et al., 1993). The species is thought to be nocturnal, seeking fallen timber and in soil cracks for shelter. Although a wide distribution range is known about the species, little is known regarding the species and is conceptualised that the species is uncommon within its limited range.

The Project Area contains two habitat types that may provide adequate habitat features for the species (remnant eucalypt open forest and brigalow (*Acacia harpophylla*) regrowth (TEC)). The remaining habitat types within the Project Area are deemed as generally unsuitable for the species. No historical records have been submitted with positive identification of the species within the Locality and during the May 2023 survey effort no individuals were observed, although habitat was present.

For the purposes of defining potential Dunmall's snake habitat, 145.3 ha of the Project Area has been classified as foraging and breeding habitat, associated with the following broad habitat types:

- Remnant eucalypt open forest
  - Associated commonly with, *Eucalyptus moluccana, Eucalyptus crebra*, and *Eucalyptus populnea* and scattered *Corymbia citriodora*.
- Brigalow (*Acacia harpophylla*) regrowth (TEC)

Dunmall's snake habitat has been mapped in Figure 4-9. Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as foraging and breeding habitat based on these vegetation communities. The fragmented patch of mapped Dunmall's snake habitat associated with the remnant open eucalypt forest in the north of the Project Area has limited habitat value for Dunmall's snake due to the isolation of this habitat type. There is no microhabitat elements in the cleared agricultural lands in the Project Area, as they lack required shelter components. It is unlikely that yakka skink would disperse across the cleared and regrowth habitats within the Project Area to utililise this habitat. Notwithstanding, the precautionary principle has been applied and given presence of suitable habitat elements in this patch it has been mapped as Dunmall's snake foraging and breeding habitat.



Potential Habitat For Dunmall's Snake (Furina dunmalli) Within The Study Area

F4-9

Drawing No:	0690924_HSF_MNES_G009_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

4.3.5.4 Brigalow woodland snail (Adclarkia cameroni)

The brigalow woodland snail is listed as endangered under the EPBC Act. The Brigalow Woodland Snail is endemic to south-east Queensland, with populations predominantly occurring in Dalby and Chinchilla. The species occurs in the 'Brigalow (*Acacia harpophylla* dominant and co-dominant)' ecological community, which currently listed as Endangered under the EPBC Act (TSSC, 2013), however it may also occur in the Coolibah–- Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt Bioregions' ecological community, also currently listed as Endangered under the EPBC Act (TSSC, 2011). Species distribution is severely fragmented with an area of occupancy of 76 m^2 (DotEE, 2016). The mobility, and therefore capacity for dispersal, of this species is very limited (TSSC, 2016b). Due to the nature of these fragmented habitats, they are subjected to several disturbances including clearing, cattle grazing and fire impacts. The species finds important refuge in the narrow Condamine River riparian corridor, particularly in areas that have seen extensive clearing for agricultural practices. The species utilises logs, leaf litter and other ground cover as habitat, feeding upon fungi, lichen, algae and other detritus/biofilm in forest debris.

The Project Area provides potentially suitable habitat features for the species, within one broad habitat type: brigalow (*Acacia harpophylla*) regrowth (TEC). Other habitats across the Project Area are generally unsuitable for the species to utilise and dwell within. Although the species is endemic to south-east Queensland no records have been noted of the species being observed within the locality. The May 2023 survey effort did not observe the species within the Project Area.

For the purposes of defining potential brigalow woodland snail habitat, 6.3 ha of the Project Area has been classified as foraging and breeding habitat, associated with broad habitat type Brigalow (*Acacia harpophylla*) regrowth (TEC).

Potential brigalow woodland snail habitat has been mapped in Figure 4-10.Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as foraging and breeding habitat based on these vegetation communities. Given the very limited mobility of this species, the actual utilsiation of this patch of Brigalow is unlikely, however given the condition and quality of the Brigalow TEC it has been considered as potential habitat and mapped as such.

Potential Habitat For Brigalow Woodland Snail (Adclarkia cameroni) Within The Study Area

F4-10

Drawing No:	0690924_HSF_MNES_G010_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

4.3.6 Birds

The survey effort identified a total of 19 species over the survey period in May 2023. No threatened species were observed or identified, however the Project Area contained small to medium sized nests, primarily being used by common woodland bird species such as noisy miner, torresian crow, pale-headed rosella, and striated honeyeater.

Only one species (excluding Migratory species, outlined in section 4.3.7) was assessed as 'Potential' to occur through the Likelihood of Occurrence assessment as described within Appendix A. The one species is:

- Painted honeyeater (*Grantiella picta*)

Given the nature of avian species having the ability to fly and have high mobility, they could occur throughout the Project Area, therefore their presence cannot be discounted. To delineate potential habitat areas that the species is most likely to utilize, habitat mapping is provided for species assessed as potential to occur in Figure 4-11.

4.3.6.1 Painted honeyeater (Grantiella picta)

The painted honeyeater is listed as vulnerable under the EPBC Act. The painted honeyeater has a sparse distribution along eastern Australia, occurring from the eastern Northern Territory and north-western Queensland to south-eastern Australia. Painted Honeyeater populations, particularly breeding populations, are most abundant inland of the Great Dividing Range, especially between the Grampians (Vic) and Roma (QLD) (Higgins et al., 2001). The species is known to migrate seasonally, in response to fruiting of Mistletoe plants (DoE, 2015a).

The Painted Honeyeater inhabits Mistletoe in eucalypt forests and woodlands, riparian woodlands of Black Box and River Red Gum, box-ironbark-yellow gum woodlands, woodlands dominated by paperbarks, acacia app., casuarina spp., Callitris spp., and occasionally farmlands and gardens (DoE, 2015a). Woodlands with a higher abundance of mature trees are of higher preference for Painted Honeyeater, as these contain a higher abundance of Mistletoes.

Breeding habitat for the Painted Honeyeater consists of Boree/Weeping Myall (*Acacia pendula*) woodlands, Brigalow (*A. harpophylla*) woodlands, box-gum woodlands, and box-ironbark forests on the inland slopes of the Great Dividing Range. Additional breeding habitats include forests and woodlands with high quantities of mistletoe and where parasitism rates are high, preferably remnant vegetation. The species typically nests in mature trees that are abundant with mistletoe, where the species may use the mistletoe as a nesting substrate.

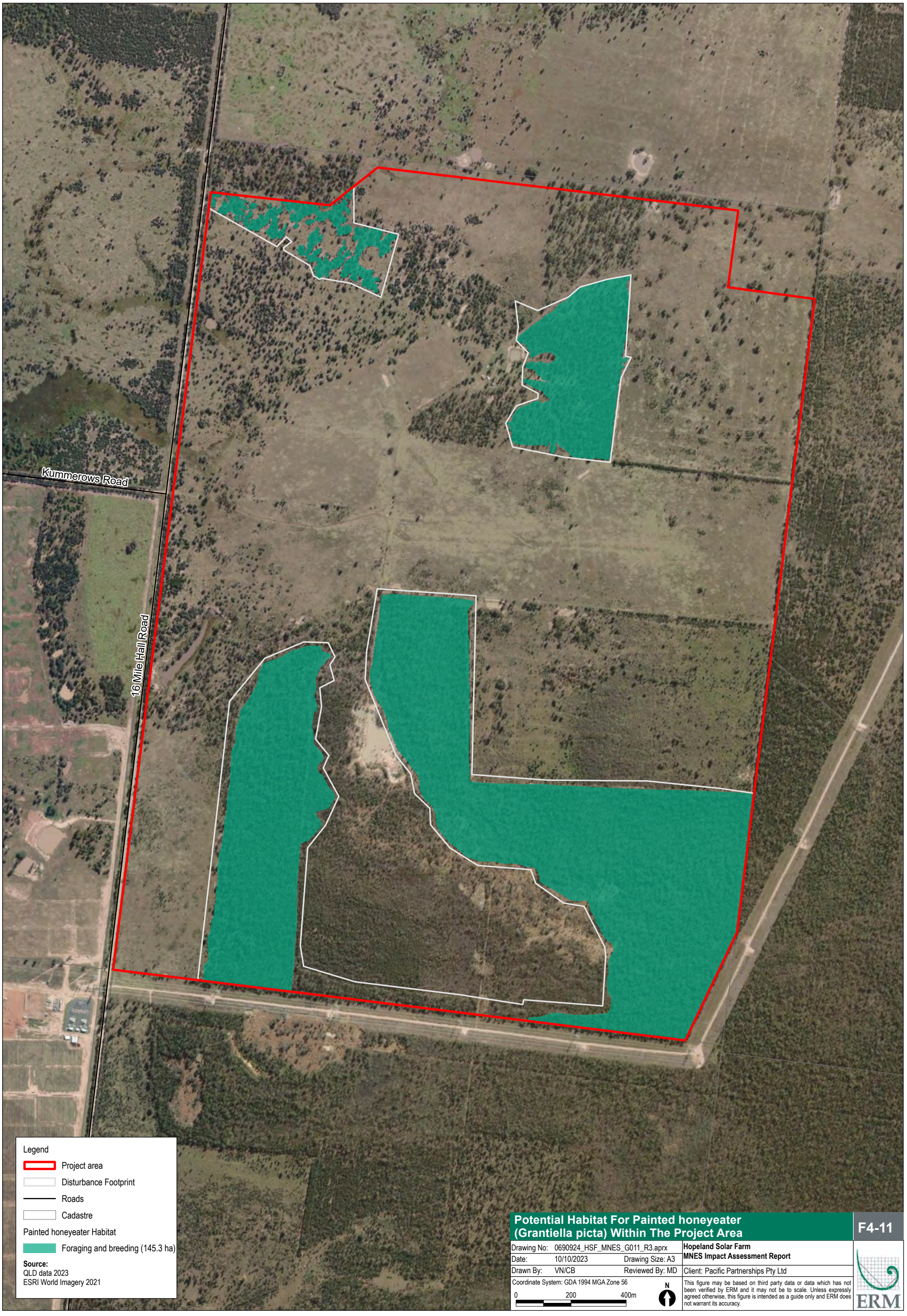
The Painted Honeyeater favours mistletoes of the genus *Amyema*, growing on forests and woodland eucalypts and acacias, for foraging and roosting habitat.

The Project Area contains potentially suitable habitat that the painted honeyeater can utilize, associated with broad habitat types: remnant eucalypt open forest, regrowth eucalypt woodland or open forest and brigalow (*Acacia harpophylla)* regrowth (TEC). The species has historical records within the locality, indicating that the species has potential to occur within the general area and within the Project Area. The May 2023 survey effort did not identify or observe any painted honeyeater individuals; however, suitable foraging resources (mistletoe) was identified throughout some habitat types.

This considered, the Project Area contains 145.3 ha of potential foraging and breeding habitat which includes:

- Remnant eucalypt open forest; and
- Brigalow (*Acacia harpophylla*) regrowth (TEC).

Painted honeyeater habitat has been mapped in Figure 4-11. Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities and where habitat is defined as foraging and breeding habitat based on these vegetation community.



Potential Habitat For Painted honeyeater (Grantiella picta) Within The Project Area

F4-11

Drawing No:	0690924_HSF_MNES_G011_R3.aprx		Hopeland Solar Farm MNES Impact Assessment Report
Date:	10/10/2023	Drawing Size: A3	
Drawn By:	VN/CB	Reviewed By: MD	Client: Pacific Partnerships Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

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ERM

4.3.7 Listed Migratory Birds

No EPBC Act listed migratory species were assessed as 'Known' or 'Likely' to occur within the Project Area through desktop and preliminary Likelihood of Occurrence assessment. Two migratory species were assessed as 'Potential' to occur throughout the Project Area as per the Likelihood of Occurrence assessment within Appendix A. The two migratory species are:

- White-throated needletail (*Hirundapus caudacutus)*
- Fork-tailed swift (*Apus pacificus)*

Given that these avian species' can occur throughout the Project Area due to their high mobility, their presence cannot be discounted.

4.3.7.1 White-throated needletail (Hirundapus caudacutus)

The White-throated Needletail is currently listed as Vulnerable under the EPBC Act, effective 4 July 2019. The White-throated Needletail (*Hirundapus caudacutus*) is a large swift measuring about 20 cm in length, with a robust, barrel-like body and a short, square tail, it has long pointed wings. The plumage is predominantly grey-brown, glossed with green. The throat and undertail are white.

The White-tailed Needletail often occur in large flocks over eastern and northern Australia, comprising approximately hundreds or thousands of birds (TSSC, 2019). The species is considered almost exclusively aerial, flying at varying heights to feed on airborne insects (i.e., beetles, cicadas, flying ants, bees and wasps, flies, termites, moths, locusts, and grasshoppers, TSSC, 2019). Within Australia, White-throated Needletail are known to roost in trees during their migration stopover (Carter 2020).

The White-throated Needletail is a seasonal visitor to Australia for the boreal winter, between the months of September to April. The species does not breed in Australia, as breeding grounds are located in the Northern Hemisphere, where egg laying occurs from late May to early June (Chantler 1999, cited in TSSC 2019). During September, the species arrives in Australia and migrates south to the Great Dividing Range in Queensland and NSW in October and November, usually arriving in the southern parts of their range (Victoria and Tasmania) in November (TSSC, 2019).

Whilst occasional aerial observations have been made for this species, the Project Area is unlikely to contain important foraging habitat for the species. Additionally, no threshold area for important habitat for this species can be determined at present and has not been identified in the species conservation advice (TSSC, 2019).

White-throated Needletail have potential to only fly aerially over the Project Area and in occasional flocks during the migratory period, being September to April, following storm fronts. The Project Area does not contain rainforests or elevated open forests with dense foliage that could be used for occasional roosting by the species. While potential flights over the Project Area may occur from time to time, only elevated areas are regarded as roosting habitat. Thus, potential habitat has not been mapped for this species, and so no subsequent impact area has been calculated.

4.3.7.2 Fork-tailed swift (Apus pacificus)

The Fork-tailed Swift (*Apus pacificus*) is currently listed as Marine and Migratory under the EPBC Act. The Fork-tailed Swift is a medium to large migratory bird, measuring a total length of 18-21 cm, with a wingspan of 40-42 cm and weighing approximately 30-40 grams. The migratory bird features a blackish colouration across the body with a white band across the rump, a white patch on the chin and throat.

The Fork-tailed Swift is a non-breeding migratory species in Australia, visiting all states and territories (Higgins, 1999). Within Queensland specifically, the species has scattered records across the Gulf Country and few records in Cape York Peninsula. The Fork-tailed Swift is widespread west of the Great Dividing Range, with the species commonly sighted along the line connecting Chinchilla and Hughenden.

Within Australia, the Fork-tailed Swift is almost exclusively aerial, particularly over inland plains, above foothills and coastal areas (Higgins, 1999). The species predominantly occurs over dry, open habitats, particularly riparian woodlands, tea-tree swamps, low scrub, heathland and/or saltmarsh. Foraging habitat for the Fork-tailed Swift consists of remnant, regrowth and non-remnant vegetation.

Due to the nature of the species, being predominantly aerial, no terrestrial habitat is mapped across the Project Area. Thus, potential habitat has not been mapped for this species, and so no subsequent impact area has been calculated.

5. PROPOSED ACTION ACTIVITIES AND POTENTIAL IMPACTS

The proposed action has the potential to impact the ecological values in the Project Area during the construction, operation, and decommissioning phases. The activities likely to result in potential ecological impacts are listed below for each phase. The impact assessments consider quantification of all three stages of the proposed action. A summary of potential disturbances to ecological values is summarised in Table 5-3, with avoidance, management and mitigation measures detailed in Section 6.

5.1 Design and Construction Phase Activities and Direct Impacts

The key activities likely to impact ecological resources during design and construction are:

- Layout optimisation to avoid environmental impacts to MNES habitat as much as possible while maintaining the viability of the proposed action;
- Vegetation clearing for new access tracks, site establishment, temporary construction compounds and laydown areas, borrow pits, water storages, a concrete batching plant, trenches for power and instrumentation cables, solar panels, and grid connections;
- Excavating trenches; and
- Construction traffic movements and plant operation.

Construction activities will result in a maximum disturbance to 480.8 ha (73%) of the Project Area, with most of the impacts occurring in areas of non-native or regrowth vegetation communities (Table 5-1). During the construction phase there is the potential for fauna entrapment and/or direct fauna mortality from falls and entrapment in trenches, artificial water storage or plant and equipment. Direct mortality from vehicle strike though unlikely on site, remains a remote possibility.

The proposed layout for the Project has resulted in the avoidance of most areas of highest ecological value and supporting habitat for MNES, with 100% of Brigalow TEC and 100% of remnant eucalypt woodland avoided and retained.

Table 5-1 Summary of Direct Impacts to Broad Habitat Types

Broad Habitat Type	Total area (ha)	Area disturbed (ha)	Area avoided (ha)	% disturbed	% avoided
Acacia, Allocasuarina and *Callitris* regrowth	50.2	49.0	1.2	97.6%	2.4%
Brigalow (*Acacia harpophylla*) regrowth (Non-TEC)	28.3	28.3	0.0	100.0%	0.0%
Brigalow (*Acacia harpophylla*) regrowth (TEC)	6.3	0.0	6.3	0.0%	100.0%
Cleared agricultural land	118.1	117.4	0.7	99.4%	0.6%
Cleared agricultural land with scattered Acacia regrowth and eucalypts	197.0	184.5	12.6	93.6%	6.4%
Maintained dwelling	2.4	2.3	0.1	94.8%	5.2%
Regrowth eucalypt woodland or open forest	114.8	99.3	15.5	86.5%	13.5%
Remnant eucalypt open forest	139.0	0.0	139.0	0.0%	100.0%
TOTAL	**656.2**	**480.8**	**175.4**	**73.3%**	**26.7%**

These areas make up the maximum clearing limits for each habitat type mapped and classified across the Project Area for the listed threatened species that have been assessed as having the potential to occur (Table 5-2).

The Project layout has avoided most of the higher quality foraging and breeding habitat for all listed MNES species, with impacts focused in areas classified as generally unsuitable for each species.

Table 5-2 Summary of MNES habitat disturbed and avoided.

Species	Habitat type	Total area (ha)	Area disturbed (ha)	Area avoided (ha)	% disturbed	% avoided
Koala	Foraging and breeding habitat	253.7	99.3	154.5	39.1%	60.0%
	Dispersal habitat	6.3	0.0	6.3	0.0%	100%
	Generally unsuitable	396.1	381.4	14.6	96.3%	3.7%
Grey-headed flying-fox	Foraging and breeding habitat	253.8	99.3	154.5	39.1%	60.9%
	Generally unsuitable	402.4	381.4	20.9	94.8%	5.2%
Painted honeyeater	Foraging and breeding habitat	145.3	0.0	145.3	0.0%	100.0%
	Generally unsuitable	510.9	480.7	30.2	94.1%	5.9%
Grey snake	Foraging and breeding habitat	6.3	0.0	6.3	0.0%	100.0%
	Generally unsuitable	649.9	480.8	169.1	74.0%	26.0%
Dunmall's snake	Foraging and breeding habitat	145.3	0.0	145.3	0.0%	100.0%
	Generally unsuitable	510.9	480.7	30.2	94.1%	5.9%
Yakka skink	Foraging and breeding habitat	139.0	0.0	139.0	0.0%	100.0%
	Generally unsuitable	517.2	480.7	36.5	93.0%	7.0%
Brigalow woodland snail	Foraging and breeding habitat	6.3	0.0	6.3	0.0%	100.0%
	Generally unsuitable	649.9	480.8	169.1	74.0%	26.0%
Corbens long-eared bat	Foraging and roosting habitat	253.8	99.3	154.5	39.1%	60.9%
	Generally unsuitable	402.4	381.4	20.9	94.8%	5.2%

5.2 Operational Activities

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

- Routine maintenance and servicing of solar panels, access tracks, electrical installations and infrastructure as required, which may result in:

- Vehicle mortality and incidents;
- Habitat loss (though on a considerably smaller scale than construction phase activities); and
- Habitat disturbance and potential hazardous materials exposure.

Operational phase activities, though longer in duration than those of construction phase activities will be of significantly lower intensity and can be effectively managed through the proposed mitigation measures detailed in Section 6. Operational activities are not expected to contribute to a significant impact to any MNES.

5.3 Decommissioning Phase Activities

If a decision was taken to decommission the proposed action, this would involve:

- Removal of solar panels and associated infrastructure, and disconnection from grid.
- Recycling or re-use of the PV modules and other infrastructure;
- Disposal of components;
- Stabilisation of land and soil remediation; and
- Revegetation/ rehabilitation works.

Removal of electrical cabling will be performed by excavating up buried cables and earthing network then collecting them in coils. The used cables will be sent for recycling and the excavated trenches will be backfilled with the existing soil within the Project Area, ground levelled, compacted, and returned to its pre-existing state. Decommissioning activities will be planned and implemented to avoid any additional environmental impacts to areas of retained MNES habitat, so will not contribute to the significance of impacts to MNES.

A summary of potential disturbances to ecological values is summarised in Table 5-3.

Table 5-3: Summary of Potential Impacts

Impact	Phase	Relevance to the proposed action
Clearing native vegetation and loss of habitat for native fauna	Construction	■ Can completely remove foraging habitat and potential breeding habitat for listed threatened fauna species assessed as 'Potential' to occur within the Project Area. ■ This has the potential to directly impact these species via habitat loss, fragmentation, and degradation. ■ Native vegetation cover does occur within the disturbance footprint, which means that some fauna species may be at risk from these impacts. ■ Threatened TEC's that are cleared are directly impacted via habitat loss. Clearing TEC may also have downstream effect on the TEC and its component species, such as habitat fragmentation or degradation. ■ Both TEC and threatened species habitat will be disturbed despite the avoidance measures undertaken through the design phase, which means that mitigation and management measures will be required.
Indirect impacts to species behaviour through creating barriers to movement and dispersal	Construction	■ Construction and operation of the solar farm is unlikely to result in complete fragmentation of habitat given the solar panels will be mounted above the ground, allowing movement of species across the natural ground surface. ■ Additional behavioural changes may occur because of short-term construction activities and machinery, creating barriers for species to move throughout the Project Area, however these are temporary in nature and dispersal can be maintained underneath panels ■ The current design layout for the solar farm includes vegetation clearing through the entire Project Area, with exception of a large patch of remnant eucalypt open forest. Proposed vegetation clearing will leave three large patches of remnant eucalyptus open forest broad habitat for listed threatened species to disperse throughout, and mobility is unlikely to be impeded to patches of retained native vegetation and habitat. ■ Some species in the Project Area are highly mobile and are unlikely to be significantly impeded by solar infrastructure (i.e. birds and bats), but others may be more vulnerable to this disturbance (i.e. koala, reptiles etc.).
Indirect impacts to adjacent habitat areas as a result of noise, dust, runoff, and erosion, including impacts to downstream environments	Construction and Operation	■ Movement of construction equipment and plant operations will result in excessive noise and dust causing potentially detrimental impacts to adjacent ecological communities. ■ Noise from construction activities have the potential to disturb and or influence breeding, roosting or foraging behaviour of native fauna. Literature illustrates that the consistency of noise is more important than volume, with irregular and unpredictable noise being more disruptive to wildlife (Jones et al., 2015), with irregular noise being commonly emitted during construction and decommissioning phases. ■ Dust generated from vehicle and machinery movements has the potential to smother vegetation adjacent to works, which has potential to inhibit plant growth and palatability of native fauna.

Impact	Phase	Relevance to the proposed action
Indirect impacts to adjacent habitat areas as a result of an introduction or spread or weed and pest species	Construction	■ Removal of vegetation during the construction phase will potentially introduce and/or spread weed and pest species throughout in the Project Area. This can result from foot movements, vehicle movement, and distribution / movement of vegetation. ■ Weed and pest species have the potential to negatively impact native flora and fauna communities through competition for resources and/or predation. ■ For example, lantana is known to be deleterious to native ecosystems by changing vegetation structure (by cluttering understoreys), outcompeting native species, and creating barriers for movement to some species.
Direct mortality or injury to native fauna during construction and operations	Construction and Operation	■ The peak traffic periods will be during the construction period with operational vehicle movements likely to be minimal. Although most fauna species are highly mobile (i.e. birds) and are unlikely to be at risk from vehicle collision, some species are more vulnerable (i.e. koala). ■ Excavations during the construction phase will pose a trapping hazard for amphibians, small reptiles, and small mammals that can trap animals in construction zones which can lead to mortality.
Fragmentation of connectivity areas	Construction	■ The Project Area is primarily already used for pastoral and cattle grazing purposes, having cleared vehicle tracks and man-made dams running throughout the Project Area. Despite the Project Area being already disturbed from agricultural practices, large areas have been mapped and identified as foraging and dispersal habitat for some listed threatened fauna species. ■ The proposed action footprint will directly result in clearing of vegetation that is used by the listed threatened species to enable construction of solar PV panels, vehicle tracks, and other associated infrastructure. This can result in fragmentation of important connectivity. ■ It must be noted however that the pre-existing land uses of the Project Area (pastoral and cattle grazing) has already disturbed and fragmented the surrounding habitat. ■ Despite this, mismanaged habitat clearing can severely impair connectivity throughout and development site.
Disturbance to MNES	Construction and Operations	■ Disturbance to MNES has been submitted in the impact assessment, in Section 0. Detailed significant impact assessments may be found in Appendix B

6. AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

As previously mentioned, ecological impact and disturbance mitigation will follow a two-stage process. The first stage of which, entails the design of solar panel layout based on avoidance of ground-truthed mapped habitat for MNES known, likely or potentially occurring in the Project Area.

6.1 Project Area selection

Careful considerations for the selection of the Project Area as an optimal location for the proposed action have been:

- The site is optimally located adjacent to the Western Downs Substation and within the Western Downs Renewable Energy Zone. This reduction in distance from the point of connection reduces the transmission infrastructure and vegetation clearing associated with the transmission line to be developed by another proponent;
- The location of the proposed action is located within close proximity to the Kogan Creek coal-fired power station and associated coal mining activities. The proposed action takes advantage of existing transmission and substation infrastructure associated with the Kogan Creek power station and will contribute to energy demand from the retirement of this facility.
- The site was deemed to not constitute prime agricultural land;
- The site is in a rural area with significant renewables and coal seam gas (CSG) development;
- The site is located away from townships decreasing the visual disruption related to development of the site;
- The project is located within a designated Renewable Energy Zone and aligns with the broader government commitment of Net Zero by 2050. Further delaying works will likely materially impact this goal;
- Prior to the selection of the site a flora and fauna desktop assessment including a review of MNES and matters of state environmental significance (MSES) was completed in 2017; and
- Field surveys of vegetation and habitat was completed in 2017 by ecologists from 28 South Pty Ltd. Their assessment of MNES identified through desktop survey and onsite validation of vegetation and habitats confirmed that the proposed action (clearing and construction of the PV power station and secondary actions) was unlikely to cause a Significant Impact on an MNES, and therefore the action was unlikely to be deemed a controlled action.

The Project Area is considered to be an optimal location for the development of a solar farm that avoids and minimises impacts on the environment and MNES. The historical and current agricultural land use on the Project Area has resulted in the majority of the high quality habitat for MNES to occur in fragmented patches and the along the southern boundary. The Project Area is in a rural area, that does not contain prime agricultural land, however given the land use zoning without the development of the proposed action it will likely continue to be used for cattle grazing and other farming activities. The continued use of the Project Area as an agricultural property will also likely continue to maintain the existing level of disturbance and threats to MNES from cattle grazing and the introduction of exotic grass cover and weeds. Given the existing land use and agricultural activities on the Project Area, it is unlikely that habitat quality and condition will improve to support MNES over time.

The surrounding landscape is dominated by similar land uses, as well as significant coal seam gas developments and other planned and existing renewable energy projects. The Project Area is also optimally located in close proximity to existing transmission and distribution infrastructure, requiring approximately 850m of new transmission line to connect into the existing Western Downs substation.

6.2 Design refinement to avoid potential impacts to MNES

As the Project has been progressed through the planning and design phase, the layout has been refined to avoid impacts to MNES as much as is practicable.

- Upon purchase of the site it was intended that the entire Project Area would be developed to maximise project yield due to its location for generation of solar power;
- Following issuance of the 28 South Report in 2017, the layout issued with the local government Development Approval was amended to avoid disturbing the full mapped extent of the MSES; which comprises predominantly Remnant eucalypt open forest. Avoidance of this area significantly impacted project yield which was accepted to reduce the potential environmental impact of the development and to avoid impacts to high value remnant eucalypt open forest that provides foraging and breeding habitat to MNES species;
- In April 2023, ERM conducted the required field studies to support this MNES Impact Assessment and EPBC Act referral. This fieldwork identified a potential area of Brigalow TEC. Following this fieldwork and subsequent mapping of the Brigalow TEC, through design revisions the layout was further updated to avoid this area and further reduce impact to MNES;
- Further reduction of developable area cannot be accommodated without eroding the feasibility and energy supply benefits of the PV power station, as the grid connection studies commenced in Q4 2022 were based on a specific yield and nameplate capacity to establish capacity. This capacity has been locked into the offtaker's forecast supply and is necessary to support planned decommissioning of grid-connected fossil fuel generated electricity.

Such habitat within the Project Area has been avoided as much as practicable through the design phase of the proposed action. Additionally, following the design phase (during the pre-construction phase) each location of proposed infrastructure will undergo detailed site-specific pre-clearance surveys to inform micro-sitting and further avoidance of ecological values as part of the final design of the proposed action.

The design refinements have progressively reduced the area of impact to MNES habitat to respond to the identification of biodiversity values across the Project Area (Figure 6-1). As the Project Area is an optimal site for the development of a solar farm, considering the maximum solar panel yield across the entire lot there is a potential for all areas of MNES habitat to be impacted. As the design has been refined, the proposed action will avoid all areas of highest quality habitat for MNES, with impacts limited to areas of regrowth open eucalypt forest providing potential habitat for Koala and Corben's Long-eared Bat only.

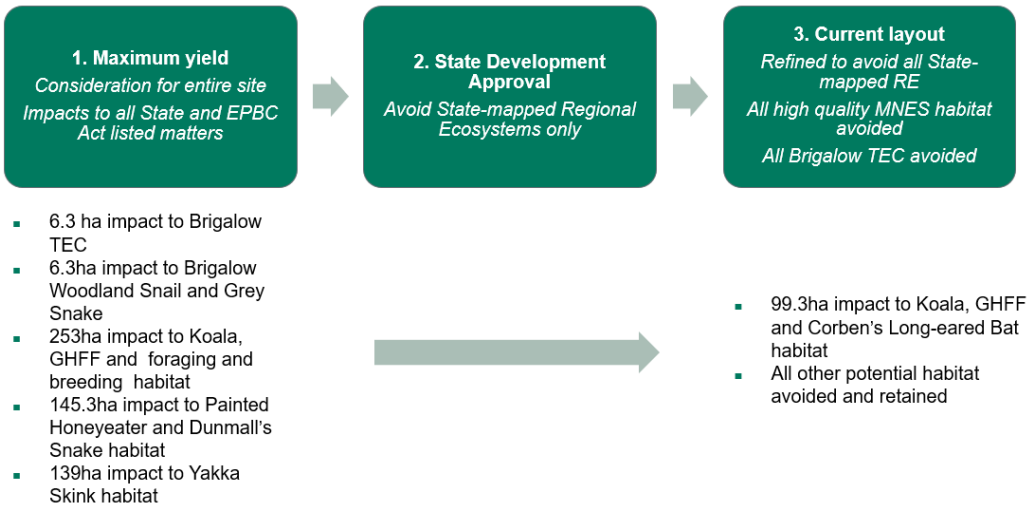

Figure 6-1 Design refinement process and habitat avoidance

The second stage of disturbance mitigation deals with the potential disturbances that may occur despite the avoidance measures undertaken in Stage 1. These potential disturbances will be managed and mitigated in a manner consistent with the approaches for solar farm activities.

Briefly, the disturbance mitigation and management measures will include:

- Allowance for fencing design to include elements of fauna connectivity such as gaps underneath fencing or pole crossing structures to allow for movement of fauna into and out of the Project Area to utilise areas of retained foraging, breeding and dispersal habitat;
- Preparation and implementation of a Vegetation Management Plan (VMP), Fauna Management Plan (FMP), Weed and Pest Animal Management Plan (WPAMP);
- Adoption of a biosecurity protocol that involves the requirement of vehicle weed washdowns and weed monitoring and reporting;
- Clear demarcating of clearing boundaries and no-go areas;
- Erosion and sediment control measures;
- Measures to minimise disturbance of noise, dust, and light; and
- Reducing risk of vehicle collision with fauna by implementing vehicle speed restrictions and signage.

These, and additional measures are detailed in Table 6-1.

Table 6-1 Management and Mitigation Measures

Impact	Hierarchy	Relevance to Identfied Impacts
Clearing native vegetation and loss of habitat for native fauna	Avoidance	■ The two-stage impact and disturbance mitigation process has been implemented. Impacts to good quality native habitat and vegetation will be avoided, then minimised through the design and micro-sitting stages. ■ Areas that have been identified to contain threatened ecological communities (TEC) and foraging and dispersal habitat that support listed threatened flora and fauna species will be avoided at design and micro-sitting stages. ■ Key microhabitat features such as tree hollows, fallen logs, rocky escapements provide key ecological functions to birds, arboreal and terrestrial mammals, reptiles, birds, and microbats. The habitats where these features are most abundant, brigalow (TEC) and remnant eucalypt open forest, are completely avoided by the proposed action which will assist in retaining key microhabitat features within the Project Area.
	Minimise	■ Any vegetation clearing, regardless of its suitability for listed threatened species will undergo a pre-clearance assessment of to minimise risk of unforeseen impact to threatened species. ■ Where risks are identified from pre-clearance assessments, a qualified fauna spotter-catcher will undergo searches immediately prior to clearing of any vegetation for presence of any fauna species. If fauna species or nesting sites are detected, the qualified fauna spotter catcher will assess and conduct the most appropriate method at the time to avoid or minimise impacts from clearing. ■ To minimise further disturbance to vegetation that is set to not be cleared, vehicles and associated equipment / machinery will be confined to approved and zoned work areas. ■ Construction workers will be made aware of management requirements through site inductions and regular check ins during the construction phase. The site inductions will delineate potential risks and possible impacts to the surrounding environment, vegetation clearing requitements, no go zones, methods to minimise, avoid and mitigate potential impacts that will be relevant to onboarding workers and contractors. ■ A VMP will be implemented to ensure that clearing is undertaken in accordance with legislative standards and requirements. ■ Where pre-clearance assessments find key microhabitat features within unavoidable clearance zones, these will be inspected for fauna, and relocated, or mimicked in the nearest suitable adjacent habitat to retain that microhabitat function in the broader ecosystem. ‘Mimicked’ refers to the utilisation of nest boxes to replace hollows, for example.
Indirect impacts to species behaviour through creating barriers to movement and dispersal	Manage	■ Construction activities and associated machinery will occur only within clearly zoned work areas, and not enter/affect any adjacent vegetation areas. ■ Before works occur micro-sitting will occur to remove / relocate any fauna species within the work zoned areas to avoid impact. ■ If fauna species are to be spotted on site during the construction phase a qualified fauna spotter catcher is to be contacted to relocate the individual. ■ Fauna management measures will be implemented during construction to reduce any impacts associated with fauna entrapment or interactions with construction activities. This will include measures in a fauna management plan to provide for the capture and release of any fauna that are encountered during construction activities.

Impact	Hierarchy	Relevance to Identfied Impacts
Indirect impacts to adjacent habitat areas as a result of noise, dust, runoff, and erosion, including impacts to downstream environments	Minimise	■ Dust will be controlled via engineering controls on machinery and dust suppression tools will be utilised through the entire construction phase of the proposed action. ■ Where needed, a qualified fauna spotter-catcher will undergo searches immediately prior to clearing of any vegetation for presence of any fauna species. If fauna species or nesting sites are detected, the qualified fauna spotter catcher will assess and conduct the most appropriate method at the time to avoid or minimise impacts. ■ Site inductions will delineate to workers and contractors the potential impacts of dust emissions and provide mitigation / management measures that will be implemented. ■ All vehicles and plant machinery will comply with site-specific speed limits to minimise dust generation. ■ Sediment and erosion controls will be implemented across the construction site in accordance with the Queensland Erosion and Sediment Control Plan, and the Contractor's erosion and sediment control procedures. ■ During construction measures will be implemented to minimise impact natural drainage (e.g., disturbing channel contours).
Indirect impacts to adjacent habitat areas as a result of an introduction or spread or weed and pest species	Avoidance	■ A biosecurity plan will be developed and implemented for the proposed action. The requirements of the property biosecurity plan will be adhered, ensuring measures alike vehicle wash downs and weed certification are conducted by all construction vehicles / plan machinery. ■ Access to the landholder's property will not occur unless authorised under a land use agreement. ■ Construction workers and contractors will be advised of biosecurity threats for the proposed action.
	Minimise	■ Material that is imported from off site will be assessed for weed seeds and ensure it is free of contamination, disease, and invasive weeds. A Weed Hygiene Declaration will be implemented to ensure no contamination. ■ WONS and Restrictive invasive species if identified will be monitored within the Project Area to ensure they are controlled. ■ Site inductions will delineate to construction workers and contractor's biosecurity requirements, potential risks from weed and pest species, and mitigation and management measure that will be conducted on site.
Direct mortality or injury to native fauna during construction and operations	Minimise	■ Where identified as needed, a qualified fauna spotter-catcher will undergo searches immediately prior to clearing of any vegetation for presence of any fauna species. If fauna species or nesting sites are detected, the qualified fauna spotter catcher will assess and conduct the most appropriate method at the time to avoid or minimise impacts. ■ Site inductions will delineate to construction workers and contractors' potential impacts to native fauna from construction activities, reporting requirements, and mitigation and management measures that need to be implemented. ■ No driving will occur in unauthorised areas and driving speeds will be limited implemented. ■ Barbed-wire fencing will be minimised as much as practical, and where needed barb-wire have bat tags installed during construction or operation phases. ■ Injured, sick or dead fauna will be recorded and reported, for the duration of construction and operation phases. A qualified fauna spotter catcher will carry out impacted fauna reporting during the construction phase. Where injured or sick fauna are detected, individuals will be taken to the nearest wildlife carer or veterinarian if practical. ■ An FMP will be prepared and implemented, that details further measures to mitigate impact to fauna.

Impact	Hierarchy	Relevance to Identfied Impacts
Fragmentation of connectivity areas	Mitigate	■ Non-work zones will be clearly marked to ensure clearing only occurs in designed footprint and does not create unnecessary fragmentation. ■ Fencing will include fauna passage elements designed to allow for Koala movement across the Project Area, such as crossing poles or gaps underneath fencing to allow for movement. ■ Solar panel arrays will be of a sufficient height and spacing to allow for the natural ground surface to be maintained with grass cover and for movement of Koala underneath the panel areas. Given the solar panel arrays will be on a tracking system, the minimum distance between natural ground level and the PV module ranges from 0.3 – 0.9m in height (Figure 6-2). The spacing between lengths of PV arrays will be between 6-9m, providing sufficient areas of natural ground over which Koalas can traverse if they occur within the Project Area.
	Minimise	■ Areas that have been cleared and are no longer required will be allowed to naturally revegetate. Revegetation works will in general will be limited to natural regrowth.
Disturbance to MNES	Avoid	■ Areas of identified threatened flora and fauna habitat will be avoided and minimised at design and micro-sitting phases. ■ 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. ■ The proposed action will aim to retain and maintain remnant eucalypt open forest that potentially contributes to listed threatened fauna species foraging and dispersal habitat. ■ 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.
	Minimising	■ Wherever practical, signage should be erected to increase awareness of potential habitat of listed threatened species within the Project Area. ■ Speed limits will be enforced on all access roads, limited to 40 km/hour across the Project Area. ■ All vehicles plant, equipment and machinery will remain within the designated access tracks. ■ Vegetation will only be removed that has been approved to be cleared. ■ A qualified fauna spotter-catcher will undergo searches immediately prior to clearing of any vegetation for presence of any fauna species. If fauna species or nesting sites are detected, the qualified fauna spotter catcher will assess and conduct the most appropriate method at the time to avoid or minimise impacts. ■ 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).

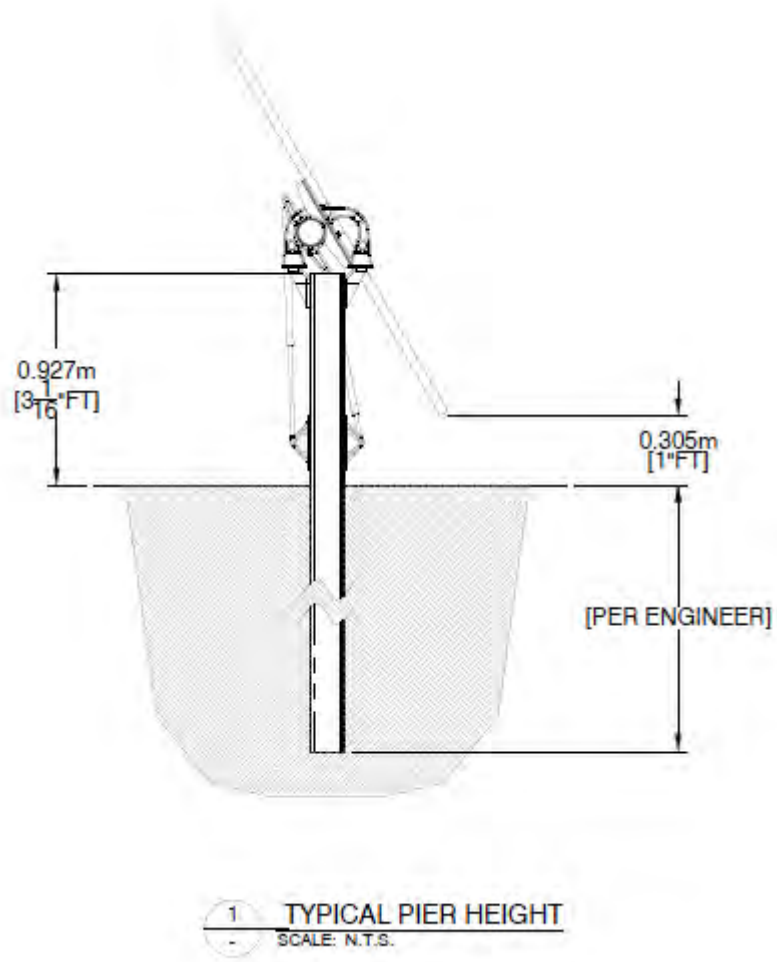

Figure 6-2 Typical cross section for tracker system PV array

7. IMPACT ASSESSMENTS

7.1 MNES Impact Assessment

The significance of impacts to MNES are determined against the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (SIG 1.1) (DoE, 2013), taking into account the controls and mitigation measures in Section 6. Eight species and one TEC were identified as known, likely or as having the potential to occur in the Project Area and the significance of the proposed actions impact to these MNES are assessed against the SIG 1.1 in Appendix B. Table 7-1 below summarises these results and displays the habitat disturbance (in hectares) for each MNES habitat according to the disturbance footprint devised by the proponent.

Table 7-1 MNES Significant Impact Assessment

Species	Potential Habitat Within the Project Area	Potential Habitat in Disturbance Footprint	Comments	Significant Impact Triggered?
Brigalow (*Acacia harpophylla*) dominant to co-dominant	6.3 ha	0 ha	The Brigalow TEC is known to occur on the Project Area and is distributed in several patches in the north-west of the Project Area, totalling 6.3 ha. Disturbance to this TEC has been avoided. Where Brigalow vegetation is impacted the patches do not meet the required condition thresholds or key diagnostic criteria to be classified as a TEC. Under the Conservation Advice for Brigalow TEC, patches that are less than 0.5ha in size or have greater than 50% exotic species in the ground cover do not meet the required patch size or condition requirements under the key to be classified as a TEC. As such, impacts to Brigalow vegetation communities in the Project Area will not cause a significant impact, as impacted patches that are impacted do not meet the requirements to be considered a TEC under the Conservation Advice and all areas that meet the TEC thresholds have been avoided.	Unlikely
Koala	253.8 ha foraging and breeding habitat 6.3 ha dispersal habitat	99.3 ha breeding and foraging habitat	The koala is considered as having the potential to occur in the Project Area, despite no observations or signs of the species during field surveys and only a single historical record within 10km of the Project Area. Potential habitat for this species has been mapped on Figure 4-3. This habitat was deemed to constitute potential habitat for koala given it contains eucalypt open forest and woodlands and given the lifetime of the proposed action, koalas may potentially and occasionally utilise the Project Area. The proposed action will retain the majority of the identified koala foraging and breeding habitat, with 154.5 ha located within the avoidance area. The proposed action will result in 99.3 ha of potential breeding and foraging to be disturbed, in the form of regrowth open eucalypt forest. The location of the Project Area in the surrounding disturbed landscape dominated by agricultural land use to the west limits the value of the site for dispersing koalas. There are large areas of retained eucalypt open forest and woodland to the south and east of the Project Area, with limited koala foraging and breeding habitat to the west.	Unlikely
Painted honeyeater	145.3 ha	0.0 ha	The painted honeyeater is considered as having the potential to occur in the Project Area. Potential habitat for this species has been mapped on Figure 4-11. All of this habitat is avoided by the proposed action. Due to the lack of evidence to suggest the species occurs in the Project Area, and the low amount of potential habitat that may be disturbed, it is unlikely that the proposed action will result in a significant impact on the painted honeyeater.	Unlikely

Species	Potential Habitat Within the Project Area	Potential Habitat in Disturbance Footprint	Comments	Significant Impact Triggered?
Grey-headed flying fox	253.8 ha	99.3 ha	The grey-headed flying-fox is considered as having the potential to occur in the Project Area. Potential habitat for this species has been mapped on Figure 4-5. Most of this habitat is avoided by the proposed action (39.1 %), with only 99.3 ha in the disturbance footprint. Any population that may occur in the Project Area is also considered unlikely to be a part of a nationally important population and there are no known camps within the Project Area Due to the lack of evidence to suggest the species occurs in the Project Area, and the low amount of potential foraging habitat that may be disturbed, it is unlikely that the proposed action will result in a significant impact on the grey-headed flying-fox.	Unlikely
Corben's long-eared bat	253.8 ha	99.3 ha	Corben's long-eared bat is considered as having the potential to occur in the Project Area. This species' presence cannot be ruled out, as suitable habitat exists in the Project Area in the form of remnant and regrowth open eucalypt forest. The area of remnant eucalypt open forest in the Project Area contains potential habitat that could support breeding and foraging for Corben's long-eared bat and these habitat features are limited in other broad habitat types in the Project Area. The proposed action avoids all areas of remnant open eucalypt forest, with impacts limited to areas of generally unsuitable habitat for Corben's Long-eared Bat or lower quality regrowth eucalypt open forest that has reduced habitat values. Due to the above, the species has been considered conservatively, and has habitat mapped on Figure 4-6. Most of this habitat is avoided by the proposed action (60.9 %), with 99.3 ha in the disturbance footprint.	Unlikely
Grey snake	6.3 ha	0.0ha	The grey snake is considered to have the potential to occur in the Project Area. Potential habitat for this species has been mapped on Figure 4-7. This habitat is avoided by the proposed action. Due to the lack of evidence to suggest the species occurs in the Project Area, and the low amount of potential habitat that may be disturbed, it is unlikely that the proposed action will result in a significant impact on the grey snake.	Unlikely
Yakka skink	139 ha	0.0 ha	The yakka skink is considered as having the potential to occur in the Project Area. Potential habitat for this species has been mapped on Figure 4-8. All of this habitat is avoided by the proposed action. Due to the lack of evidence to suggest the species occurs in the Project Area, and the low amount of potential habitat that may be disturbed, it is unlikely that the proposed action will result in a significant impact on the yakka skink.	Unlikely.
Dunmall's snake	145.3 ha	0.0 ha	Dunmall's snake is considered to have the potential to occur in the Project Area. Potential habitat for this species has been mapped on Figure 4-9. All of this habitat is avoided by the proposed action.	Unlikely

Species	Potential Habitat Within the Project Area	Potential Habitat in Disturbance Footprint	Comments	Significant Impact Triggered?
			Due to the lack of evidence to suggest the species occurs in the Project Area, and the low amount of potential habitat that may be disturbed, it is unlikely that the proposed action will result in a significant impact on the Dunmall's snake.	
Brigalow woodland snail	6.3 ha	0.0 ha	The brigalow woodland snail is considered as having the potential to occur in the Project Area. Potential habitat for this species has been mapped on Figure 4-10. This habitat is avoided by the proposed action. Due to the lack of evidence to suggest the species occurs in the Project Area, and the low amount of potential habitat that may be disturbed, it is unlikely that the proposed action will result in a significant impact on the brigalow woodland snail.	Unlikely

7.2 Transmission line cumulative impacts

The required transmission line to connect the proposed action to the Western Downs substation to support the Hopeland Solar Farm, however this will be delivered separately by another proponent and subject to a separate assessment under the EPBC Act. The alignment of the transmission line will be determined by the other proponent, however based on the location of the connection to the existing Western Downs substation, the distance of the connection is approximately 850m. Assuming a maximum 60m easement will be required, this will result in a total disturbance footprint of approximately 5ha.

This small area of additional impact is not considered to have a significant cumulative impact to MNES associated with the proposed action.

8. CONCLUSION

To assess the potential impacts to ecological values associated with the proposed action, an ecological assessment was undertaken to determine the ecological values within the Project Area. The ecological assessment to date has included one four-day field investigation undertaken in May 2023. The ecological assessment involved a desktop assessment using various publicly available databases, mapping, aerial imagery, and publicly available ecological assessment reports from other proposed actions in the vicinity if the Project Area.

The Project Area is approximately 656 ha in size and has been ground-truthed to comprise of 77.7 % non-remnant or regrowth vegetation. Habitat within the Project Area is predominantly in moderate to low condition, due to disturbances from its agricultural history and established invasive flora species. Habitats within the Project Area have been delineated into seven broad vegetation communities and habitats, which are (excluding 2.4 ha of maintained dwellings):

- Remnant eucalypt open forest (139 ha);
- Regrowth eucalypt woodland or open forest (114.8 ha);
- Cleared agricultural land with scattered Acacia regrowth and eucalypts (197 ha);
- Brigalow (*Acacia harpophylla*) regrowth (TEC) (6.3 ha);
- Brigalow (*Acacia harpophylla*) regrowth (Non-TEC) (28.3 ha);
- *Acacia*, *Allocasuarina* and *Callitris* regrowth (50.2 ha);
- Maintained dwelling (2.4 ha)
- Cleared agricultural land (118.1 ha).

Ten listed threatened species and two migratory species were determined as potentially occurring in the Project Area based on the presence of suitable habitat and overlap of distribution with the Project Area. Due to this, potential future presence of these species cannot be excluded, despite no observations or evidence of the species inhabiting the Project Area in recent years, or during the May field investigation.

One EPBC Act listed Threatened Ecological Community (TEC), Brigalow (*Acacia harpophylla*) dominant to co-dominant was confirmed to occur in the Project Area. No other EPBC Act listed TECs were considered as known, likely or potentially occurring in the Project Area.

Potential impacts from construction, operational, and decommissioning phases have been identified and evaluated, with numerous proposed management measures to avoid, minimise and mitigate impacts. A significant process is that of pre-clearance surveys prior to construction of the proposed action to support micro-sitting and adjustments of infrastructure to avoid further impact to ecological values of the Project Area.

Based on the development footprint (479.1 ha), the proposed action will lead to:

- A maximum disturbance to 73% of the Project Area, with most of the impacts occurring in areas of non-native or regrowth vegetation communities.
- The clearing of up to 99.3 ha of potential koala foraging and breeding habitat (39.1% of potential foraging and breeding habitat in the Project Area);
- The clearing of up to 99.3 ha of potential grey-headed flying-fox foraging and breeding habitat (39.1% of potential foraging and breeding habitat in the Project Area);
- The clearing of up to 99.3 ha of potential Corbens' long-eared bat foraging and breeding habitat (39.1% of potential foraging and breeding habitat in the Project Area);

The proposed layout for the Project has resulted in the avoidance of most areas of highest ecological value and supporting habitat for MNES, with 100% of Brigalow TEC and 100% of remnant eucalypt open forest avoided and retained.

Impact assessments were undertaken against the relevant MNES impact assessment guidelines under the EPBC Act which concluded:

- That the removal of 99.3 ha of potential foraging and breeding Koala and Corben's Long-eared Bat is unlikely to result in a significant impact to these species given no evidence of utilisation of the Project Area from field surveys and historical records, the avoidance of all areas of highest quality foraging and breeding habitat and the maintenance of dispersal opportunities across the landscape and connectivity to surrounding areas of habitat
- The proposed action is unlikely to result in a significant residual impact to grey-headed flying-fox, painted honeyeater, grey snake, Dunmall's snake, yakka skink, brigalow woodland snail and the brigalow threatened ecological community.

Management and mitigation measures have been proposed to further reduce potential impacts and will include:

- Design elements to be included in solar array layout to allow for fencing design to include elements of fauna connectivity such as gaps underneath fencing or pole crossing structures to allow for movement of fauna into and out of the Project Area to utilise areas of retained foraging, breeding and dispersal habitat;
- Preparation and implementation of a Vegetation Management Plan (VMP), Fauna Management Plan (FMP), Weed and Pest Animal Management Plan (WPAMP);
- Adoption of a biosecurity protocol that involves the requirement of vehicle weed washdowns and weed monitoring and reporting;
- Clear demarcating of clearing boundaries and no-go areas;
- Erosion and sediment control measures;
- Measures to minimise disturbance of noise, dust, and light; and
- Reducing risk of vehicle collision with fauna by implementing vehicle speed restrictions and signage.

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APPENDIX A LIKELIHOOD OF OCCURRENCE

1. LIKELIHOOD OF OCCURRENCE

1.1 Methodology

Consistent with the accepted approach for biodiversity assessment, a likelihood of occurrence assessment was undertaken, informed by desktop sources and the results of the field survey. Desktop sources identified a number of fauna and flora species and ecological communities listed under the EPBC Act, Queensland NC Act that have been recorded previously or are predicted to occur within an approximately 10 km^2 buffer centred on the Project Area. The likelihood of occurrence approach refines the desktop generated list using site-specific and specific-species habitat information. Desktop sources are indicative only and likelihood rankings, particularly in regard to the presence of preferred habitat, are conservative. The assessment ranks the likelihood of the species occurring within the Project 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 applied are outlined in Table 1-1.

Table 1-1 Likelihood of Occurrence Criteria

	Preferred habitat exists	Suitable habitat exists[2]	Habitat does not exist[3]
Recent[1] records within the Project Area	Known	Known	Known
Recent records in the Locality[2]	Likely	Potential	Unlikely
No records within the Project Area, but the Project Area is within known distribution	Potential	Unlikely	Unlikely
No records in the Project Area, and the Project Area is outside of distribution	Unlikely	Unlikely	Unlikely

1. *Recent records are those that have been recorded in the last 20 years*
2. *Habitat may be considered suitable, 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.*
3. *Based on sources reviewed and/or field survey results.*
4. *'Locality' refers to a 10 km^2 buffer around the Project Area and is inclusive of the Project Area.*

1.2 Flora and Fauna

1.2.1.1 Threatened Species

A total of **53** MNES were considered in the LoO Assessment, including **37** listed threatened, **11** listed migratory species and **5** ecological communities. No listed threatened species were assessed as known or likely to occur in the Project Area. Threatened/migratory species are considered known to occur in the Project Area, none are considered as likely to occur, and **10** are considered as having the potential to occur. The remaining species are considered unlikely to occur in the Project Area. Species that are MNES or MSES considered as known, likely or as having the potential to occur in the Project Area are presented in Table 1-2 below.

Threatened ecological communities were verified through field surveys and only one Brigalow (*Acacia harpophylla* dominant and co-dominant) was confirmed to occur in the Project Area.

Table 1-2 Threatened Species with the Potential to Occur in the Project Area

Scientific Name	Common name	NC Act	Comm. EPBC Act
Potential			
Grantiella picta	painted honeyeater	VU	VU
Hirundapus caudacutus	white-throated needletail	VU	VU, Mi
Apus pacificus	fork-tailed swift	SL	Mi
Phascolarctos cinereus	koala	EN	E
Pteropus poliocephalus	grey-headed flying-fox	VU	VU
Hemiaspis damelii	grey snake	EN	E
Egernia rugosa	yakka skink	VU	VU
Furina dunmalli	Dunmall's snake	VU	VU
Adclarkia cameroni	brigalow woodland snail	VU	E
Nyctophilus corbeni	Corben's Long-eared Bat	VU	VU

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Birds						
Calidris ferruginea	Curlew Sandpiper	CE	CE,MI,MA	No	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also 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**: Does not breed in Australia. **Foraging habitat**: Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated salt flats **Roosting habitat:** Curlew Sandpipers generally roost on bare dry 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 (Higgins & Davies 1996)	**Unlikely to occur.** ■ SPRAT “may occur” PMST “may occur”. ■ There are drainage lines present on site, however no watercourses are present. ■ No records of the species within the locality of the Site.

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Erythrotriorchis radiatus	Red Goshawk	E	V	Yes	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 forest where they meet grassland, cleared land, roads or watercourses. Avoids very dense and very open habitats and has a large home range. This species prefers forest and woodland with a mosaic of vegetation types, large prey populations (birds), and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins.	**Unlikely to occur** ■ SPRAT "habitat may occur" PMST "may occur". ■ Study area is directly adjacent large eucalyptus woodland with suitable habitat complexity; however these elements are absent from the Study Area ■ No records within the locality, the closest record is located 17 kilometres to the north.
Rostratula australis	Australian Painted Snipe	E	E	No	Species uses 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*). The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber. **Breeding habitat:** Australian Painted Snipe breeding habitat requirements may be quite specific: shallow	**Unlikely to occur** ■ No records exist within the Site area / locality ■ SPRAT "habitat likely to occur" PMST "likely to occur" ■ No field observations

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					wetlands with areas of bare wet mud and both upper and canopy cover nearby. **Foraging habitat:** The Australian Painted Snipe loafs on the ground under clumps of lignum, tea-tree and similar dense bushes (Marchant & Higgins 1993). This species has been recorded foraging under clumps of tea-trees (Leach et al. 1987) but most records are from daytime roost sites and the foraging habitat requirements of this species are not well understood and may be quite specific.	
Botaurus poiciloptilus	Australasian Bittern	E	E	No	The preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate. The species has been recorded to be distributed among threated ecological communities, such as; Littoral rainforest and coastal vine thickets in eastern Queensland, temperate highland peat swamps on sandstone, thrombolite (microbial) community of coastal freshwater lakes of the swan coastal plain and	**Unlikely to occur** ■ SPRAT “Habitat unlikely to occur” PMST “May occur”. ■ No records in the locality ■ Study area does not have any areas of inundation from freshwater, it comprises of one dam however is unlikely to inhabit species.

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					brackish lake, uplands wetlands of the new England tablelands, and swamps in the Fleureu peninsula.	
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	Yes	**Foraging habitat:** South-eastern Glossy Black-Cockatoos rely on nine species of She-oaks (Allocasuarina spp. and Casuarina spp.) for feeding. In south-east Queensland and north-east New South Wales, they show preference for Black She-oak (A. littoralis) and Forest She-oak (A. torulosa), although there are also records of them feeding on Coastal She-oak (C. equisetifolia), and to a lesser extent River She-oak (C. cunninghamiana) and Swamp She-oak (C. glauca) during limited times of the year **Breeding habitat:** Majority of nesting hollows are within narrowed-leaved ironbarks (*Eucalyptus crebra*), Blue-leaved ironbark (*E. nubila*) and red gum (*E. blakely*). Literature additionally illustrates nest hollow traits that see more South-eastern Glossy Black-Cockatoo utilising them for breeding, those nest hollow traits include; >8m above ground, located in branches >30 cm in diameter, branch or stem no more than a 45 degree angle from vertical, and a minimum entrance diameter of >15 cm.	**Unlikely to occur** ■ SPRAT "Habitat likely to occur" PMST "May occur". ■ Has one known record / sighting with the locality ■ Study area and surround locality present suitable foraging and breeding habitat ■ Study Area lacks appropriately sized hollows ■ No evidence of feeding (orts) or species observed
Grantiella picta	Painted Honeyeater	V	V	Yes	The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, Callitris, and trees on	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "Known to occur"

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips (Garnett et al., 2011), although it breeds in quite narrow roadside strips if ample mistletoe fruit is available	■ Records exist within the locality – closest 3km to the north east. ■ Marginal foraging habitat occurs in the Study Area, however preferred foraging associated with mistletoes was low.
Stagonopleura guttata	Diamond Firetail	V	V	No	Diamond firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees (Higgins et al. 2007). They prefer areas with relatively low tree density, few large logs, and little litter cover but high grass cover.	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records in study area or locality ■ Habitat exists within study area / locality
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	V	No	Brown treecreepers (south-eastern) occupy dry open eucalypt forests and woodlands (Bounds 2019; Ford et al. 2021). The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests and woodlands subject to periodic inundation, e.g., river red gum (Eucalyptus camaldulensis) woodlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses in the upper Murray River (Loyn et al. 2002, 2019).	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records exist of the species within the locality ■ Habitat exists in locality and study area

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					The subspecies is not usually found in woodlands with a dense shrub layer, and it is absent from heavily degraded woodlands and steep rocky hills (Noske 1982). Optimal habitat for brown treecreeper (south-eastern) must experience some kind of ongoing disturbance regime (historically Indigenous burning practices) to keep the ground layer from becoming too dense and uniform (Doerr pers. comm. 2022). **Roosting habitat:** Brown treecreepers (south-eastern) nest and roost in naturally occurring tree cavities in a variety of eucalypt species (Noske 1982b). Hollows in standing dead or live trees and tree stumps are essential for nesting.	
Aphelocephala leucopsis	Southern Whiteface	V	V	No	Southern whitefaces live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. **Foraging habitat:** Southern whiteface forage almost exclusively on the ground, favouring habitat with low tree densities and an herbaceous understorey litter cover	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within the locality, closest record located 23 km to the north west ■ Eucalyptus and acacia woodlands are present within the Study Area
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	No	The squatter pigeon (southern) inhabits the grassy understorey of open eucalypt woodland, and less often savannas. It is nearly always found near permanent water such as rivers, creeks and	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur"

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					waterholes. Sandy areas dissected by gravel ridges, which have open and short grass cover allowing easier movement, are preferred. It is less commonly found on heavier soils with dense grass. It often occurs in burnt areas and is sometimes found on tracks and roadsides.	■ No records in locality ■ Study Area does not contain any permanent water sources
Hirundapus caudacutus	White-throated Needletail	V	V	Yes	**Foraging habitat:** In Australia, White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats. They sometimes forage over recently disturbed areas, such as forest that has been recently cleared or burnt, or above paddocks as they are being ploughed or slashed. **Roosting habitat:** The species has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows. **Breeding habitat:** The species breeds in wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests.	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "May occur" ■ Closest record 12 km to the west ■ White-throated Needletail is an aerial foraging species, so no terrestrial habitat is mapped across the Study Area. There is an absence of breeding or roosting habitat in the Study Area.
Falco hypoleucos	Grey Falcon	V	V	Yes	The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter.	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "likely to occur" ■ Closest record located 17 km to the north

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					A rarely seen species, occurring at low densities throughout much of the arid and semi-arid interior of Australia **Nesting habitat:** Eggs are laid in the old nests of other birds, particularly those of other raptors or corvids. The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (Eucalyptus camaldulensis) and Coolibah (E. coolabah), but falcons also nest in telecommunication towers.	■ The Study Area is far from the preferred habitat of this species, *Acacia* shrubland plains traversed by tree-lined watercourses in the southwest of the State (TSSC 2020). Occurrence in this region would only involve transient individuals.
Turnix melanogaster	Black-breasted Button-quail	V	V	No	The Black-breasted Button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest. Many reports are from dry forest described as Bottletree Scrub, comprising Brigalow (*Acacia harpophylla*), Belah (*Casuarina cristata*) and Bottletree (*Brachychiton rupestris*), with or without emergent Hoop Pine (Araucaria cunninghamii), with a shrub understorey and thick litter layer	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Areas of regrowth brigalow exists within the Study Area, but is not classified as closed forest
Lathamus discolor	Swift Parrot	E	CE	No	The Swift Parrot breeds in Tasmania during the summer, migrating north to mainland Australia for the winter. On the mainland disperses widely to forage on flowers and *psyllid* lerps in Eucalyptus species, with the majority being found in Victoria and New	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records exist within the locality – Closest record located

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					South Wales. Small numbers of Swift Parrots are observed in south-eastern Queensland on a regular basis. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*E. robusta*) and spotted gum (*Corymbia maculata*) woodland when in flower.	approximately 20km to the north west in Chinchilla township. ■ Potential foraging habitat occurs in the Study Area, in the form of Eucalypt woodlands. ■ May visit the Study Area as an occasional vagrant when migrating
Mammals & Reptiles						
Phascolarctos cinereus	Koala	E	E	Yes	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.	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "Likely to occur" ■ Records exist within locality, closest record is approximately 3.5 km to the north east. ■ Suitable breeding and foraging habitat of eucalypt woodland occurs within the Study Area. ■ No evidence of Koala utilisation in the Study Area from targeted surveys and 15 Spot Assessment Technique searches for faecal pellets.
Hemiaspis damelii	Grey Snake	E	E	No	Hemiaspis damelii favours woodlands (typically brigalow Acacia harpophylla and belah Casuarina	**Potential to occur**

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					cristata), usually on heavier, cracking clay soils, particularly in association with water bodies or in areas with small gullies and ditches. The species is known to shelter under rocks, logs and flood debris, as well as in soil cracks or abandoned burrows within these moist/seasonally inundated habitats.	■ SPRAT "Habitat likely to occur" PMST "Likely to occur" ■ No records exist within the locality, the closest record is located 17 km to the north east ■ Potential habitat of regrowth brigalow exists within the Study Area
Adclarkia dulacca	Dulacca Woodland Snail	E	E	No	The Dulacca woodland snail may occur in or be associated with the 'Brigalow (Acacia harpophylla dominant and co-dominant)' ecological community. The snail may also occur in the 'Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt Bioregions' ecological community, and 'Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions' ecological community. The Dulacca woodland snail lives under rocks and timber (Stanisic et al., 2010). This species requires both canopy and on-ground timber cover for survival and egg-laying. It is confined to the Dulacca Downs subregion and adjacent areas of the Southern Downs subregion, occurring in highly fragmented landscapes, living in small woodland patches, strips of habitat retained on roadsides, shade lines and/or on ridges	**Unlikely to occur** ■ SPRAT "Habitat likely to occur" PMST "Likely to occur" ■ No records within locality ■ Study Area is outside the known range of this species

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Dasyurus hallucatus	Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu]	E	E	No	The Northern Quoll inhabits a range of areas including; rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and deserts. Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected but can also include tor fields or caves in low lying areas such as in Western Australia. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes. Dens are made in rock crevices, tree holes or occasionally termite mounds	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Rocky area habitat not present within the Study Area
Petauroides volans	Greater Glider (southern and central)	E	E	Yes	Greater gliders are predominantly solitary and largely restricted to eucalypt forests and woodlands of eastern Australia. **Denning habitat:** . In south-eastern Qld the species showed a strong preference for three den-tree species (E. acmenoides (broad-leaved white mahogany), E. fibrosa (red ironbark) and E. tereticornis (forest red gum)) due to their availability as hollow-bearing trees. **Foraging Habitat:** It feeds from a restricted range of eucalypt species, such as E. radiata (narrow-leaved	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "Known to occur" ■ Records occur within locality ■ Foraging habitat is present, however the Study Area is lacking adequate denning habitats / hollows including in the areas of remnant open eucalypt forest. These areas are dominated by *Eucalyptus*

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					peppermint) in Vic (Henry 1995), manna gum in south-eastern NSW (Kavanagh & Lambert 1990), and E. moluccana (grey box) in south-eastern Qld. It favours forests with a diversity of eucalypt species, due to seasonal variation in growth and nutrient content of its preferred tree species	*moluccana* and *Eucalyptus crebra* species, which have limited potential for the development of suitable hollows for Greater Glider over time. The area of existing fragmented eucalypt woodland in the north of the Project Area does not have any connection to surrounding habitat and will not be utilised by Greater Glider due to this separation.
Adclarkia cameroni	Brigalow Woodland Snail	V	E	No	This snail is found in eucalypt and brigalow woodland associated with the Condamine River floodplain, centred on the area between Dalby and Miles/Condamine. The brigalow woodland snail is known to occur under logs (Stanisic et al., 2010) and leaf litter, where it likely feeds on fungi, lichen, algae and other detritus/biofilm growing on forest debris, thereby recycling nutrients into the soil.	**Potential to occur** ■ SPRAT "Habitat may occur" PMST "Known to occur" ■ No records exist within the locality, closest record is located 11 km to the North ■ Potential habitat occurs in the area of higher quality Brigalow regrowth
Nyctophilus corbeni	Corben's Long-eared Bat, South-eastern Long-eared Bat	V	V	No	The south-eastern long-eared bat is found in a wide range of inland woodland vegetation types. These include box / ironbark / cypress pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, smooth-barked apple woodland, river red	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "likely to occur"

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					gum forest, black box woodland, and various types of tree mallee. In Queensland and New South Wales it inhabits a variety of vegetation types but it is distinctly more common in box / ironbark / cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of New South Wales and southern Queensland.	■ No records in locality, closest record is located 35 km to the west ■ Remnant eucalyptus woodlands within Study Area could present possible habitat
Furina dunmalli	Dunmall's Snake	V	V	No	The Dunmall's snake primary habitat is areas of 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*). Various Blue Spotted Gum (*Corymbia citriodora*), Ironbark (*Eucalyptus crebra* and *E. melanophloia*), White Cypress Pine (*Callitris glaucophylla*) and Bulloak open forest and woodland associations on sandstone derived soils **Denning habitat:** The species has been found sheltering under fallen timber and ground litter, and may use cracks in alluvial clay soils	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "likely to occur" ■ No records exist with locality, the closest record is located 18 km to the west ■ Possible habitat of Brigalow on alluvial clay present within the Study Area
Egernia rugosa	Yakka Skink	V	V	No	The Yakka Skink is endemic to Queensland where its distribution is patchy. Isolated populations occur throughout subhumid areas in the interior of Queensland from St George in the south, to Coen and Cape York in the north. In the southern half of the	**Potential to occur** ■ SPRAT "Habitat likely to occur" PMST "likely to occur"

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					Brigalow Belt it occurs near Rockhampton, south to St George and west to Chesterton Range National Park. The core habitat of this species is within the Mulga Lands and Brigalow Belt South Bioregions. The Yakka Skink is found in open dry sclerophyll forest or woodland. 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	■ No records within locality, the closest record is located approximately 25 km to the west ■ suitable habitat of remnant eucalypt woodland is present within the Study Area
Petaurus australis australis	Yellow-bellied Glider (south-eastern)	V	V	No	The species occurs in tall mature eucalyptus forest generally in areas with high rainfall and nutrient rich soils. The Yellow-bellied Glider (south-eastern) occurs in eucalypt-dominated forests and woodlands, with abundance highly dependent on habitat suitability, which is in turn determined by forest age and floristics. **Foraging Habitat:** As such, the subspecies occurs in both wet and dry sclerophyll forests, 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 **Denning habitat:** Yellow- bellied gliders shelter in hollows found in large, old trees, usually more than one metre in diameter (Kambouris et al 2014). Hollow-bearing trees are an essential habitat feature for the Yellow-bellied Glider (south-eastern) which	**Unlikely to occur** ■ SPRAT “Habitat may occur” PMST “May occur” ■ No records within locality ■ Study area / locality may contain hollow bearing trees (Denning habitat), needs field verification ■ Study Area lacks adequate hollows for denning habitat, Foraging habitat may be present within the Study Area

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					requires forests with high densities of large, mature trees; the subspecies is uncommon or absent in young, logged stands	
Delma torquata	Adorned Delma, Collared Delma	V	V	No	The Collared Delma normally inhabits eucalypt dominated woodland and open forest where it is associated with suitable micro-habitats (exposed rocky outcrops). The ground cover is predominantly native grasses, such as Kangaroo Grass (Themeda triandra), Barbed-wire Grass (Cymbopogon refractus), Wiregrass (Aristida sp.) and Lomandra (Lomandra sp.)	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records exist within locality ■ Eucalyptus dominated woodlands are present within locality but lack suitable micro habitat such as exposed rocky outcrops
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	V	V	No	**Roosting habitat:** Sandstone cliffs and fertile woodland valley habitat within proximity of each other is habitat of importance to the Large-eared Pied Bat. Records from south-east Queensland suggest that rainforest and moist eucalypt forest habitats on other geological substrates (rhyolite, trachyte and basalt) at high elevation are of similar importance to the species	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Study Area does not contain moist eucalyptus forest habitat
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	No	The grey-headed flying fox utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands. **Foraging habitat:** The primary food source is blossom from *Eucalyptus* and related genera but in some areas, it also utilises a wide range of rainforest	**Potential to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality, the closest record is located 20 km to the north west

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					fruits. None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year. As a result, the species has adopted complex migration traits in response to ephemeral and patchy food resources. **Roosting sites:** Roost sites are typically located near water, such as lakes, rivers or the coast (van der Ree et al. 2005). Roost vegetation includes rainforest patches, stands of *Melaleuca*, mangroves and riparian vegetation (Nelson 1965a; Ratcliffe 1931), but colonies also use highly modified vegetation in urban and suburban areas.	■ Suitable foraging habitat of remnant eucalypt woodland present within the Study Area. ■ No roosting sites or known camps are within the Study Area.
Anomalopus mackayi	Five-clawed Worm-skink, Long-legged Worm-skink	E	V	No	The Five-clawed Worm-skink occurs on the lower slopes of slight rises in grassy White Box woodland, open woodland and River Red Gum–Coolibah-Bimble Box woodland. This type of woodland is generally supported by red-black to black clay-loam soils (Shea et al., 1987). The Five-clawed Worm-skink lives in permanent deep tunnel-like burrows and deep soil cracks, using fallen logs and timber as sheltering sites on the surface.	**Unlikely to occur** ■ SPRAT “Habitat likely to occur” PMST “likely to occur” ■ Study Area has suitable woodland habitat, study area does not have any major water courses.

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Fish						
Bidyanus bidyanus	Silver Perch, Bidyan	E	CE	No	Silver perch formerly utilised a diversity of habitats within the Murray-Darling system. Silver perch are commonly described as a lowland species that are not found in the cooler upper reaches of rivers. Silver perch are consistently reported by anglers and researchers to show a general preference for faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin	**Unlikely to occur** ■ SPRAT "Habitat not likely to occur" PMST "likely to occur" ■ No records in locality ■ Study area does not have any major water courses present
Maccullochella peelii	Murray Cod	V	V	No	Murray Cod are frequently found in the main channels of rivers and larger tributaries. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. Such structures reduce or influence stream flows and provide Murray Cod with shelter from fast-flowing water. Riparian vegetation, for example River Red Gum (*Eucalyptus camaldulensis*) woodland in the lowland river systems of the Murray-Darling Basin, not only provides an ongoing supply of structural habitat for the Murray Cod in the form of coarse woody debris or snags, but aids stream bank stability and protects riparian soils from water and wind erosion.	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "Known to occur" ■ No records in locality ■ Study area does not have any major water courses present

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Plants						
Lepidium monoplocoides	Winged Pepper-cress	E	E	No	Winged Pepper-cress occurs predominantly in mallee scrub in semi-arid areas. Sites are seasonally moist to water-logged with heavy, fertile soils and a mean annual rainfall of around 300 to 500 mm. The predominant vegetation is usually an open-woodland dominated by *Allocasuarina leuhmannii* and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or *Eucalyptus populnea* (Poplar Box).	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Open woodland habitat of *Allocasuarina and Eucalyptus* species present within the Study Area
Homopholis belsonii	Belson's Panic	E	V	No	Belson's panic is usually found in rocky, basaltic hills supporting *Eucalyptus albens* (White Box)/*Geijera parviflora* (Wilga) woodland with assorted shrubs and a number of grass species. It was generally found among fallen timber at the base of trees or shrubs, among branches and leaves of trees hanging to ground level or along the bottom of netting fences. Flat to gently undulating alluvial areas supporting *Casuarina cristata* (Belah) forest and sometimes *Acacia harpophylla* (Brigalow) or *G.parviflora* (Wilga). Understorey varied from the presence of only Belson's Panic to a mixture of shrubs, sub-shrubs and grasses. Many of the *C. cristata* sites were subject to intermittent inundation.	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records in locality ■ Suitable habitat containing rocky basaltic hills not present in Study Area

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Dicanthium setosum	bluegrass	V	V	No	*Dichanthium setosum* is associated with heavy basaltic black soils and red-brown loams with clay subsoil. *Dichanthium setosum* is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. It is often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched. The species may tolerate or benefit from disturbance, otherwise, disturbance is indicative of threatening processes in its habitat.	**Unlikely to occur** ■ SPRAT "Habitat unlikely to occur" PMST "May occur" ■ No records within locality
Cadellia pentastylis	Ooline	V	V	-	Ooline grows in semi-evergreen vine thickets and sclerophyll vegetation on undulating terrain of various geology, including sandstone, conglomerate and claystone (Harden 1991). 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.	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Study Area lacks potential habitat

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Thesium australe	Austral Toadflax, Toadflax	V	V	No	It occurs in shrubland, grassland or woodland, often on damp sites (George 1984; Harden 1992). Vegetation types include open grassy heath dominated by Swamp Myrtle (*Leptospermum myrtifolium*), Small-fruit Hakea (*Hakea microcarpa*), Alpine Bottlebrush (*Callistemon sieberi*), Woolly Grevillea (*Grevillea lanigera*), Coral Heath (*Epacris microphylla*) and *Poa* spp. (Griffith 1991); Kangaroo Grass grassland surrounded by *Eucalyptus* woodland; and grassland dominated by Barbed-wire Grass (*Cymbopogon refractus*).	**Unlikely to occur** ■ SPRAT "Habitat unlikely to occur" PMST "May occur" ■ No record within locality, closest record 24km to the north west ■ Study Area contain limited areas of kangaroo and barbed wire grass species surround by eucalyptus woodland, and no areas of heath habitat
Eucalyptus argophloia	Queensland White Gum, Queensland Western White Gum, Lapunyah, Scrub Gum, White Gum	CE	V	No	*Eucalyptus argophloia* occurs on flat to undulating country at 300-340m above sea level. It prefers deep, dark, heavy clay soils, often with strong gilgai (melon hole) development. It has been recorded growing in brigalow woodland and forest communities associated with belah, poplar box and inland grey box.	**Unlikely to occur** ■ SPRAT "Unlikely to occur" PMST "May occur" ■ No records in locality, the closest record occurs 23 km to the north west ■ Potential habitat of brigalow woodland alongside gilgais present within the Study Area, however species was not recorded across field surveys.
Xerothamnella herbacea		E	E		*Xerothamnella herbacea is known from two sites northeast of Chinchilla, a single record from near Theodore and a record near Yelarbon east of Goondiwindi, Queensland. This species occurs within the Condamine, Border Rivers*	Unlikely to occur ■ The Project Area is within the known distribution of the species.

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					Maranoa–Balonne and Fitzroy (Queensland) Natural Resource Management Regions. *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 (Queensland Herbarium, 2008).*	■ There is suitable habitat of Brigalow woodlands present within the Project Area. ■ No recent records exist for this species within the Project Area/Locality and no observations were made during field surveys. The closest record is approximately 60 km north-east of the Project Area recorded in 1984.
Migratory Species						
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	-	MI	- No	They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). **Foraging habitat:** The foraging habitats of Latham's Snipe are 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) (Frith et al. 1977; Todd 2000). The snipe roost 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 plough marks, among boulders, or in shallow water if cover is unavailable	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "Likely to occur" ■ No records within locality ■ Study area / locality lacking areas of freshwater / wetlands type habitat

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					Latham's Snipe sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers. These habitats are most commonly used when the birds are on migration (Frith et al. 1977). They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches, ricefields, orchards, saltworks, and sewage and dairy farms	
Motacilla flava	Yellow Wagtail	SL	MI	No	This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range it is also found in large forest clearings. It breeds from April to August, although this varies with latitude. The nest is a grass cup lined with hair and placed on or close to the ground in a shallow scrape.	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Locality lacking damp wet habitats
Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo	-	MI	- No	The oriental cuckoo primarily inhabits forested areas, wet sclerophyll forest, paperbark swamps and mangroves ecosystems.	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Study area / locality do not contain mangrove or swamp habitats

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Rhipidura rufifrons	Rufous Fantail	-	MI	No	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*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted Gum (*Eucalyptus maculata*), Yellow Box (*E. melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey. They are also recorded from parks and gardens when on passage. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks (*Melaleuca* spp.)	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Study Area contains possible suitable habitat of Eucalypt woodland
Actitis hypoleucos	Common Sandpiper	E	E	No	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,	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur" ■ No records within locality ■ Study area / locality lacking wetland and or mangrove

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					reservoirs, dams and claypans, and occasionally piers and jetties. **Foraging habitat:** Generally the 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	ecosystems for foraging / breeding habitat
Calidris melanotos	Pectoral Sandpiper	-	MI	No	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. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands	**Unlikely to occur** ■ SPRAT “Habitat may occur” PMST “May occur” ■ No records within locality ■ Suitable habitat not present within Study Area

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
Myiagra cyanoleuca	Satin Flycatcher	SL	MI	No	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. Found in woodlands often dominated by eucalypts such as Brown Barrel, *Eucalypt fastigata*, Mountain Gum, *E. dalrympleana*, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash, *E. regnans*	**Unlikely to occur** ■ SPRAT "Habitat likely to occur PMST "likely to occur" ■ No records within locality ■ Study Area contains woodland dominated by Eucalypts but no gullies are present.
Apus pacificus	Fork-tailed Swift	SL	MI	Yes	The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. They often 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. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines.	**Potential to occur** ■ SPRAT "Habitat may occur" PMST "likely to occur" ■ Records exist within the locality ■ Grassland habitats are present within the locality
Calidris acuminata	Sharp-tailed Sandpiper	SL	MI	No	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and	**Unlikely to occur** ■ SPRAT "Habitat may occur" PMST "May occur"

Identification		Records			Assessment	
Scientific Name	Common Name	QLD NC Act	Comm. EPBC Act	WildNet Records with 10 km	Habitat Summary	Likelihood of Occurrence
					pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. **Foraging habitat:** They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. They also forage among inundated vegetation of saltmarsh, grass or sedges. They forage in sewage ponds, and often in 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.	■ No records within locality ■ No wetland habitat present within the Study Area ■ Wet habitats, alike wetlands or swamps are not present with locality

APPENDIX B MNES SIGNIFICANT IMPACT ASSESSMENTS

Brigalow (*Acacia harpophylla* dominant and co-dominant) (Brigalow TEC)

The proposed action in the Project Area is likely to result in a significant impact to the Brigalow TEC.

Brigalow (*Acacia harpophylla* dominant and co-dominant) is listed as Endangered under the EPBC Act. There is a total of 7.1 ha of Brigalow TEC within the Project Area. There is 0.0 ha of Brigalow TEC within the disturbance footprint, which constitutes 0% of the Brigalow TEC within the Project Area. Mapping for this TEC is presented in Figure 4-2.

Based on this information, a significant impact assessment in accordance with the SIG 1.1 for the Endangered Brigalow TEC is presented in Table B-1

Table B-1 Significant Impact Assessment for the Brigalow Threatened Ecological Community

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:		
Reduce the extent of an ecological community	The Project Area lies is around the centre of the known distribution of the Brigalow TEC. This means that direct disturbance to 0.0 ha of Brigalow TEC will not reduce the extent of the Brigalow Belt TEC, as it is widespread in south-east Queensland and northern New South Wales.	Unlikely.
Fragment or increase fragmentation of an ecological community	The Brigalow TEC already exists in a highly fragmented state in the Project Area. No Brigalow TEC is to be directly disturbed to accommodate solar infrastructure. Thus, the proposed action is unlikely to increase the fragmentation of the Brigalow TEC.	Unlikely.
Adversely affect habitat critical to the survival of an ecological community	No direct disturbance to TEC, as such the proposed action is unlikely to impact an area critical to the survival of this TEC.	Unlikely.
Modify or destroy abiotic factors necessary for an ecological community's survival	The proposed action will not result in a direct disturbance to Brigalow TEC. The 6.3 ha of Brigalow TEC in the Project Area will not be disturbed by the proposed action, as the solar infrastructure will not affect any biotic or abiotic factors that could interfere with the natural progression of other patches of Brigalow TEC in the Project Area. Conditions typical of QLD Brigalow stands that if modified, may affect the survival of the Brigalow TEC include substrate of cracking clay soils and gently undulating terrain (DoE, 2015). Most of the distinguishing features of this TEC however lie within its floristic composition, which will not be affected by the proposed action. Potential impacts to the native flora in the Project Area will be mitigated by the development and implementation of a Vegetation Management Plan (VMP) and Weed and Pest Animal Management Plan (WPAMP).	Unlikely.
Cause a substantial change in the species composition of an occurrence of an ecological community	Potential impacts to the native flora in the Project Area not within the disturbance footprint will be mitigated by the development and implementation of a Vegetation Management Plan (VMP) and Weed and Pest Animal Management Plan (WPAMP). These plans will assist in maintaining the native floral composition and preventing weed establishment in the Brigalow TEC patches, which means it is unlikely that the species composition of the TEC patches is unlikely to change as a result of the proposed action.	Unlikely.

Criteria	Description	Criteria Triggered?
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community	As no direct disturbance to Brigalow TEC in the Project Area does not constitute a 'substantial reduction in the quality of integrity' of Brigalow TEC within the Project Area.	Unlikely.
Interfere with the recovery of an ecological community	The recovery and threat abatement actions listed in the Brigalow TEC Conservation Advice (DoE, 2015) include: ■ Threat reduction and control; ■ Land management; ■ Management for wildlife; and ■ Develop and propagate conservation information. The proposed action does not interfere with but rather complies with these recovery objectives.	Unlikely.
Significant impact: Unlikely.		

Koala (*Phascolarctos cinereus*)

The proposed action in the Project Area has potential to result in a significant impact to the koala.

The koala is currently listed as Endangered under the EPBC Act, as of the 12 February 2022. The koala is generally found in temperate to tropical forests and 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, 2022). 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).

Under the revised Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE, 2022c), released on 12th 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; or*
>
> *(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*.

The koala is considered as having the potential to occur despite no direct or indirect signs or observations during field surveys. This is because suitable habitat exists in the Project Area and there are three records from the last 20 years within 20 km of the Project Area, and a 1992 record 3.5 km north-east of the Project Area. The lack of observation during field surveys, and lack of observation in recent years demonstrates that should the koala occur in the Project Area, its overall usage of the Project Area is likely to be quite low, which will be considered in its significant impact assessment.

With the above habitat description considered, the Project Area contains varied types of potential koala habitat, which may be delineated into breeding and foraging habitat, or dispersal habitat. This is

due to the differing quality of the habitat and the ecological function provided by these two habitat types. Table B-2 below summarises koala habitat within the Project Area, and the proposed actions impact to these habitat types.

Table B-2 Disturbance to Koala Habitat Types within Project Area

	Potential Foraging and Breeding Habitat	Potential Dispersal Habitat
Description	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 grass/bare ground, rural land-uses. Contains isolated or scattered foraging or shelter trees. Contains vegetation generally not used frequently for foraging and breeding purposes by the species.
Presence within the	Remnant Eucalypt open forest. Regrowth eucalypt woodland or open forest	Brigalow regrowth (TEC).
Total in the Project Area	253.8 ha	6.3 ha
Total in Disturbance Footprint (% of Habitat in Project Area	99.3 ha (39.1 %)	0.0 ha

It is noted that the infrastructure for the proposed action will not inhibit Koala dispersal, should it occur in the future. This is because koalas simply require grassed areas connected to remnant vegetation for dispersal. The solar farm landscape includes a largely traversable ground layer, where the solar panels block most of the natural sunlight from reaching the ground. There is no literature that has explored the koalas readiness to traverse this type of landscape, but given they're able to traverse modified grasslands, they may be able to disperse across the Project Area whilst it is in operation.

It is considered that the removal of 99.3 ha of potential foraging and breeding Koala habitat is unlikely to result in a significant impact, as there is limited evidence of Koala utilisation in the Project Area and the locality. The majority of the koala habitat in the Project Area, will be retained and maintain connectivity to areas of larger, contiguous eucalypt open forest and woodland to the south and east.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in the following table.

Table B-3 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,	The amount of potential foraging and breeding habitat, with no evidence of Koala utilisation, to be directly cleared in the Project Area is 99.3 ha. This direct impact will be clearing of remnant vegetation for the construction of solar farm infrastructure, which will prevent potential koala breeding and foraging in these areas. Mitigation measures such as pre-clearance surveys will ensure that impacts are further avoided to the species. There is a lack of recent records for Koala in the Project Area and locality, and no evidence of a Koala population utilising the Project Area, so the proposed action is considered unlikely to lead to a long-term decline in the koala population.	Unlikely.

Criteria	Description	Criteria Triggered?
Reduce the area of occupancy of the species,	State government and CSIRO mapping and records from 2000 indicate koala's area of occupancy at approximately 19,428 km^2 across Queensland, New South Wales and the Australian Capital Territory (DAWE, 2020). This species has a wide extent of habitat present throughout the Locality and surrounds. 99.3 ha of koala habitat within the Project Area will be directly disturbed, but this area is not on any of the outer fringes of the koalas distribution, nor is there any evidence to suggest that the Project Area acts as a major connectivity corridor for the species. As no major impediment to koala dispersion will occur from the proposed action, and the Project Area is not on the border of the distribution range of the species, it is considered unlikely the proposed action will lead to a reduced area of occupancy of the species	Unlikely.
Fragment an existing population into two or more populations,	The home range for the koala is highly variable, however evidence suggest it can range from anywhere between 3 to 500 ha (Wilmott, 2020). It is not expected the disturbance to 99.3 ha of koala habitat will fragment existing populations. This is because the proposed action will remove a relatively small area of habitat for the species in comparison to its wider distribution range, and the koala is still very likely to disperse around the Project Area. Additionally, there is no evidence of koala usage in the Project Area.	Unlikely.
Adversely affect habitat critical to the survival of a species,	A total of 253.8 ha of potential foraging and breeding habitat for Koala has been mapped to occur within the Project Area, with a direct disturbance to 99.3 ha. While survey efforts suggest that the potential habitat within the Project Area is currently not utilised by Koala, with consideration to the lifespan of the proposed action and the potential movement patterns of the Koala it is regarded as potential habitat with limited value in maintenance of a koala population in the landscape. The proposed action will retain the majority of the identified koala foraging and breeding habitat, with 154.5 ha located within the avoidance area. The proposed action will result in 99.3 ha of potential breeding and foraging to be disturbed, in the form of regrowth open eucalypt forest. The location of the Project Area in the surrounding disturbed landscape dominated by agricultural land use to the west limits the value of the site for dispersing koalas. There are large areas of retained eucalypt open forest and woodland to the south and east of the Project Area, with limited koala foraging and breeding habitat to the west.	Unlikely
Disrupt the breeding cycle of a population,	The low density of koala records in the Locality suggests the area is not integral for the breeding and genetic diversity of the species. Given this, the impact to potential koala breeding habitat within the Project Area is unlikely to disrupt the breeding cycle of a koala population.	Unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	Disturbance to a total of 99.3 ha of koala habitat within the Project Area is unlikely to modify, destroy, remove, isolate or decrease the availability of koala habitat to the extent that the species is likely to decline. This is due largely to the lack of evidence of koala utilisation of suitable habitat in the Project Area. Additionally, there are extensive stands of remnant vegetation to the south and south-west of the Project Area that is preferable to the Project Area for utilisation by koala.	Unlikely.
Result in invasive species that are harmful to a critically	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. The proposed	Unlikely.

Criteria	Description	Criteria Triggered?
endangered or endangered species becoming established in the endangered or critically endangered species' habitat	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 are not introduced into the Project Area.	
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. 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.	Recovery objectives for Koala include (DAWE, 2022b): ■ 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 disturbance footprint will only impact a comparatively small area of habitat for the koala. Therefore, the proposed action does not interfere with the recovery objectives for the species.	No.
Significant impact: Unlikely		

Painted honeyeater (*Grantiella picta*)

The proposed action in the Project Area is unlikely to result in a significant impact to the painted honeyeater.

The painted honeyeater is listed as vulnerable under the EPBC Act. The painted honeyeater has a sparse distribution across Australia, spanning from south-eastern Australia to north-western Queensland, and up to the east of the Northern Territory. The inland extent of the species occurs on the western side of the Great Dividing Range, between Roma Queensland and Grampians Victoria. The species typically governs north to south movements across its distribution range based on availability of fruiting mistletoe, consequently, is closely associated with the species breeding season. The species commonly migrates to semi-arid regions after breeding season (DoE, 2015).

The painted honeyeater feeds on mistletoe in eucalypt forests and woodlands, riparian woodlands of Black Box and River Red Gum, box-ironbark-yellow gum woodlands, woodlands dominated by paperbarks, acacia app., casuarina spp., Callitris spp., and occasionally farmlands and gardens (DoE, 2015a). Woodlands with a higher abundance of mature trees are of higher preference for painted honeyeater, as these contain a higher abundance of mistletoes (DoE, 2015).

The species is considered as having the potential to occur in the Project Area despite no direct signs or observations of the species. This is because the Project Area contains potentially suitable habitat for the painted honeyeater, such as remnant eucalypt open forest, regrowth eucalypt woodland or open forest and brigalow (*Acacia harpohylla)* regrowth (TEC) that harbour mistletoe. The species also has historical records within the locality.

This considered, the Project Area contains potential foraging and breeding habitat which includes:

- Remnant eucalypt open forest; and
- Brigalow (*Acacia harpophylla*) regrowth (TEC).

This includes 145.3 ha of potential habitat, all of which is avoided by the proposed action's disturbance footprint.

A significant impact assessment for Painted Honeyeater, based on the guidance provided in the SIG 1.1 is presented in the following table.

Table B-4 Significant Impact Assessment for the Painted Honeyeater

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,	The survey effort completed in the Project Area resulted in no observations of the species and all area of potential habitat will be avoided. Based on the lack of site utilisation by the species, and the small amount of habitat to be disturbed, it is considered unlikely that the proposed action lead to a long-term decrease In the size of any population of this species.	Unlikely.
Reduce the area of occupancy of an important population,	The Project Area does not occur on any border of the species known distribution range and no suitable habitat will be disturbed. Therefore, the proposed action is unlikely to reduce the area of occupancy of any population of the species.	Unlikely.
Fragment an existing important population into two or more populations,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, there will be no suitable habitat impacted by the proposed action. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to fragment an existing population into two or more populations.	Unlikely.

Criteria	Description	Criteria Triggered?
Adversely affect habitat critical to the survival of a species,	Habitat critical to the survival of this species has not been defined or identified within the Project Area, and thus cannot be affected.	Unlikely.
Disrupt the breeding cycle of an important population,	The survey effort completed in the Project Area resulted in no observations of the species. The species breeding activities are also thought to predominantly occur in the NSW portion of its distribution. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to disrupt the breeding cycle of any 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 survey effort completed in the Project Area resulted in no observations of the species. The lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species means that the proposed action is unlikely to modify the species habitat to the extent the species is likely to decline.	Unlikely.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat,	The proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate the painted honeyeater or degrade the species habitat.	Unlikely.
Introduce disease that may cause the species to decline, or	The painted honeyeater conservation advice does not list any diseases as a threat to this species (DoE, 2015). Regardless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Interfere substantially with the recovery of the species.	There are no specific recovery objectives in place for this species, but the primary conservation objectives are: ■ Maintain stable populations at key sites; ■ Prevent further clearance of suitable habitat; and ■ Ensure adequate numbers of mature trees and mistletoe populations across its distribution. The proposed action will not interfere with any of these objectives, and all areas of potential habitat will be avoided.	Unlikely.
Significant impact: Unlikely.		

Grey-headed flying-fox (*Pteropus poliocephalus*)

The proposed action in the Project Area is unlikely to result in a significant impact to the grey-headed flying-fox.

The grey-headed flying fox is listed vulnerable under the EPBC act. The grey-headed flying fox occupies coastal lowlands in eastern Australia from Ingham, Queensland to Adelaide, South Australia. Local abundance of the species varies from region to region, as they migrate seasonally to be closer to more abundant food sources, which includes the fruit and flower of rainforest species (ie. Ficus spp.), myrtaceous species (ie. Eucalyptus spp., Corymbia spp.) (DAWE, 2021).

Grey-headed flying fox foraging habitat is closely correlated with abundance of flowering eucalypts. As they have no biological adaptations to withstand food shortages, they migrate regularly to areas that have a higher abundance of flowering eucalypts. On top of this, they will also fly up to 40 km away in one night to forage before returning to their roost camp (DAWE, 2021). Westcott et al. (2015) found the average distance between foraging habitat and roosting camps to be 10.9 km.

Roosting camps selected by the grey-headed flying fox can include habitat such as continuous forest or smaller patches, so long as they have exposed branches to hang from. Most grey-headed flying foxes camps are well updated to reflect occupancy on the DCCEEW national Flying-fox monitoring viewer (DCCEEW, 2023). The *National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus* (DAWE, 2021) identifies habitat critical to the survival of this species as vegetation communities that:

- Are winter and spring flowering (usually coastal lowland) vegetation communities with species such as: *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Gastanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera*;
- Contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May);
- Contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department's interactive flying-fox web viewer; or
- Contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp as identified on the Department's interactive flying-fox web viewer.

The species was not observed during the field survey effort and there are no historical records in the Project Area or locality. Furthermore, there are no known grey-headed flying-fox camps near the Project Area, the nearest being over 100 kms west near Cooyar. Despite the above, the species is considered as having the potential to occur, based on the presence of suitable habitat in the Project Area, and a lack of survey effort targeting the species.

It is difficult to predict which vegetation communities will produce foraging resources at certain times of the year, however a conservative approach was used to identify 253.7 ha of potential foraging habitat as mapped on Figure 4-5. This potential foraging habitat includes the following broad habitat types:

- Remnant eucalypt open forest; and
- Regrowth eucalypt woodland or open forest.

Of this habitat, 99.3 ha lies within the disturbance footprint, which constitutes 39.1 % of the species habitat in the Project Area. According to the above definition of habitat critical to the survival of this species, the potential foraging habitat in the Project Area is not habitat critical to the survival of the species. This is due to the lack of evidence of site utilisation by the species, and the absence of a nearby roosting camp for the species.

A significant impact assessment for the grey-headed flying-fox, based on the guidance provided in the SIG 1.1 is presented in Table B-5

Table B-5 Significant Impact Assessment for the Grey-headed Flying-fox

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,	The Recovery plan for this species states that nationally important camps are those with greater than 10,000 individuals for more than one year in the last 10 years, or those that have been occupied by more than 2,500 individuals permanently or seasonally every year for the last 10 years (DAWE, 2021). No known camps for this species exist near the Project Area, and it is therefore highly unlikely that any nationally important camps exist near the Project Area. This species is known to forage up to 50 km away from their roosting grounds, and due to the likely absence of any nationally important camps within this range of the Project Area, it is highly unlikely that the proposed actions disturbance to 99.3 ha of potential foraging habitat would affect an important population of this species.	Unlikely.
Reduce the area of occupancy of an important population,	The Recovery plan for this species states that nationally important camps are those with greater than 10,000 individuals for more than one year in the last 10 years, or those that have been occupied by more than 2,500 individuals permanently or seasonally every year for the last 10 years (DAWE, 2021). No known camps for this species exist near the Project Area, and it is therefore highly unlikely that any nationally important camps exist near the Project Area. As there is no evidence to suggest that an important population forages in the Project Area, it is unlikely that the proposed action would reduce the area of occupancy for any important population of the species.	Unlikely.
Fragment an existing important population into two or more populations,	The Recovery plan for this species states that nationally important camps are those with greater than 10,000 individuals for more than one year in the last 10 years, or those that have been occupied by more than 2,500 individuals permanently or seasonally every year for the last 10 years (DAWE, 2021). No known camps for this species exist near the Project Area (DCCEEW, 2023), and it is therefore highly unlikely that any nationally important camps exist near the Project Area. Furthermore, this species is known for its high dispersal capabilities, and extensive nightly flight distance, that can be up to 50 km. Considering the above, the proposed actions disturbance to 99.3 ha of potential foraging habitat is unlikely to fragment any important populations of the species.	Unlikely.
Adversely affect habitat critical to the survival of a species,	As discussed above, the potential foraging habitat within eh Project Area may not be considered habitat critical to the survival of this species. Thus, the proposed action disturbances to potential foraging habitat will not affect habitat critical to the survival of this species.	No.
Disrupt the breeding cycle of an important population,	Breeding activities for this species take place at roosting camps, and breeding success is known to be affected detrimental by anthropogenic activities. Due to the lack of evidence that a camp exists near the Project Area, and the minimal anthropogenic disturbance in the Project Area once construction ceases, it is unlikely that the proposed action would disrupt the breeding cycle of an important population of this species.	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,	The Recovery plan for this species states that nationally important camps are those with greater than 10,000 individuals for more than one year in the last 10 years, or those that have been occupied by more than 2,500 individuals permanently or seasonally every year for the last 10 years (DAWE, 2021). No known camps for this species exist near the Project Area (DCCEEW, 2023), and it is therefore highly unlikely that any nationally important camps exist near the Project Area. Furthermore, this species is known for its high dispersal capabilities, and extensive nightly flight distance, that can be up to 50 km. Considering the above, the proposed actions disturbance to 99.3 ha of potential foraging habitat 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,	No invasive species are listed as threats in the species Recovery Plan, but it is likely that introduction of invasive flora species would have the potential to degrade habitat quality for the grey-headed flying-fox. The proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate the grey-headed flying-fox or degrade the species habitat.	Unlikely.
Introduce disease that may cause the species to decline, or	The Recovery Plan for this species states that the public association between disease and bats is grossly exaggerated. This plan also states that diseases are not a primary threat to the grey-headed flying-fox, as prevalence of bat-associated diseases such as white-nosed syndrome, Hendra virus, Lyssavirus, and corona viruses is usually quite low. However, the focus of these studies is usually their transmission rates and effect on humans, rather than how they impact flying-fox populations. Ultimately, the impact of common bat diseases on grey-headed flying-fox populations is not well understood. Nevertheless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Interfere with the recovery of the species.	The recovery objectives outlined in the National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus (DAWE 2021) include: ■ Identify, protect and increase native foraging habitat that is critical to the survival of the Grey-headed Flying-fox; ■ Identify, protect and increase roosting habitat of Grey-headed Flying-fox camps; ■ Determine trends in the Grey-headed Flying-fox population so as to monitor the species' national distribution, habitat use and conservation status; ■ Build community capacity to coexist with flying-foxes and minimise the impacts on urban settlements from new and existing camps while avoiding interventions to move on or relocate entire camps; ■ Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and involve the community in the recovery program where appropriate; ■ Improve the management of Grey-headed Flying-fox camps in areas where interaction with humans is likely; ■ Significantly reduce levels of licenced harm to Grey-headed Flying-foxes associated with commercial horticulture; ■ Support research activities that will improve the conservation status and management of Grey-headed Flying-foxes; and	Unlikely.

Criteria	Description	Criteria Triggered?
	■ Reduce the impact on Grey-headed Flying-foxes of electrocution on power lines, and entanglement in netting and on barbed-wire. The proposed action is unlikely to interfere with any of these recovery objectives. Instead, the proposed action may assist in identifying native foraging or roosting habitat as a fauna spotter catcher will be on-site during clearing activities and will be able to identify any individuals of the species should they occur. This will result in identification of known habitat for this species, which will be reported back to the Department. Of course, if the species is observed, then further clearing works will be postponed ensuring no individuals of the species are harmed.	
Significant impact: Unlikely.		

Corben's long-eared bat (*Nyctophilus corbeni*)

Significant impacts to Corben's long-eared bat as a result of the proposed action is unable to be determined until targeted surveys to determine species presence are completed.

Corben's long-eared bat is listed vulnerable under the EPBC act. This is an insectivorous microbat that inhabits a wide range of inland woodland communities in southern-central QLD, central-western NSW, north-western Victoria, and eastern South Australia. Most records of the species come from the west of the Great Dividing Range, however it is generally rare and solemn identified (TSSC, 2015).

Typical QLD habitat for this species includes box, ironbark, cypress-pine woodlands in the western slopes and plains. However, in other states the species is known to live in other woodland communities, demonstrating that the habitats this species select are quite broad. It should be noted however, that the species prefers extensive stands of vegetation rather than smaller, fragmented patches. The species forages on a range of insects, and roosts (generally solitarily) in dead trees, or dead sprouts of live trees. The species often roosts in new trees, and generally, consecutive roost trees are around 4 km from one another, indicating the species is quite nomadic when foraging. Information about the breeding biology and ecology of the species is lacking (TSSC, 2016).

The recommended survey approach for this species involves acoustic monitoring via the use of bat detectors (DEWHA, 2010). Due to the presence of suitable habitat in the Project Area and lack of targeted survey effort for this species, it cannot be ruled out from occurring in the Project Area, despite a lack of historical records of the species in the locality. Thus, Corben's long-eared bat is considered as having the potential to occur in the Project Area.

With the above in mind, potential foraging and roosting habitat within the Project Area includes the following broad habitat types that make up an extensive, continuous patch of potential habitat:

- Remnant eucalypt open forest;
- Regrowth eucalypt woodland or open forest.

This constitutes 253.7 ha of habitat in the Project Area, 99.3 ha (39.1 % of total habitat) of which lies within the disturbance footprint.

A significant impact assessment for Corben's long-eared bat, based on the guidance provided in the SIG 1.1 is presented in Table B-6

Table B-6Significant Impact Assessment for Corben's Long-eared 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 an important population of a species,	The Conservation Advice for this species does not provide a definition for an important population of this species. Given that the species has the potential to occur in the Project Area based on the presence of suitable habitat and lack of targeted surveys for the species, it cannot be determined if the proposed action will lead to a long-term decrease in the size of a population of this species. Regardless, should the species be determined to occur in the Project Area, then the proposed action disturbance to 99.3 ha of habitat for this species is unlikely to result in a long-term decrease in its population size given the Project Area's proximity to extensive tracts of native vegetation.	Unlikely.
Reduce the area of occupancy of an important population,	The Conservation Advice for this species does not provide a definition for an important population of this species. Given that the species has the potential to occur in the Project Area based on the presence of suitable habitat and lack of targeted surveys for the species, it cannot be determined if the proposed action will lead to a reduction in the area of occupancy of this species. Should the species be determined to occur in the Project Area, then the proposed action disturbance to 99.3 ha of habitat for this species has the potential to reduce the area of occupancy of this species by 99.3 ha, which in a regional context across the species distribution is unlikely to be significant.	Unlikely
Fragment an existing important population into two or more populations,	The Conservation Advice for this species does not provide a definition for an important population of this species. The species is considered as having the potential to occur in the Project Area based on the presence of suitable habitat and lack of targeted surveys for the species. Should the species be determined to occur in the Project Area, then the proposed action disturbance to 99.3 ha of habitat for this species is unlikely to fragment existing populations. This is because the north-west of the Project Area is already likely uninhabitable for the species, and a connectivity corridor around the rest of the Project Area will permit dispersal around all other areas of the Project Area. Therefore, any populations within or around the Project Area are unlikely to be fragmented.	Unlikely.
Adversely affect habitat critical to the survival of a species,	The Conservation Advice for this species does not define habitat critical to the survival of this species, however under SIG 1.1 habitat critical to the survival of a species includes areas that can support breeding, foraging and dispersal functions. The area of remnant eucalypt open forest in the Project Area contains potential habitat that could support breeding and foraging for Corben's long-eared bat and these habitat features are limited in other broad habitat types in the Project Area. Therefore, regardless of whether the species occurs in the Project Area or not, the proposed actions disturbance to the species habitat cannot affect critical habitat to survival.	Unlikely.

Criteria	Description	Criteria Triggered?
Disrupt the breeding cycle of an important population,	Very little is known about the reproductive cycle and ecology of this species (TSSC, 2015). Also, the species is considered as having potential to occur in the Project Area based on the presence of suitable habitat and lack of targeted surveys for the species. As it cannot be determined if the species occurs in the Project Area, it cannot be determined if the proposed action would disrupt the breeding cycle of a population of this species. This in mind, the Conservation Advice for this species does not provide a definition for an important population of this species. Ultimately, regardless of whether the species occurs or not, it is unlikely that the proposed action would disrupt the breeding cycle of an important population of Corben's long-eared bat.	Unlikely.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	Given that the species has the potential to occur in the Project Area based on the presence of suitable habitat and lack of targeted surveys for the species, it cannot be determined if the proposed action's disturbance to 99.3 ha of habitat for this species would lead to a decline in the species. Unless a substantial population exists in the Project Area, then it is unlikely that the proposed action's disturbance would cause the species to decline. Given the current data (no nearby records), it is reasonable to conclude that no substantial population exists in the Project Area.	Unlikely.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat,	The Conservation Advice for this species (TSSC, 2015) lists grazing by domestic animals as a threat to the species as it reduces foraging habitat by removing shrubs and causing changes to the structure of these habitats. Predation by feral animals such as the cat or red fox is likely a threat but has not been assessed for this species. The proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate the Corben's long-eared bat or degrade the species habitat.	Unlikely.
Introduce disease that may cause the species to decline, or	This species Conservation Advice does not list any diseases as a threat to Corben's long-eared bat (TSSC, 2015). Nevertheless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Interfere with the recovery of the species.	The species conservation advice (TSSC, 2015) does not list any recovery objectives, but lists conservation actions to prevent the detrimental effect of the following on the species: ■ Habitat loss disturbance and modifications; ■ Invasive species; ■ Impacts of domestic species; and ■ Fire. Whether the proposed action interferes with the prevention of habitat loss, disturbance and modifications cannot be determined until targeted surveys inform a higher understanding of the species occurrence in the Project Area. The proposed action will not interfere with any of the other conservation actions however.	Unlikely.
Significant impact: Potential		

Grey snake (*Hemiaspis damelii*)

The proposed action in the Project Area is unlikely to result in a significant impact to the grey snake.

The grey snake is listed endangered under the EPBC Act. The grey snake (*Hemiaspis damelii*) distribution is regarded as continuous from southern New South Wales to southern-eastern Queensland, however the species is fragmented along the entire distribution range with subpopulations through Queensland and New South Wales. Most records of the species in Queensland are recorded along the Macintyre and Condamine Rivers and the flood plains of the southern brigalow belt (ranging from Goondiwindi, Dalby, Darling Downs, western Lockyer Valley, and Currawinya) (DCCEEW, 2022).

Despite no signs or observations of the species during the field survey effort the grey snake is considered as having the potential to occur in the Project Area. This is because the Project Area contains suitable habitat for the species, and the relatively low survey effort completed to identify the grey snake.

Potential grey snake habitat within the Project Area has been mapped to include 7.1 ha of regrowth Brigalow (Acacia harpophylla) dominant to co-dominant (TEC) displayed in Figure 4-7. Identification of this potential habitat is based on ground-truthed vegetation communities. No identified habitat is subject to disturbance from the proposed action.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table B-7

Table B-7 Significant Impact Assessment for Grey Snake

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 survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. Based on the lack of site utilisation by the species, and the small amount of habitat to be disturbed, it is considered unlikely that the proposed action will lead to a long-term decrease In the size of any population of this species.	Unlikely.
Reduce the area of occupancy of the species,	The Project Area does not occur on any border of the species known distribution range and no habitat will be disturbed. Therefore, the proposed action is unlikely to reduce the area of occupancy of any population of the species.	Unlikely.
Fragment an existing population into two or more populations,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to fragment an existing population into two or more populations.	Unlikely.
Adversely affect habitat critical to the survival of a species,	Habitat critical to the survival of this species has not been defined or identified in the Project Area, and thus cannot be a affected.	Unlikely.

Criteria	Description	Criteria Triggered?
Disrupt the breeding cycle of a population,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to disrupt the breeding cycle of any 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 survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. The lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species means that the proposed action is unlikely to modify the species habitat to the extent the species is likely to 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 proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate the grey snake or degrade the species habitat.	Unlikely.
Introduce disease that may cause the species to decline, or	The grey snake conservation advice does not list any diseases as a threat to this species (DoE, 2015). Regardless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Interfere with the recovery of the species.	There are no specific recovery objectives in place for this species, but the primary conservation objective is to increase the total population size and area of occupancy of the grey snake and the quality and connectivity of habitat across its subpopulations. The proposed action will not interfere with any of these objectives, as no potential habitat will be removed, and there is no known, or likely population of the species in the Project Area.	Unlikely.
Significant impact: Unlikely.		

Dunmall's Snake (*Furina dunmalli*)

The proposed action in the Project Area is unlikely to result in a significant impact to the grey snake.

Dunmall's Snake (Furina dunmalli) is currently listed as Vulnerable under the EPBC Act. Dunmall's Snake inhabits open forests, dominated by Brigalow (*Acacia harpophylla*), Wattles (A*. burowii, A. deanii, A. leioclyx*), native Cypress (*Callitris* spp.) and/or Bulloak (*Allocasuarina luehmannii*), and woodlands on floodplains associated with deep, cracking clays and clay loam soils (Covacevich et al., 1988, Cogger et al., 1993). The species is thought to be nocturnal, seeking fallen timber and in soil cracks for shelter (DoE, 2014).

Despite no observation of the species in the Project Area, and no nearby records of the species, it is considered as having the potential to occur. This is due to a limited targeted survey effort for the species, and the presence of suitable habitat in the Project Area.

Potential habitat in the Project Area has been mapped on Figure 4-9 to include 146 ha of the following broad habitat types:

- Remnant eucalypt open forest; and
- Brigalow (*Acacia harpophylla*) regrowth (TEC).

None of this habitat is within the disturbance footprint.

A significant impact assessment based on guidance provided in the SIG 1.1 for a listed Vulnerable species, is presented in

Table B-8 Significant Impact Assessment for Dunmall's Snake

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,	The survey effort completed in the Project Area resulted in no observations of the species and all areas of potential habitat will be avoided. Based on the lack of site utilisation by the species, and the small amount of habitat to be disturbed, it is considered unlikely that the proposed action will lead to a long-term decrease In the size of any population of this species.	Unlikely.
Reduce the area of occupancy of an important population,	The Project Area does not occur on any border of the species known distribution range and no habitat will be disturbed. Therefore, the proposed action is unlikely to reduce the area of occupancy of any population of the species. Additionally, the species Conservation Advice does not define 'important populations' of this species (DoE, 2014).	Unlikely.
Fragment an existing important population into two or more populations,	The survey effort completed in the Project Area resulted in no observations of the species. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to fragment an existing population into two or more populations. Additionally, the species Conservation Advice does not define 'important populations' of this species (DoE, 2014).	Unlikely.
Adversely affect habitat critical to the survival of a species,	Habitat that has the potential to provide foraging and breeding resources for Dunmall's snake has been avoided through the design of the layout for the proposed action.	Unlikely.
Disrupt the breeding cycle of an important population,	The survey effort completed in the Project Area resulted in no observations of the species. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential	Unlikely.

Criteria	Description	Criteria Triggered?
	habitat disturbance to this species, the proposed action is unlikely to disrupt the breeding cycle of any population of this species.	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The survey effort completed in the Project Area resulted in no observations of the species. The lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species means that the proposed action is unlikely to modify the species habitat to the extent the species is likely to decline. Additionally, the species Conservation Advice does not define 'important populations' of this species (DoE, 2014).	Unlikely.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat,	Predation by feral animals is acknowledged as a potential threat to this species. The proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate Dunmall's snake.	Unlikely.
Introduce disease that may cause the species to decline, or	The Dunmall's snake conservation advice does not list any diseases as a threat to this species (DoE, 2014). Regardless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Interfere with the recovery of the species.	There are no specific recovery objectives in place for this species, but the primary conservation objective is to manage habitat loss, modification and disturbance and gain knowledge on conservation knowledge (DoE, 2014). The proposed action will not interfere with any of these objectives, and all areas of potential habitat will be avoided.	Unlikely.
Significant impact: Unlikely.		

Yakka skink (*Ergonia rugosa*)

The proposed action in the Project Area is unlikely to result in a significant impact to the yakka skink.

The yakka skink is listed vulnerable under the EPBC Act. The yakka skink (*Egernia rugosa*) is endemic to Queensland, though its distribution throughout Queensland is patchy with isolated populations across subhumid regions from St George in the south to Cape York in the north. The core habitat however resides within the Mugla Lands and Brigalow Belt South Bioregions, with majority of the species distribution associated with the Brigalow (*Acacia harpohylla* dominant and co-dominant) EPBC Act listed threatened ecological community. The species can additionally be found in open dry sclerophyll forest or woodlands, utilising dense ground vegetation, large hollow logs and fallen trees as habitat features. The species presence is commonly confirmed or indicated via shared denning sites where they deposit droppings.

Despite no direct or indirect observations or signs of the species during the field survey effort in the Project Area, the species is considered as having the potential to occur. This is due to suitable habitat occurring within the Project Area, and the lack of survey effort targeting the species. Ultimately, the species presence cannot be ruled out based on the survey effort conducted in the Project Area.

The potential habitat in the Project Area includes 138.9ha of remnant eucalypt open forest as mapped on Figure 4-8. Other habitat types that are typically considered suitable for the species also exist in the , such as Brigalow dominant to co-dominant, however these were generally of low quality, and are not considered suitable for the yakka skink in this instance. Of the 138.9ha of potential habitat in the Project Area, only 0.2 ha (0.1% total yakka skink habitat) will be disturbed by the proposed action.

A significant impact assessment for yakka skink, based on the guidance provided in the SIG 1.1 is presented in Table B-9

Table B-9 Significant Impact Assessment for Yakka Skink

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,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, the area of potential habitat subject to disturbance by the proposed action is only 0.2 ha. Based on the lack of site utilisation by the species, and the small amount of habitat to be disturbed, it is considered unlikely that the proposed action will lead to a long-term decrease In the size of any population of this species.	Unlikely.
Reduce the area of occupancy of an important population,	The Project Area does not occur on any border of the species known distribution range and only 0.2 ha of habitat will be disturbed. Therefore, the proposed action is unlikely to reduce the area of occupancy of any population of the species.	Unlikely.
Fragment an existing important population into two or more populations,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, the area of potential habitat subject to disturbance by the proposed action is only 0.2 ha. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to fragment an existing population into two or more populations.	Unlikely.
Adversely affect habitat critical to the survival of a species,	Habitat that has the potential to provide foraging and breeding resources for yakka skink has been avoided through the design of the layout for the proposed action.	No.
Disrupt the breeding cycle of an important population,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, the area of potential habitat subject to disturbance by the proposed action is only 0.2 ha. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to disrupt the breeding cycle of any 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 survey effort completed in the Project Area resulted in no observations of the species. Additionally, the area of potential habitat subject to disturbance by the proposed action is only 0.2 ha. The lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species means that the proposed action is unlikely to modify the species habitat to the extent the species is likely to decline.	Unlikely.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat,	The proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate the yakka skink or degrade the species habitat.	Unlikely.
Introduce disease that may cause the species to decline, or	The yakka skink conservation advice does not list any diseases as a threat to this species (DoE, 2014). Regardless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Substantially interfere with the recovery of the species.	There are no specific recovery or conservation objectives in place for this species according to its conservation advice (DoE, 2014).	No.
Significant impact:		

Brigalow Woodland Snail (*Adclarkia cameroni*)

The proposed action in the Project Area is unlikely to result in a significant impact to the brigalow woodland snail.

The brigalow woodland snail is listed as endangered under the EPBC Act. The brigalow woodland snail (*Adclarkia cameroni*) is endemic to south-east Queensland, commonly occurring in small remnant patches of scattered brigalow (*Acacia harpohylla)* and eucalypt woodlands, particularly in areas within the Dalby and Chinchilla region. Due to the nature of these fragmented habitats, they are subjected to several disturbances including clearing, cattle grazing and fire impacts. The species finds important refuge in the narrow Condamine River riparian corridor, particularly in areas that have seen extensive clearing for agricultural practices. The species utilises logs, leaf litter and other ground cover as habitat, feeding upon fungi, lichen, algae and other detritus/biofilm in forest debris.

Despite no observations of the species during field surveys, and no recent records of the species in the locality, this species is considered to have the potential to occur in the Project Area. This is because the species preferred habitat type, fragmented brigalow, occurs in the Project Area, and there was a lack of surveys conducted to target the species.

Therefore, there is 7.1 ha of potential habitat for this species in the Project Area, none of which is subject to disturbance. This habitat is mapped on Figure 4-10. Habitat for the species was identified and mapped in the Project Area based on the ground-truthed vegetation communities.

A significant impact assessment based on the guidance provided in the SIG 1.1 is presented in Table B-10

Table B-10 Significant Impact Assessment for Brigalow Woodland Snail

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 survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. Based on the lack of site utilisation by the species, and the small amount of habitat to be disturbed, it is considered unlikely that the proposed action would lead to a long-term decrease in the size of any population of this species.	Unlikely.
Reduce the area of occupancy of the species,	The Project Area does not occur on any border of the species known distribution range and no habitat will be disturbed. Therefore, the proposed action is unlikely to reduce the area of occupancy of any population of the species.	Unlikely.
Fragment an existing population into two or more populations,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. Disturbance to such a small area of potential habitat is unlikely to fragment an existing population into two or more populations.	Unlikely.
Adversely affect habitat critical to the survival of a species,	Habitat that has the potential to provide foraging and breeding resources for Brigalow woodland snail has been avoided through the design of the layout for the proposed action.	Unlikely.
Disrupt the breeding cycle of a population,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. Lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species, the proposed action is unlikely to disrupt the breeding cycle of any population of this species.	Unlikely.

Criteria	Description	Criteria Triggered?
	The Condamine river is thought to be an important water system for this species, which means that habitat adjacent to this waterway is likely to be important for breeding processes. This river does not go through the Project Area, which reinforces the unlikelihood that the proposed actions disturbance would disrupt breeding processes.	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The survey effort completed in the Project Area resulted in no observations of the species. Additionally, no areas of potential habitat are subject to disturbance by the proposed action. The lack of evidence to suggest that a population occurs within the Project Area, and the small potential habitat disturbance to this species means that the proposed action is unlikely to modify the species habitat to the extent the species is likely to 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	Buffel grass is an invasive species known to b deleterious to the brigalow woodland snail, as it replaces native grasses and increases fuel loads that create more intense fires that kill brigalow woodland snail (TSSC, 2016). Rats, mice and pigs are known to prey on native land snails, which can obviously lower population numbers. Additionally, pig, cattle and horse trampling can also lower the quality of habitat for the brigalow woodland snail (TSSC, 2016). The proposed action will develop and implement a VMP and WPAMP that will prevent the establishment of harmful invasive species that may predate the brigalow woodland snail or degrade the species habitat.	Unlikely.
Introduce disease that may cause the species to decline, or	The brigalow woodland snail conservation advice does not list any diseases as a threat to this species (TSSC, 2016). Regardless, biosecurity management procedures will be established for the proposed action to minimise the risk of introducing harmful diseases into the Project Area.	Unlikely.
Interfere with the recovery of the species.	There are no specific recovery or conservation objectives in place for this species according to its conservation advice (TSSC, 2016).	Unlikely.
Significant impact: Unlikely.		

APPENDIX C PMST RESULTS

EPBC Act Protected Matters Report

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. Please see the caveat for interpretation of information provided here.

Report created: 28-Aug-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	37
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	14
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	1200 - 1300km upstream from Ramsar site	In feature area
Narran lake nature reserve	400 - 500km upstream from Ramsar site	In feature area
Riverland	1100 - 1200km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	1400 - 1500km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area	In feature area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Weeping Myall Woodlands	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat may occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
FISH			
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area	In feature area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area	In feature area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
PLANT			
Cadellia pentastylis			
Ooline [9828]	Vulnerable	Species or species habitat may occur within area	In feature area
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat may occur within area	In feature area
Eucalyptus argophloia			
Queensland White Gum, Queensland Western White Gum, Lapunyah, Scrub Gum, White Gum [19748]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Homopholis belsonii			
Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area	In feature area
Lepidium monoplocoides			
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In feature area
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Xerothamnella herbacea			
[4146]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Anomalopus mackayi			
Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Delma torquata			
Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area	In feature area
Egernia rugosa			
Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Furina dunmalli			
Dunmall's Snake [59254]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hemiaspis damelii			
Grey Snake [1179]	Endangered	Species or species habitat likely to occur within area	In feature area
SNAIL			
Adclarkia cameroni			
Brigalow Woodland Snail [83886]	Endangered	Species or species habitat known to occur within area	In feature area
Adclarkia dulacca			
Dulacca Woodland Snail [83885]	Endangered	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat likely to occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata			
Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Everleigh Solar Park Project	2022/09339		Assessment	In buffer area only
Controlled action				
Construction of a high pressure buried gas pipeline, Kogan to Gladstone, QLD	2009/5029	Controlled Action	Post-Approval	In feature area
Development of Existing Coal Seam Gas Fields	2008/4398	Controlled Action	Post-Approval	In feature area
Expansion of Coal Seam Gas Fields	2009/4974	Controlled Action	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Expansion Of Coal Seam Gas Operations	2010/5344	Controlled Action	Post-Approval	In feature area
Glen Wilga Open-cut Coal Mine	2003/1173	Controlled Action	Completed	In buffer area only
Surat Gas Project off-tenure pipelines, Surat Basin, Qld	2018/8223	Controlled Action	Post-Approval	In buffer area only
Underground Coal Gasification and Liquefaction Project	2007/3541	Controlled Action	Completed	In feature area
Wandoan Coal Project - Coal Seam Methane Water Supply South	2008/4287	Controlled Action	Post-Approval	In feature area
Not controlled action				
Edenvale Solar Park	2020/8663	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Surat Basin to Tarong Railway project	2003/1264	Not Controlled Action	Completed	In buffer area only
Western Downs Green Power Hub, Hopeland, Qld	2018/8301	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Construction and operation of gas pipeline	2005/2254	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Bioregional Assessments			
SubRegion	BioRegion	Website	Buffer Status
Maranoa-Balonne-Condamine	Northern Inland Catchments	BA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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APPENDIX D BIRD SPECIES LIST

- Apostlebird (Struthidea cinerea)
- Australian magpie (*Cracticus tibicen*)
- Black kite (*Milvus migrans*)
- Blue faced honeyeater (*Entomyzon cyanotis*)
- Brown falcon (*Falco berigora*)
- Brown quail (*Coturnix ypsilophora*)
- Crested pigeon (*Ocyphaps lophotes*)
- Double-barred finch (Taeniopygia bichenovii)
- Emu (*Dromaius novaehollandiae*)
- Fairywren sp.
- Fan-tailed cuckoo (*Cacomantis flabelliformis*)
- Galah (*Cacatua roseicapilla*)
- Grey-crowned babbler (*Pomatostomus temporalis*)
- Laughing kookaburra (*Dacelo novaeguineae*)
- Lewin's honeyeater (*Meliphaga lewinii*)
- Magpie-lark (*Grallina cyanoleuca*)
- Masked lapwing (*Vanellus miles*)
- Noisy Friarbird *(Philemon corniculatus)*
- Noisy Miner *(Manorina melanocephala)*
- Pale-Headed Rosella *(Platycercus adscitus)*
- Pied Butcherbird *(Cracticus nigrogularis)*
- Red-winged Parrot *(Aprosmictus erythropterus)*
- Restless flycatcher *(Myiagra inquieta)*
- Rufous Whistler *(Pachycephala rufogularis)*
- Singing honeyeater *(Gavicalis virescens)*
- Spiny-cheeked Honeyeater *(Acanthagenys rufogularis)*
- Spotted Dove *(Spilopelia chinensis)*
- Spotted nightjar *(Eurostopodus argus)*
- Striated Pardalote *(Pardalotus striatus)*
- Striped honeyeater *(Plectorhyncha lanceolata)*
- Sulphur-Crested Cockatoo *(Cacatua galerita)*
- Torresian Crow *(Corvus orru)*
- Weebill *(Smicrornis brevirostris)*
- Welcome Swallow *(Hirundo neoxena)*
- Whistling Kite *(Haliastur sphenurus)*
- Willie Wagtail *(Rhipidura leucophrys)*

APPENDIX E ECOLOGICAL ASSESSMENT REPORT PROPOSED WESTERN DOWNS SOLAR FARM HOPELAND (28 SOUTH, 2017)

REEL PLANNING
URBAN AND RURAL STRATEGIES

APPENDIX E

Ecological Assessment by 28 South Environmental

Ecological Assessment Report
Proposed Western Downs Solar Farm
Hopeland

Report to Western Downs Solar Project Pty Ltd & Tilt Renewables Australia Pty Ltd

30 June 2017

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1 Introduction

1.1 Background and Site Context

28 South Environmental (28 South) has been engaged by Western Downs Solar Project Pty Ltd & Tilt Renewables Australia Pty Ltd (Applicant(s)) to advise on ecological matters in relation to a proposed Material Change of Use (MCU) for a Solar Farm up to 250MW at Banana Bridge Road & Sixteen Mile Hall Road, Hopeland (described as Lots 1, 3 & 4 on RP176346 & Lot 2 on RP117442 (Ulinda Park) and referred to herein as: 'the Site').

The Site is located in the central portions of the Western Downs Region Council (WDRC) Local Government Area (LGA), and is identified as a Rural C (RuC) under the Superseded Chinchilla Shire Planning Scheme 2006 (Planning Scheme) which this application is being submitted under. The Site occurs approximately 23 km south-east of the Chinchilla town centre. All adjoining properties share the same zone designation (RuC). The Site is bound to: the east by Banana Ridge Road; to the west by Sixteen Mile Hall Road; to the north by Whyalla Road; and to the south by similar large rural allotments and a Powerlink High Voltage easement. A large Powerlink Substation in located within the eastern component of the Site. The Site is collectively 897.05 ha in size and is formed by flat sandy and clay plains. The Site crowns through its central portions; with the western components draining from Site to the south-west and the eastern components draining to the east. The Site drains into larger tributaries of the Condamine River which occurs to the north of the Site. The character and extent of these adjoining properties and rural context of the Site are shown in **Figure 1**. The Site and its current context is shown in **Figure 2**.

1.1.1 Historical Context

The Site and wider locality has been subject to extensive broad scale clearing and or vegetation thinning since European settlement. A review of historical aerial imagery from 1959 to 2002 has been undertaken as a part of this assessment, with images from 1959, 1973, 1982, 1990 & 2002 shown in **Figures 2a to 2c**. Since settlement, much of the Site has been subject to broad scale clearing apart from two larger finger shaped parcels of vegetation in the south of Ulinda Park which have remained well vegetated from 1959 to present day.

The 1959 aerial shows that the western half of Ulinda Park and much of the eastern and northern components of the Site have been extensively cleared of remnant vegetation. Sixteen Mile Hall Road is clearly established within this photo; however, Banana Ridge and Whyalla Roads appear to have only been created as smaller access tracks where they meet the Site. The eastern and central areas of Ulinda Park remain well vegetation. The Ulinda Park homestead has been established by this point time.

The 1973 aerial shows that extensive clearing and property maintenance has occurred across much of the Site with the northern and eastern allotments supporting minimal woody vegetation. Ulinda Park has also undergone extensive clearing and property management between 1959 and 1973. Much of the vegetation supported in the eastern and central areas of the Site has been cleared with evidence of quarrying activities in the south being apparent. The larger areas of remnant evident in the south of Ulinda Park remain present within this Site a small pocket of vegetation has also been retained to the east of the homestead.

The 1982 aerial show minimal further clearing over the Site, with areas on the northern allotment showing signs of vegetative regeneration and a series of maintenance tracks/windrows. Expansion of quarrying areas in the south of Ulinda Park is obvious with activities moving further south and east of those areas evident in the 1973 aerial. Regeneration of paddock vegetation surrounding the homestead and in the north-western corner of Ulinda Park are also evident. A similar trend of regeneration and quarry expansion is evident in the 1990 aerial with further clearing and quarry expansion occurring in the south of Ulinda Park; while areas of historically cleared paddock continue to support regenerating vegetation.

The 2002 aerial shows that the extensive clearing in the southern areas of Ulinda Park has occur to the south of the noted quarry activities; leaving two large fingers of remnant vegetation occurring in the south of the property. Further regeneration of vegetation continues to occur around the homestead areas and in the north-west of the property. Vegetation management has again occurred over the northern allotment retaining rectangular strips of vegetation in the central areas of this property. Vegetation regeneration continues to occur over the eastern most allotment.

Between the 2002 aerial and the most recent satellite photography, the construction of the Kogan Power Station to the east of the Site has occurred. A large Powerlink Sub-station has been constructed over the central areas of the eastern most allotment of the Site and its associated high voltage powerline easements traversing eastwards and southwards (**Figure 2**). Areas of Ulinda Park continue to support regenerating vegetation in the north surrounding the homestead and the in the north-west of the property. Those areas which were cleared to the south of the quarry in the 2002 image appear to have been allowed to regenerate; however quarried areas remain clear. A large formalised airstrip is apparent in the central areas of Ulinda Park.

1.1.2 Local Government Planning Context

The Site and surrounding locality is located within the RuC zone (**Attachment 1**). The overall outcomes of this zone are to support appropriate land use structure that is in accordance with the environmental characteristics of the locality and that avoids conflict between incompatible uses; and retains its viability as an area of primary production. The Site is encompassed by a similarly zone rural properties under the Planning Scheme. Contextually, surrounding rural properties have undergone significant historical clearing to support grazing and other agricultural pursuits as well as power infrastructure projects; however, areas to the south and west of the Site support large tracts of remnant woodlands, typically on poorer quality soils or along riparian corridors (**Figure 1**). The Site itself has been regularly subject to broad scale clearing, vegetation maintenance and quarrying activities as shown in **Figure 2**.

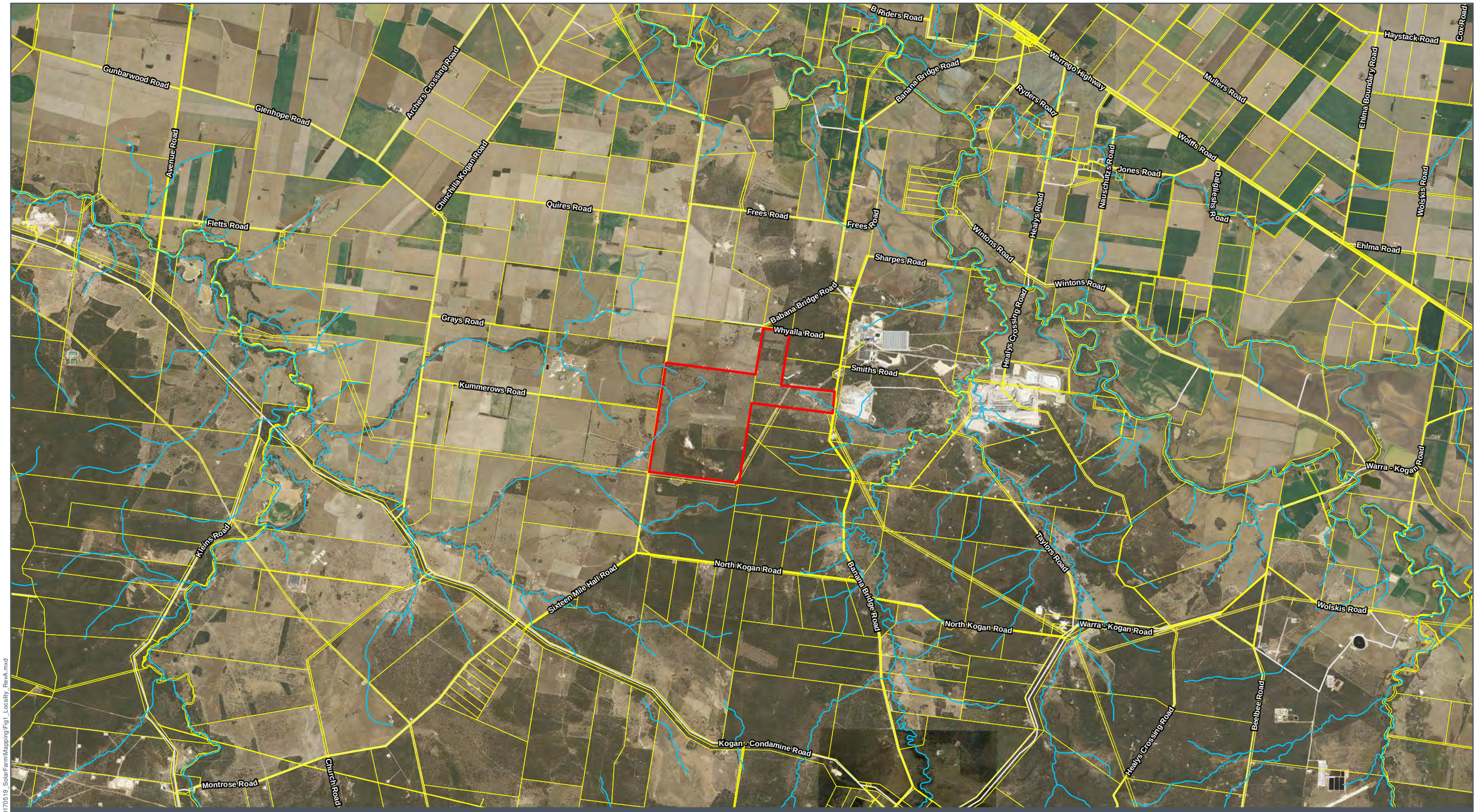
1.2 Scope of this Assessment

This Ecological Assessment Report discusses the applicability, and where necessary address the provisions of the following Commonwealth, State and WDRC environmental planning instruments:

(i) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
(ii) State Development Assessment Provisions (SDAP);
(iii) Superseded Chinchilla Planning Scheme.

This report is current at 30 June 2017. It is provided to Western Downs Solar Project Pty Ltd & Tilt Renewables Australia Pty Ltd for the purpose for which it was commissioned. This report is not to be relied upon by any other party for commercial purposes. All parts of this report are to be read together, including all attachments and figures. Further detail on planning, and other technical elements of the proposed MCU can be found in the corresponding technical reports accompanying the Applicants submission to WDRC.

This report considers historical clearing and agricultural events and takes into consideration impacts to Matters of National Environmental Significance (MNES), Matters of State Environmental Significance (MSES) and planning considerations of the Planning Scheme as well as any relevant code assessments.



28 South Environmental

Figure 1
Site Locality

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	REV.	REVISION NOTE
09/06/2017	JLG	MT	MT	A	Issued For Information

WORK REQUEST NUMBER: 652230

DATA SOURCES:
GPS Survey - 28 South Environmental
DCDB, Aerial, Waterways, Roads © State of Queensland 2015
Service Layer Credits: Copyright:© 2015 DeLorme

N

0 1,500 3,000
Meters

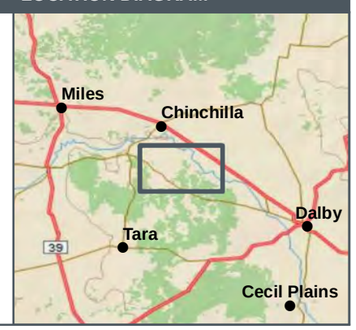
1:100,000 (A3) GCS GDA 1994

28 SOUTH Environmental

LEGEND

- Road
- Waterway
- Site
- DCDB

LOCATION DIAGRAM



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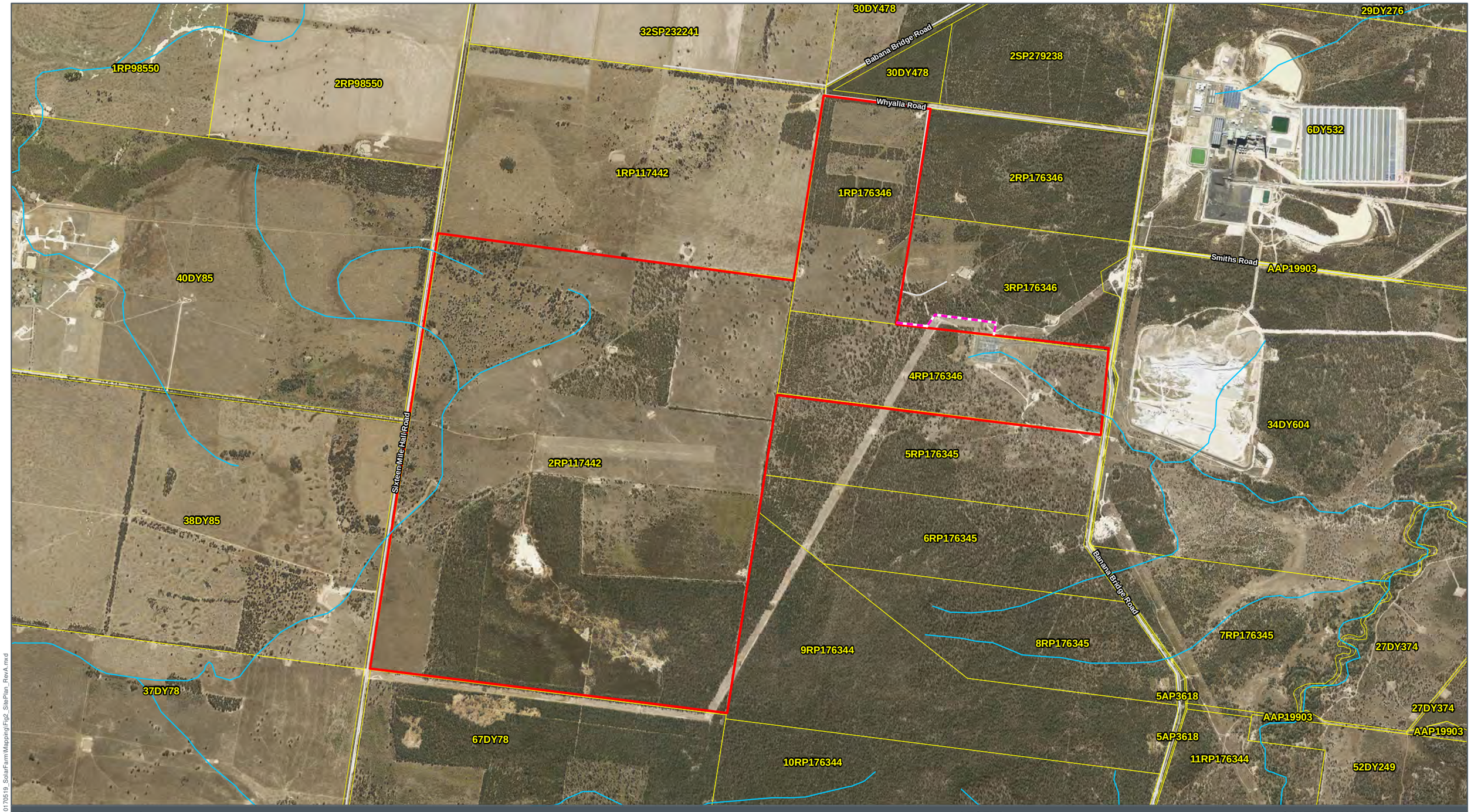

28 South Environmental

Figure 2
Site Plan

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	REV.	REVISION NOTE
27/06/2017	MG	MT	MT	A	Issued For Information

WORK REQUEST NUMBER: 652230

DATA SOURCES:
GPS Survey - 28 South Environmental
DCDB, Aerial, Waterways, Roads © State of Queensland 2015
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Copyright:© 2015 DeLorme

N

0 500 1,000
Meters

1:25,000 (A3) GCS GDA 1994

28 SOUTH Environmental

LEGEND

- Road
- Waterway
- Lot 3 Proposed Transmission Line
- Site
- DCDB

LOCATION DIAGRAM

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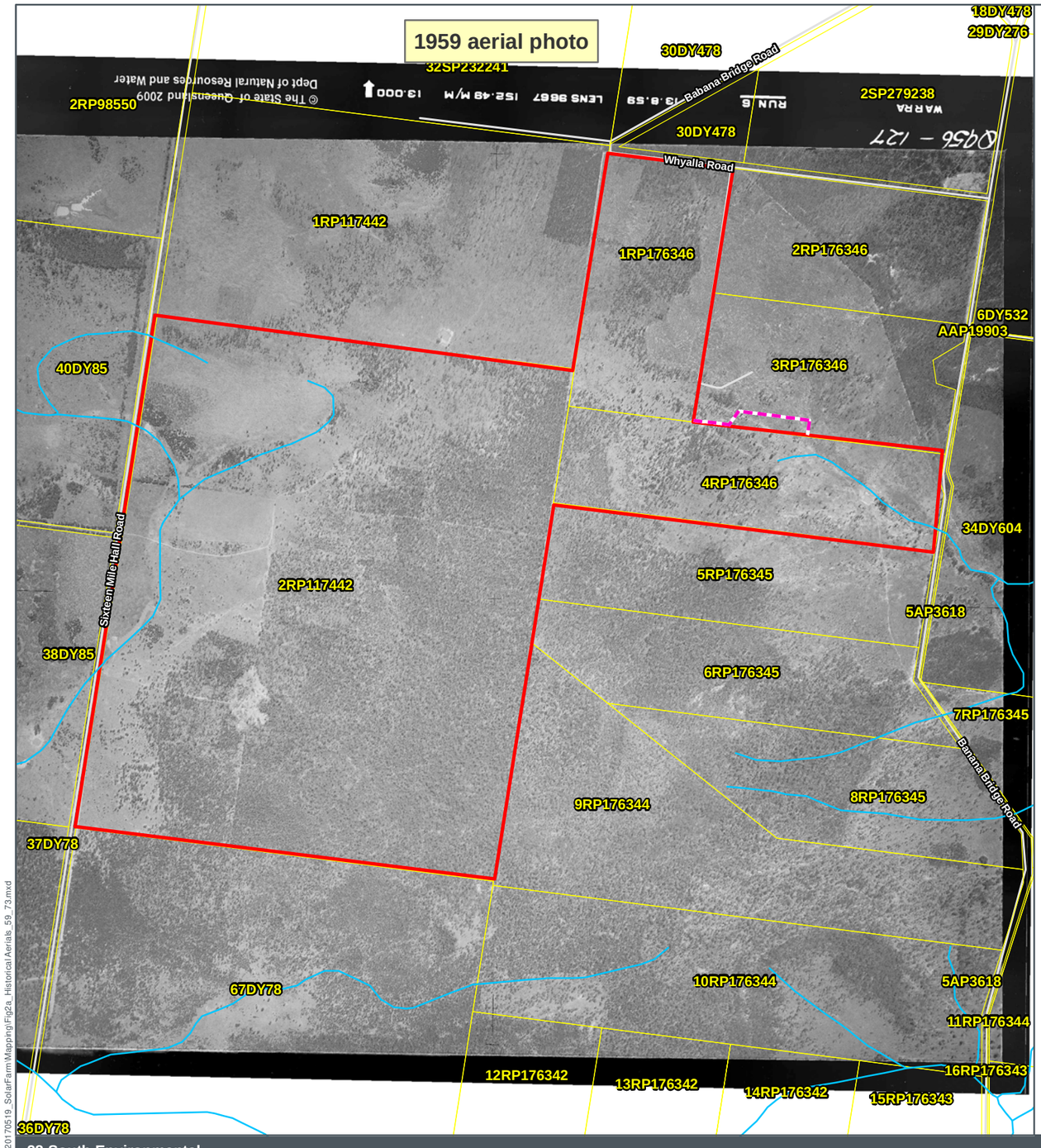
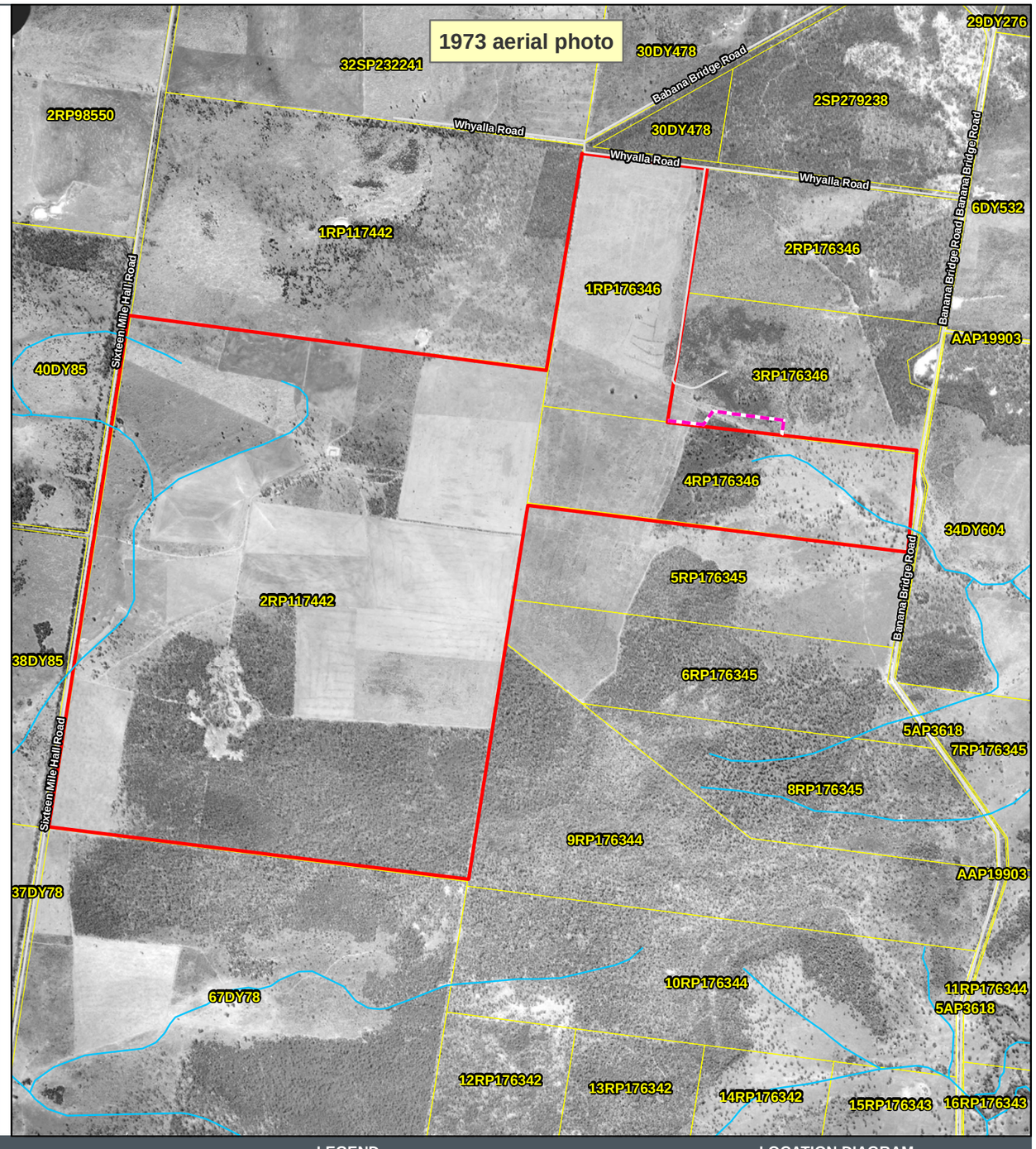




28 South Environmental

Figure 2a
Historical aerials - 1959 and 1973

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	REV.	REVISION NOTE
26/06/2017	MG	MT	MT	A	Issued For Information

WORK REQUEST NUMBER: 652230

DATA SOURCES:
GPS Survey - 28 South Environmental
DCDB, Regional Ecosystems Version 8.0, Aerial, Waterways, Roads
© State of Queensland 2015
Service Layer Credits: Copyright:© 2015 DeLorme

N

0 500 1,000
Meters

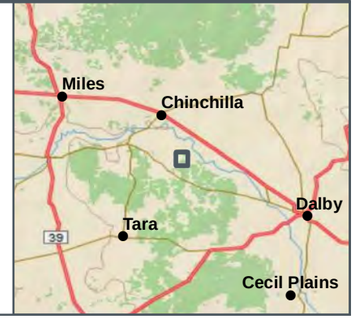
1:30,000 (A3) GCS GDA 1994

28 SOUTH Environmental

LEGEND

- Road
- Waterway
- Lot 3 Proposed Transmission Line
- Site
- DCDB

LOCATION DIAGRAM



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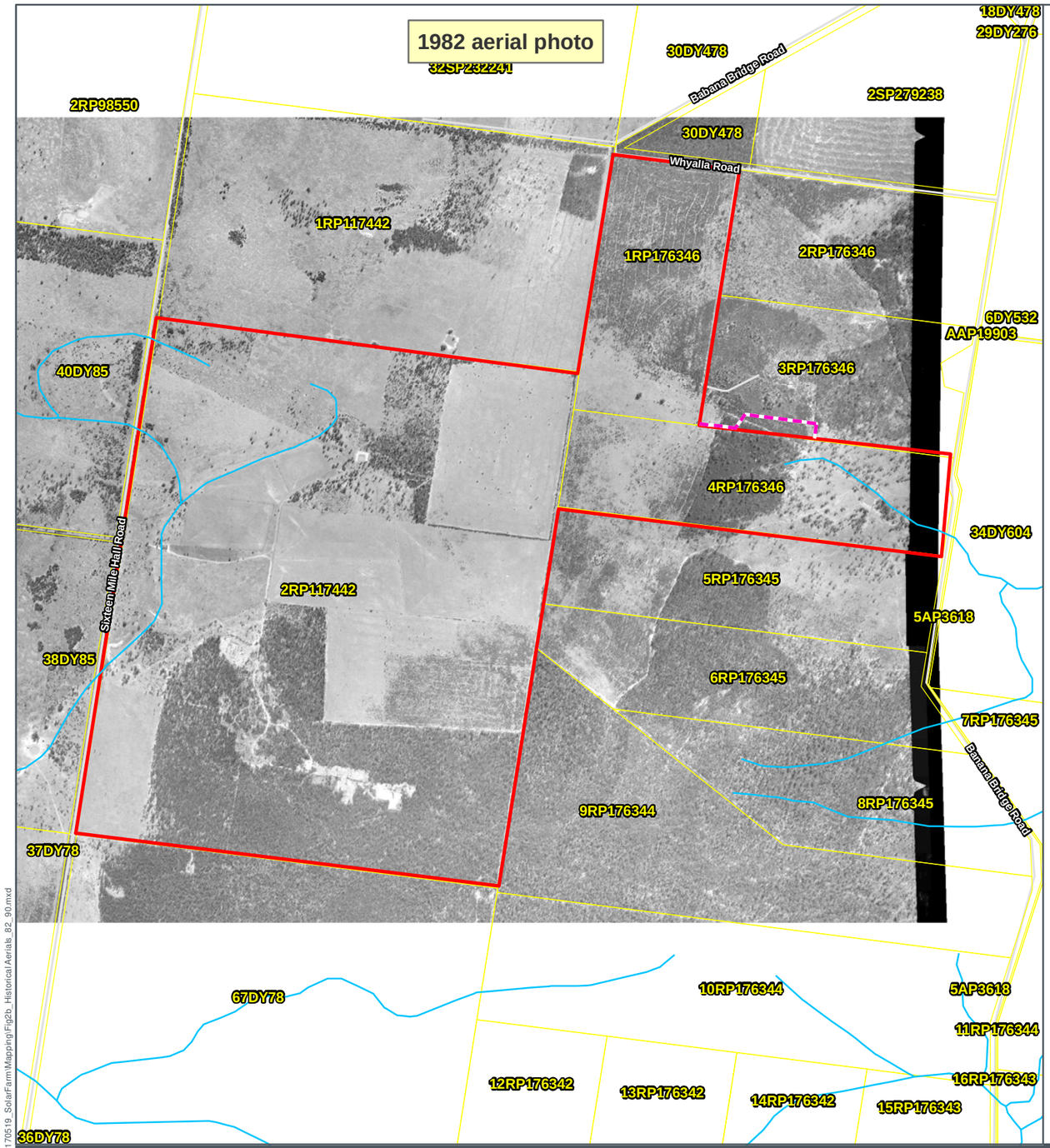
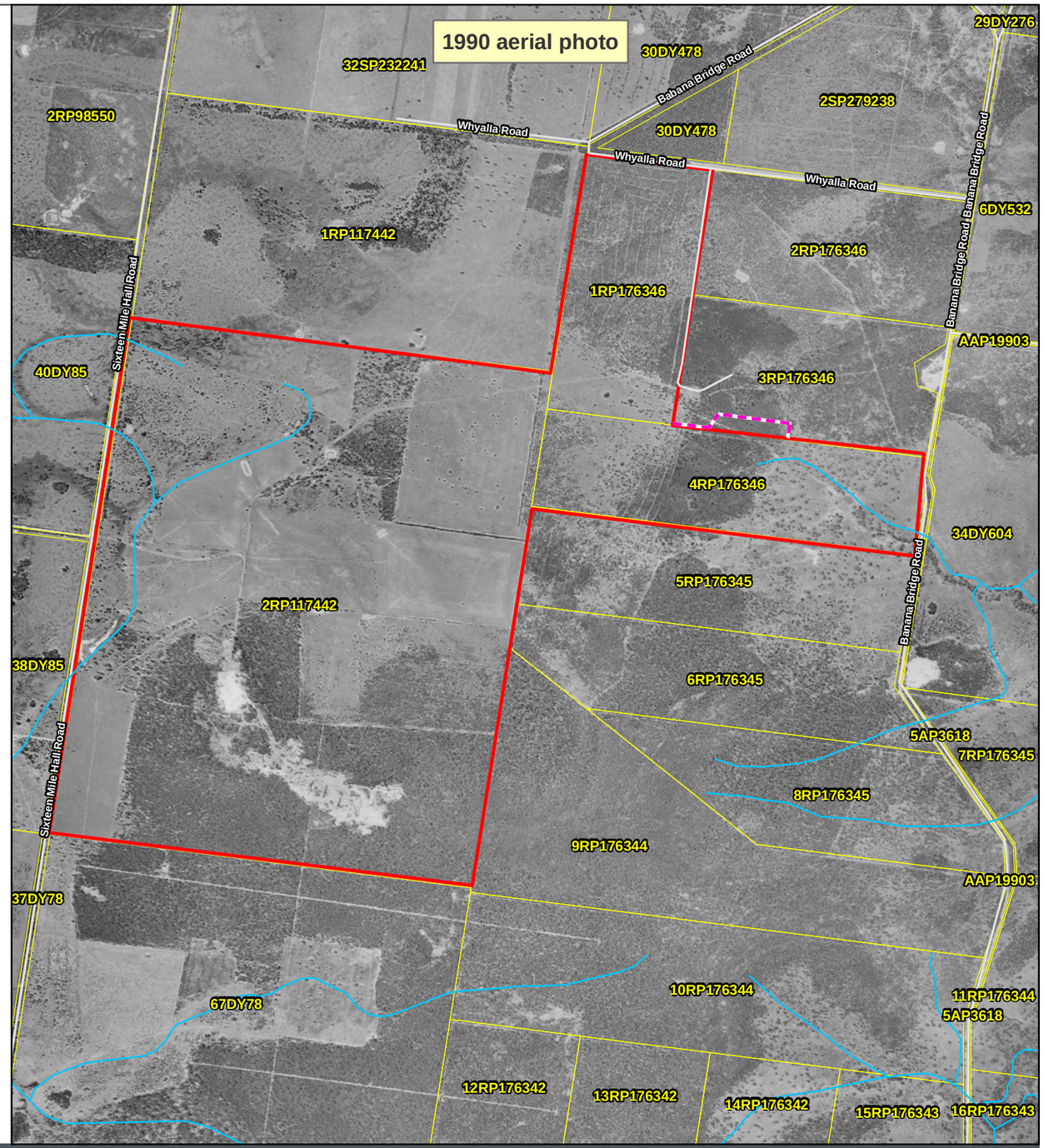




28 South Environmental

Figure 2b
Historical aerials - 1982 and 1990

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	REV.	REVISION NOTE
26/06/2017	MG	MT	MT	A	Issued For Information

WORK REQUEST NUMBER: 652230

DATA SOURCES:
GPS Survey - 28 South Environmental
DCDB, Regional Ecosystems Version 8.0, Aerial, Waterways, Roads
© State of Queensland 2015
Service Layer Credits: Copyright:© 2015 DeLorme

N

0 500 1,000
Meters

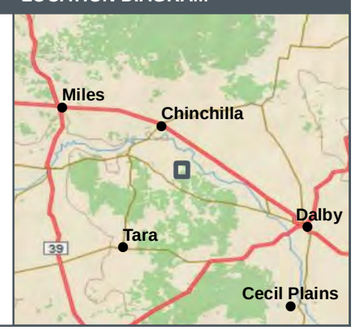
1:30,000 (A3) GCS GDA 1994

28 SOUTH Environmental

LEGEND

- Road
- Waterway
- Lot 3 Proposed Transmission Line
- Site
- DCDB

LOCATION DIAGRAM



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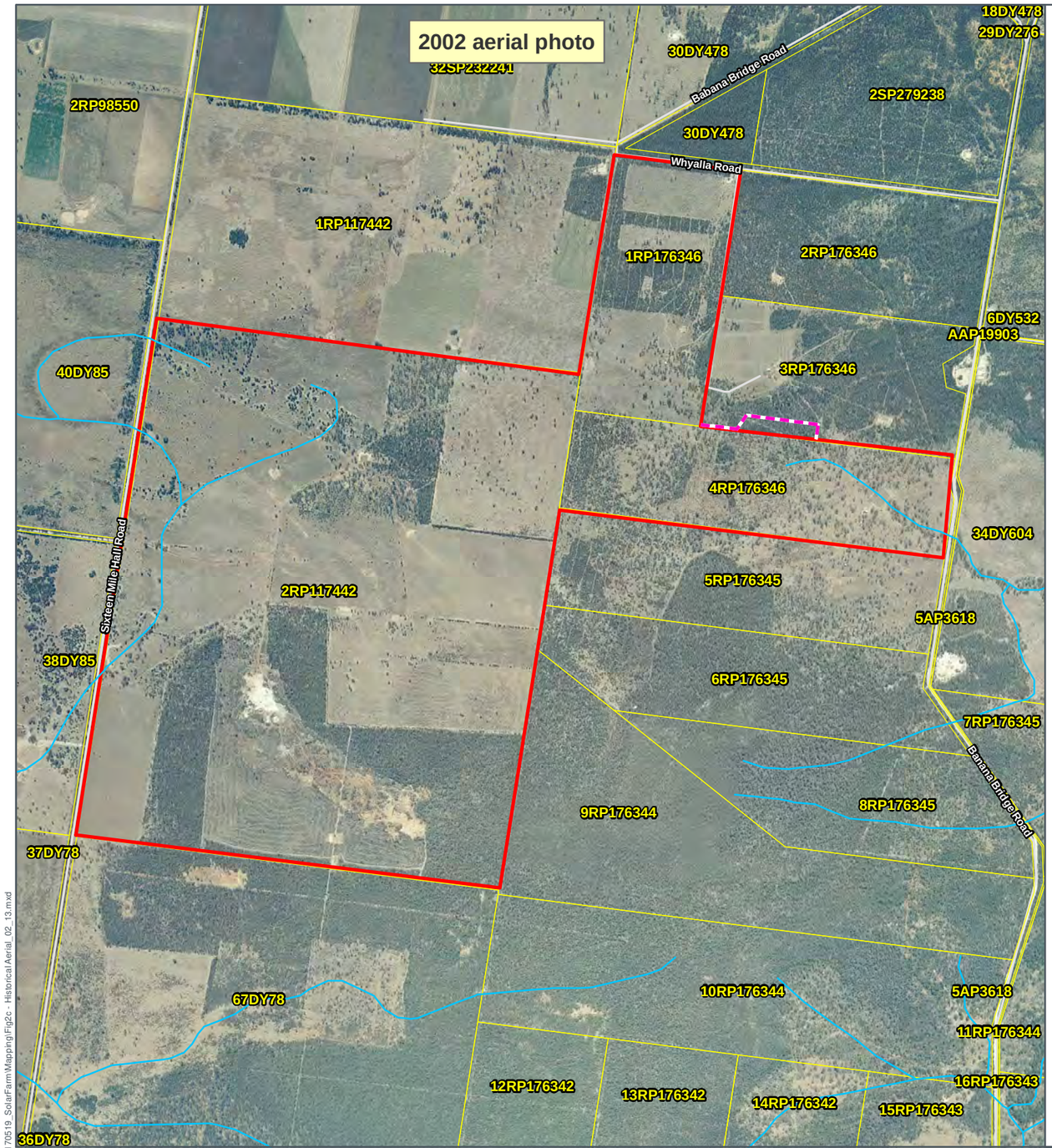
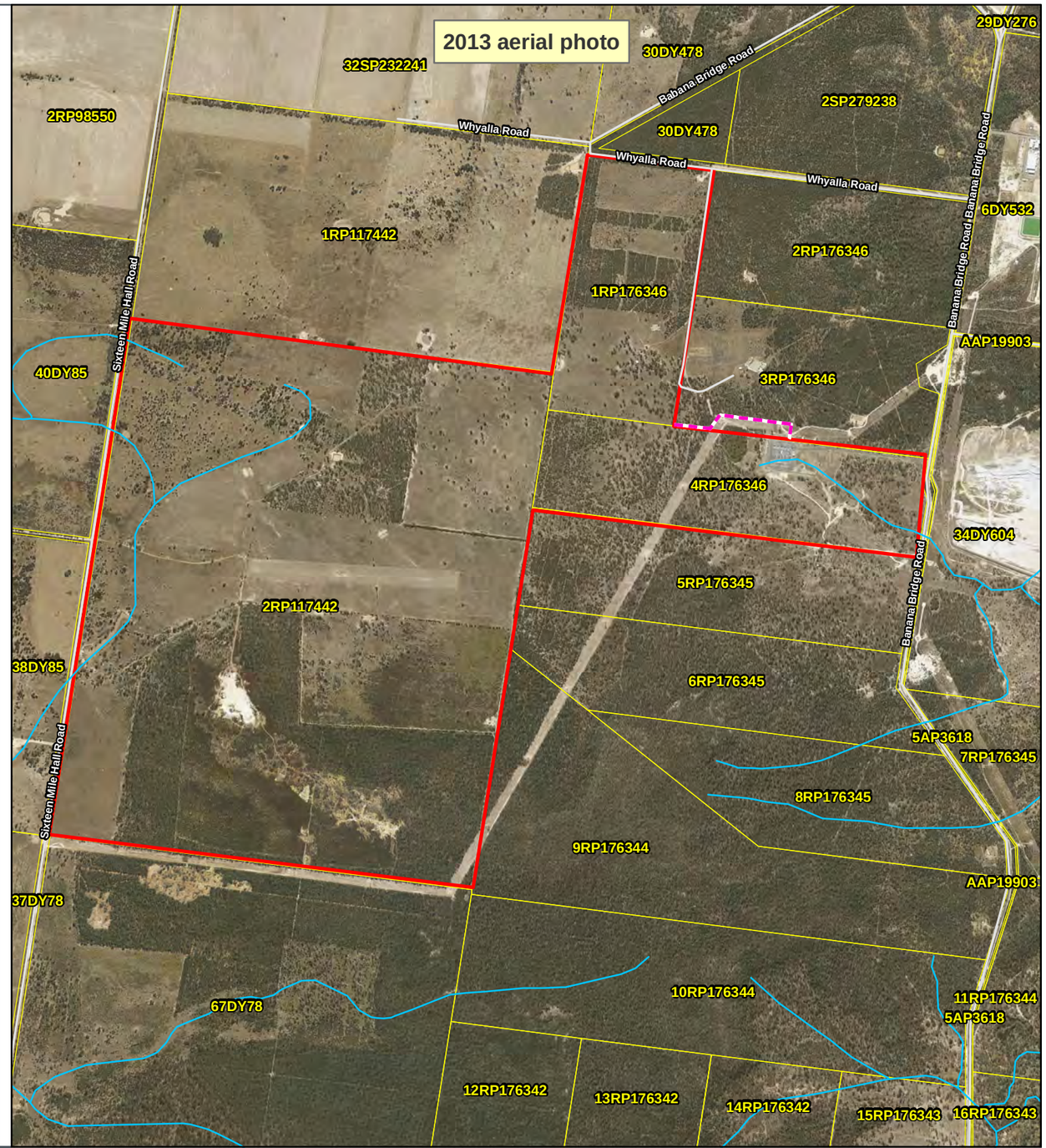




28 South Environmental

Figure 2c
Historical aerials - 2002 and 2013

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	REV.	REVISION NOTE
26/06/2017	MG	MT	MT	A	Issued For Information

WORK REQUEST NUMBER: 652230

DATA SOURCES:
GPS Survey - 28 South Environmental
DCDB, Regional Ecosystems Version 8.0, Aerial, Waterways, Roads
© State of Queensland 2015
Service Layer Credits: Copyright:© 2015 DeLorme

N

0 500 1,000
Meters

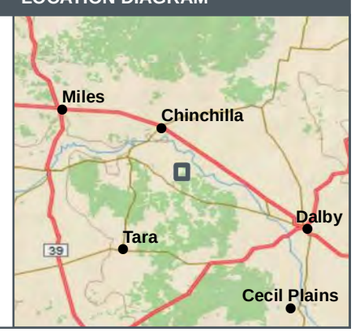
1:30,000 (A3) GCS GDA 1994

28 SOUTH Environmental

LEGEND

- Road
- Waterway
- Lot 3 Proposed Transmission Line
- Site
- DCDB

LOCATION DIAGRAM



Path: W:\PROJECTS\EI\CildenGrange\652230\2.0_Project_Delivery\20170519_SolarFarm\Mapping\Fig2c - Historical Aerial_02_13.mxd

2 Proposed Development

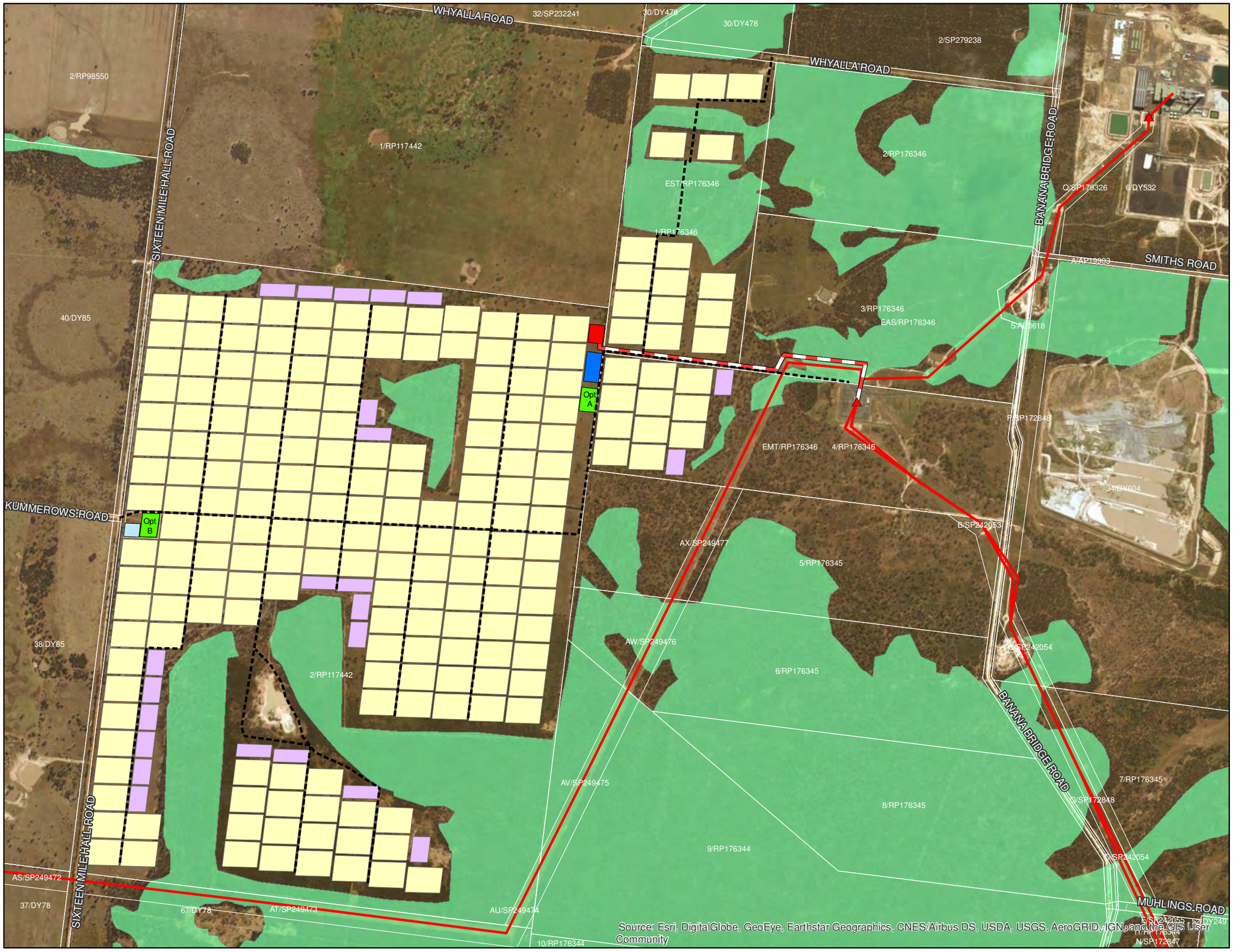
The proposed development subject to this Development Application (DA) intends to construct a Solar Farm up to 250MW across the Site which includes the following facilities:

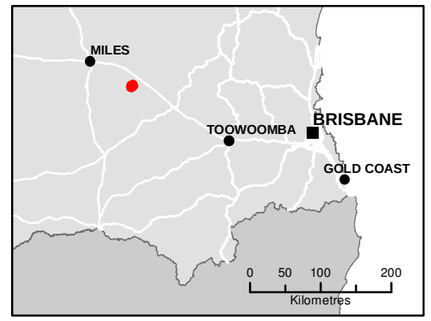
- Access gates;
- Access roads;
- Battery Energy Storage Solution (Optional);
- Solar array blocks (1MWp & 2MWp);
- 275Kv export substation;
- Transmission Line;
- Site Office;
- Temporary laydown areas;
- Temporary Construction Compounds; and
- Switchyard.

The indicative Solar Farm layout has been provided in **Figure 3a**. The proposed design has avoided all areas of mapped regulated vegetation within the Site and has provided them with a minimum 20m environmental buffer. A small area of regulated vegetation which occurs off Site on Lot 3 RP176346 will however, be impacted as result of the proposed Solar Farm. Due to development constraints imposed by Powerlink, the proposed Overhead 275kV Line is required to be sited along the northern boundary of Powerlink's existing Electricity Transmission Line and connect into the existing Sub-station from the north. This requires a small expansion of the existing electricity easement which has recently cleared remnant vegetation across the Site and adjoining properties as shown in **Figure 3b**.

Development areas of the Solar Farm have been focused on areas which support minimal mature woody vegetation; however, areas of regenerating vegetation in open paddocks will require removal to support the necessary extent of development for the project to remain feasible.

Proposed fence lines may also require the removal of mature vegetation for their establishment; however, the Applicants intent is to include minor alterations to fence line and access track alignments at the time of construction to retain trees and vegetation within the Site. One Access Track is proposed to traverse mapped remnant vegetation in the northern parcel of the Site; however, the proposed access track will follow an existing cleared powerline easement which currently supports an established access tracks and will avoid any clearing requirements. Bushfire management measures have also been considered within this report, noting that all structures outside of solar arrays have been positioned in areas of low bushfire hazard.





Legend

Array Layout

- 0.75MWp Area x 23
- 1.5MWp Area x 206
- Battery Energy Storage Solution
- Substation
- Switchyard
- O&M Facility
- Overhead 275kV Line
- Access Tracks

Existing Conditions

- Electricity Transmission Lines
- Electricity Transmission Substations
- Regulated vegetation management

Date: 23/06/2017
Version: H

Data Sources: Electricity transmission (GA, 2017); Regulated Vegetation Management v 1.41, (© State of Queensland (Department of Natural Resources and Mines) 2017.
Floodplain Assessmsent Overlay (© State of Queensland (Queensland Reconstruction Authority) 2017.

Updated data available at http://qldspatial.information.qld.gov.au/catalogue//).

GDA 1994 MGA Zone 56
Scale: 1:18,000 at A3

N

0 200 400 600 800
Metres

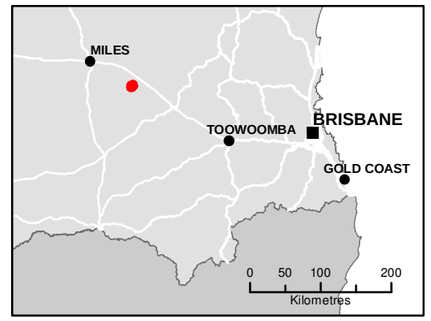
Document Path: C:\GIS\Development_Sites\QLD\WesternDowns\Maps\Working\WDSF_002_AvailableLand_A3L.mxd

Western Downs Solar Farm

Proposed Indicative Layout

FIGURE 3A - Proposed Layout

renewables



Legend

Array Layout

- 0.75MWp Area x 23
- 1.5MWp Area x 206
- Battery Energy Storage Solution
- Substation
- Switchyard
- O&M Facility
- Overhead 275kV Line
- 60m Easement
- Existing Vegetation Impacted by Easement (1.45ha)
- Access Tracks

Existing Conditions

- Electricity Transmission Lines
- Electricity Transmission Substations
- Regulated vegetation management

Date: 27/06/2017
Version: A

Data Sources: Electricity transmission (GA, 2017); Regulated Vegetation Management v 1.41, (© State of Queensland (Department of Natural Resources and Mines) 2017.
Floodplain Assessmsent Overlay (© State of Queensland (Queensland Reconstruction Authority) 2017.

Updated data available at http://qldspatial.information.qld.gov.au/catalogue//).

GDA 1994 MGA Zone 56
Scale: 1:4,297 at A3

N

0 50 100 150 200
Metres

Document Path: C:\GIS\Development_Sites\QLD\WesternDowns\Maps\Working\WDSF_005_TxlEasementVegImpact_A3L.mxd

Western Downs Solar Farm

Vegetation Impacted by Transmission Easement

FIGURE 3B - Overhead 275kV Line

renewables

3 Matters for Consideration

3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides the legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined under the EPBC Act as 'Matters of National Environmental Significance' (MNES). Under the EPBC Act, a referral to the Department of the Environment and Energy (DotEE) is required if the proposed development could cause a Significant Impact on MNES. The determination of whether a Significant Impact will arise is made with reference to the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DoE 2013) and other EPBC Act policy statements[1].

A search[2] of the Protected Matters Search tool (PMST) indicates the likely or potential occurrence of MNES or their habitats in the locality (**Attachment 2**). This included four (4) Wetlands of International Importance; 4 listed Threatened Ecological Communities (TECs); twenty-four fauna and flora listed flora species; and twelve listed migratory species. A search of the Department of Environment and Heritage Protection (DEHP) Wildlife Online database provides confirmed records of MNES within the same search radius (**Attachment 3**). This search confirmed records of one (1) listed invertebrate; 1 listed mammal species; and 1 listed plant species within the search radius. Further a sieving review of the Atlas of Living Australia for identified threatened fauna within the PMST and Wildlife Online databases was undertaken to spatially identify the location of records, with limited records noted in proximity to the Site. Further assessment of MNES is undertaken in **Sections 4** - **6**

3.2 State Development Assessment Provisions

3.2.1 Module 5 – Fisheries Resources

State Assessment Referral Agency (SARA) mapping shows that there are no fish habitat referral triggers for Module 5 (**Attachment 4**); however, does illustrate three mapped waterways for waterway barrier works within the Site. Two of the mapped waterways are identified as "Low" occurring in the far north-west and the far east of the Site. The other mapped waterway is identified as "Moderate" and occurs in the north-west and central west of Ulinda Park. There is no further requirement for assessment against Module 5 of the SDAP. All works within these mapped waterways are to be constructed in accordance with the Department of Agriculture, Fisheries and Forestry (DAFF) Codes for self-assessable development and as such no further approval is required. Should, these works not meet the requirements of the code, then an application for a development approval will need to be lodged. Assessment would be made against Module 5.2 (Constructing or raising waterway barrier works in fish habitats state code) of the SDAP.

Overall, the need to comply with Module 5 of the SDAP does not create significant complexity for development. Based on the location of Queensland Waterways for Waterway Barrier Works and the proposed development works, it is likely compliance can be achieved.

3.2.2 Module 8 – Native Vegetation Clearing

SARA mapping shows that the Site supports regulated vegetation (**Attachment 5**). A review of the Regulated Vegetation Management Map (RVMM) indicates that the Site supports areas mapped as Category X and Category B vegetation. A review of the Vegetation Management Supporting Map (VMSM) illustrates that the seven distinct areas of the Site which support Category B Regulated Vegetation. Of the seven polygons, six are

[1] Including significant impact guidelines for individual threatened species, groups of species and threatened ecological communities (refer http://www.environment.gov.au/epbc/publications/guidelines.html)
[2] A 10km radius around the Site was specified from a central co-ordinate (-26.94041, 150.7174).

mapped as Least Concern mixed polygon RE11.5.20/11.5.1 or RE11.5.20/11.5.1a/11.5.1. The other polygon is mapped as a small area of homogenous Endangered RE11.4.3.

The clearing of Regulated Vegetation as a result of this MCU requires assessment against Module 8, Table 8.1.3 (PO1-3) of the SDAP and Table 8.1.4 (PO2 – 10).

Pre-clear regional ecosystem mapping shows that the majority of the Site was considered to historically support three RE polygons being: RE11.4.3 (western boundary areas); RE11.5.20/11.5.1a/11.5.1 (northern and central areas); and RE11.5.1a/11.5.1/11.5.20.

3.2.3 Module 11 – Wetland Protection Areas

SARA mapping shows that there are no referral triggers for Module 11 (**Attachment 6**). There is no further requirement for assessment against Module 11 of the SDAP.

3.3 Protected Plants Survey Trigger Mapping

The Site is not identified with a High Risk Area on the Protected Plants Flora Survey Trigger Map (**Attachment 5**). In-field survey of the Site was however, undertaken to search for threatened flora species listed MNES or MSES that were identified in **Attachment 2** & **3** or are known to occur in the region.

3.4 Chinchilla Planning Scheme

The Site is located within the RuC zone under the Planning Scheme. As such an assessment of the proposed development against the Rural Zone Code for a MCU. Environmental Overlays relevant to the proposed development are derived from the Land Characteristics Map and include: Features Map 2 "*Biodiversity Planning Assessment*" and "*Bushfire Hazard Areas*"

3.4.1 Landscape Characteristics Map

3.4.1.1 Features Map 2 "*Biodiversity Planning Assessment*"

The Chinchilla Planning Scheme Land Characteristics Map (Features Map 2 – *Biodiversity Planning Assessment*) shows that a small component of the Site is mapped as supporting areas of Biodiversity Planning Assessment (**Attachment 7**). It is noted that the mapped area correlates with the area mapped as Endangered Regulated Vegetation. The proposed development will require assessment against specific components of the Rural Zone Code including but not limited to Performance Criteria(s) 21, 22, 24, 25-31 & 40.

3.4.2 Bushfire Hazard Area

The Planning Scheme Bushfire hazard area map shows that the Site is mapped as supporting Low and Medium Fire Hazard (**Attachment 8**). Areas mapped as bushfire hazard in **Attachment 8** are restricted to those areas of mapped remnant vegetation. The proposed development will require assessment against specific components of the Rural Zone Code including but not limited to Performance Criteria(s) 14, 20 & 37-38 which is provided in **Section 9.4.3**.

4 Flora Assessment

4.1 Survey Methods

4.1.1 Desktop Assessment

Pre-clear regional ecosystem mapping shows that the majority of the Site was considered to historically support three RE polygons being: RE11.4.3 (western boundary areas); RE11.5.20/11.5.1a/11.5.1 (northern and central areas); and RE11.5.1a/11.5.1/11.5.20.

Review of the VMSM has identified that large components of the Site mapped within pre-clear mapping are now non-remnant Category X. Much of the Site has been subject to historical and contemporary vegetation clearing and land management for grazing, rock quarrying and other agricultural pursuits, and currently supports either no woody vegetation or regenerating communities in variable states. As such, much of the Site has been appropriately omitted from regulated vegetation mapping. Smaller components of the northern and central areas within the Site are mapped as supporting Category B vegetation as well as two larger fingers of vegetation in the south of the Site as illustrated in **Figure 3c**.

Prior to the commencement of surveys, a review of relevant databases and background information was undertaken to develop a target list of species, communities and potential environmental management issues. This also included a review of the: EPBCs Protected Matters Search Tool (PMST) (**Attachment 2**); and Wildlife Online searches (**Attachment 3**). Both searches were conducted using a 10km buffer. Other sources of desktop information were consulted such as the Atlas of Living Australia and Google Earth's Queensland Globe dataset as a part of desktop analysis. Further, a review of historical aerial photography was undertaken and is outlined within **Section 1.1.1**.

4.1.2 Field Survey Results and Discussion

Botanical surveys were undertaken by Bruce McLennan and Mitch Taylor over 23-25 May 2017 for a period of 58 person hours. Weather conditions were considered adequate for the level of ecological assessment undertaken; however, temporal conditions were not ideal for some flora species. The team's CVs are provided in **Attachment 9**.

Surveys initially traversed the entire Site to provide an understanding of vegetation communities supported on varying geologies and landform features. Survey efforts were then focused on confirming:

i. vegetation was consistent with the described mapping;
ii. the Site supported any plant species identified as MNES under the EPBC Act;
iii. cleared country was appropriately excluded from the RVMM;
iv. mature vegetation was appropriately mapped and included in the RVMM;
v. the Site supported threatened plant species; and
vi. supported plant species or communities which were otherwise of conservation interest.

The survey concentrated on the description of vegetation communities and their spatial extent within the Site; and search for threatened flora species. An on-ground review of RVMM was undertaken in accordance with the Queensland Herbarium's regional ecosystem mapping criteria[3]; however, surveys were considered sufficient to

[3] Neldner et. al (2012) Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.2: Department of Science, Information Technology, Innovation and the Arts.

undertake a detailed Property Map of Assessable Vegetation. Four full tertiary (BioCondition) site assessments and 30 quaternary site assessments were undertaken within remnant and non-remnant areas of the Site to assess the vegetation community's parameters with reference to known benchmarks and highlight the quality of vegetation. The result of these site assessments is shown in **Attachment 10**.

The Site occurs outside of High-Risk Areas mapped under the Protected Plants Trigger Mapping (**Attachment 5**). Botanical surveys included a series of timed random meander searches on top of the 34-site assessment over the course of three days (58 person hours) searching for threatened flora species, particularly those identified within **Table 1**. Site assessment data is also provided in **Attachment 10**.

Most areas mapped as supporting remnant vegetation are considered to meet remnant status and are analogous with the extent of the RVSM; however, the small Brigalow community mapped in the north-west of Ulinda Park did not meet thresholds set out in the benchmarks for RE11.4.3[4]. Survey identified that mapped remnant vegetation communities across much of the Site exhibited high to moderate levels of historical disturbance as evidenced by the lack of large mature trees outside of the larger fingers of vegetation surrounding the quarry areas in the south of Ulinda Park. Much of the wooded vegetation communities found outside of the mapped regulated vegetation polygons conform to the same vegetation community descriptions as the proximate areas of remnant vegetation.

The north west of the Site is found on Cainozoic clay plains (Landzone 4). These soils are light to medium clays derived from fine sediments and in parts exhibit significant gilgai formation. These soils exclusively support the Brigalow community vegetation of RE 11.4.3 within the Site. This community is described as:

- *Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.

This community is listed under the EPBC Act and Qld VMA as an Endangered community.

The bulk of the site is made up of Cainozoic era sand plains (Landzone 5) with evidence of old eroded and laterised sandstone pediments within the plain. Vegetation communities within this landzone are characterised by subtle differences within soil profiles in the sand plain. There are three mapped Landzone 5 communities being:

- RE 11.5.20 *Eucalyptus moluccana* and/or *E. microcarpa* and/or E*. woollsiana* +/- *E. crebra* woodland on Cainozoic sand plains

- RE 11.5.1 *Eucalyptus crebra* and/or E*. populnea*, *Callitris glaucophylla*, *Angophora leiocarpa*, *Allocasuarina luehmannii* woodland on Cainozoic sand plains and/or remnant surfaces

- RE 11.5.1a *Eucalyptus populnea* woodland with *Allocasuarina luehmannii* low tree layer

One small area of vegetation mapped within the broad heterogenous polygon of REs 11.5.20/11.5.1/11.5.1a is an incorrectly mapped area of *Eucalyptus fibrosa subsp. nubila* (broad leafed ironbark) on laterised sandstone soils. This RE is described as:

- RE 11.7.7 *Eucalyptus fibrosa subsp. nubila +/- Corymbia spp. +/- Eucalyptus spp*. woodland on Cainozoic lateritic duricrust

[4] A detailed map amendment for this particular polygon has been submitted to the Department of Natural Resources and Mines to remove this vegetation from the RVMM.

Over the Site 2 distinct vegetation communities outside of cleared paddocks with scattered tree were identified. A description of each community is provided below:

4.1.2.1 Vegetation Community 1 - Regrowth Brigalow Woodland

This Vegetation Community is present only as a sliver running east west in the north-west corner of the site.

Two BioCondition transects were collected in Community I to ascertain whether this patch meets minimum height and cover benchmarks for the RE. Vegetation Community 1's canopy layer (T1 layer) forms the Ecologically Dominant Layer (EDL) with a median approximate height of 17m and 20m respectively. The T1 layer cover was measured at 43% and 9.5% respectively and compared to a benchmark of 70%. While one of the transects appears to meet the 50% rule for T1 cover, Brigalow (*Acacia harpophylla*) is not represented in either canopy intercept. This means that the patch does not meet the third rule for remnant vegetation which requires a species composition consistent with the remnant community.

With the exception of a tall and partly intact canopy of *Eucalyptus woollsiana* this patch of Brigalow regrowth appears little different to the adjacent cleared country which consists of open grassed country with scattered patches of Brigalow regrowth up to 9m in height.

Surveys did not record any threatened plant communities or threatened plant species.

4.1.2.2 Vegetation Community 2 - Box – Ironbark Woodlands

Vegetation Community 2 is the dominant community across the Site. It is a heterogenous mix of the three regional ecosystems listed and exists in varying states of maturity.

The 11.5.20 component has median canopy heights of *E. woollsiana* varying typically from 17m to 22m with canopy covers of 20-40%. The T2 canopy is generally sparse and contains a range of species such as *Callitris glaucophylla* and *Allocasuarina luehmannii*. Shrub cover varies from sparse to mid-dense and contains species such as *Dodonaea viscosa, Geijera parviflora, Acacia ixiophylla* and *Callitris glaucophylla*. Some areas of this community exhibit coppiced growth indicating the area was cleared to ground level at some time. This component of the mixed heterogenous communities is generally the most dominant throughout remnant and non-remnant areas of the Site.

The 11.5.1a component has median canopy heights of *E. populnea* varying typically from 15m to 20m with canopy covers of 20-45%. The T2 canopy is generally sparse to mid-dense and is dominated by *Allocasuarina luehmannii* when the T2 layer is mid-dense. Shrub cover varies from sparse to mid-dense (inversely proportional to the density of the T2 layer) and contains species such as *Dodonaea viscosa, Acacia leiocalyx, Acacia crassa, Acacia excelsa, Myoporum acuminatum* and *Callitris glaucophylla*. This component of the mixed heterogenous communities is isolated and often occurs as thinner strips on the fringing areas of broader vegetation communities, particularly around the homestead on Ulinda Park.

The 11.5.1 component has median canopy heights of *E. crebra* varying typically from 14m to 22m with canopy covers of 25-40%. The T2 canopy is generally sparse but ranging from 15-30% cover and contains a range of species including *Allocasuarina luehmannii* and *Callitris glaucophylla*. Shrub cover is typically sparse and contains species such as *Dodonaea viscosa*, a range of Acacia species and *Callitris glaucophylla*. This component of the mixed heterogenous communities is generally restricted to the southern areas of the Site where the larger fingers of remnant vegetation occur in Ulinda Park.

Surveys did not record any threatened plant communities or threatened plant species.

Surveys detected the presence of numerous larger hollow bearing trees; however, these were restricted mapped remnant areas in the south of Ulinda Park and surrounding the homestead defining areas which have not been subject to broad scale clearing. Historical aerial imagery and remnant vegetation mapping provides a good guide to the location of larger trees, with most relict trees likely to support hollow bearing features. The lack of relict trees across the non-remnant areas of the Site and from the remnant areas in the northern and eastern allotment highlights that most vegetation communities supported over the Site have been subject to historical broad-scale clearing and are advanced regrowth.

4.1.3 Field Survey Limitations

Less than average rainfall during the wet season period leading into the survey resulted in a reduced level of observed flora species richness and plant vigour.

Ecological survey often fails to record all species of flora present in a study area for a variety of reasons, including seasonal absence or reduced flowering during certain seasons. Furthermore, the ecology and nature of some significant and/or cryptic species means that such species are potentially not recorded during short survey periods.

Based on: the existing condition of the Site's habitats; the ecology; and habitat requirements of flora species of conservation significance known from the area, the surveys undertaken are considered to be sufficient to detect those species noted in **Table 1** which are derived from known records in proximity to the Site.

4.1.4 Conservation Significant Plant Communities and Flora

The EPBC Act PMST indicates the potential occurrence of the: Brigalow (*Acacia harpophylla* dominant and co-dominant) (Endangered); Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Endangered); Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Critically Endangered); and Weeping Myall Woodlands (Endangered) within the search area (**Attachment 2**).

Surveys failed to record these communities or any other TECs listed under the EPBC Act. It is unlikely that these communities would be supported within the immediate locality given either past disturbances or the community types within the immediate locality. The VMSM and Pre-Clearing Mapping suggest that the Site and surrounding areas would have supported the Brigalow TEC; however, Site survey has confirmed that no vegetation communities within the Site meet the criteria of this TEC or endangered RE benchmarks.

The PMST and Wildnet searches indicate the potential occurrence of a number of threatened flora species in this locality (**Attachment 2** & **3**) which have been outlined in **Table 1**.

Table 1: Threatened Flora Species Potentially Occurring in the Locality

Species name	Common name	EPBC Act	NC Act
Cadellia pentastylis	Ooline	Vulnerable	Vulnerable
Dichanthium setosum	Blue grass	Vulnerable	Least Concern
Homopholis belsonii	Belson's panic	Vulnerable	Endangered
Philotheca sporadica	Kogan Waxflower	Vulnerable	Near Threatened

Targeted survey failed to find these species, or any other flora MNES, or EVNT species listed under the NC Act. Although surveys were considered sufficient to identify the listed threatened flora species listed in **Table 1** and any of those identifiable at the temporal period surveys were undertaken.

99DY315
1RP98550
2RP98550
32SP232241
30DY478
1SP279238
18DY478
29DY276
Babana Bridge Road
2SP279238
30DY478
Whyalla Road
1RP117442
1RP176346
2RP176346
6DY532
9DY469
40DY85
3RP176346
Smiths Road
AAP19903
26DY374
34DY604
Kummerows Road
39RP912566
4RP176346
34DY604
26DY374
Sixteen Mile Hall Road
2RP117442
5RP176345
26DY374
AAP19903
AAP19903
38DY85
6RP176345
Banana Bridge Road
27DY374
2RP82810
9RP176344
8RP176345
7RP176345
5AP3618
27DY374
5AP3618
AAP19903
AAP19903
37DY78
67DY78
10RP176344
11RP176344
52DY249
12RP176342
13RP176342
14RP176342
15RP176343
16RP176343
36DY78

Path: W:\PROJECTS\EI\CilldenGrange\652230\2.0_Project_Delivery\20170519_SolarFarm\Mapping\Fig3_SiteRE_mapping.mxd

28 South Environmental

Figure 4
Site RE Mapping (VMA)

ISSUE DATE	AUTHOR	QA CHECK	APPROVED	REV.	REVISION NOTE
27/06/2017	MG	MT	MT	A	Issued For Information

WORK REQUEST NUMBER: 652230

DATA SOURCES:
GPS Survey - 28 South Environmental
DCDB, Regional Ecosystems Version 8.0, Aerial, Waterways, Roads

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

N

0 500 1,000
Meters

1:30,000 (A3) GCS GDA 1994

28 SOUTH Environmental

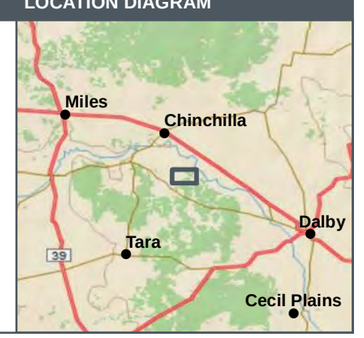
LEGEND

- Road
- Waterway
- Lot 3 Proposed Transmission Line
- Site
- DCDB

Regional Ecosystems Version 8.0 (VMA status)

- Endangered - Dominant
- Of concern - Dominant
- No concern at present

LOCATION DIAGRAM



5 Fauna Habitat Assessment

5.1 Survey Methods

5.1.1 Desktop Assessment

Fauna habitat assessment was undertaken to determine the fauna habitat values of the sites, and in particular determine the likely occurrence of MNES, MSES and triggers for assessment under relevant environmental planning instruments.

The desktop assessment discussed under **Section 1.3 and 2.1.1** was also relevant to assessing the fauna habitat values of the Site.

5.1.1 Habitat Surveys

Survey effort was focused on remnant areas of the Site which supported woody vegetation communities and varying habitat structures. Although much of the cleared non-remnant areas were walked through; more detailed assessment was reserved for vegetated areas due to the regular historical management measures applied to cleared areas and the distinct lack of habitat features outside of cracking clays in the north-west of the Site.

5.2 Habitat Assessment and Survey Results

Habitats assessments were qualified based on the presence of the following habitat features:

- Vegetation cover and structure;
- Size and range of arboreal and terrestrial hollows;
- Woody debris and leaf litter;
- Rocky outcrops, overhangs and crevices;
- Freestanding water bodies, ephemeral drainage or seepage areas;
- Disturbances including weed incursion, clearing and/or inappropriate fire regimes;
- Surrounding habitats.

The quality of habitat persisting within the Site was assessed based on several criteria which are outlined within **Table 2**.

Table 2: Habitat Quality Criteria

Rating	Description of Habitat
Low	Many fauna habitat elements in low quality areas have been removed or altered such as mature, hollow bearing trees, fallen timber and deep leaf litter. For terrestrial habitats remnants are often small in size, support substantial weed infestations and are poorly connected to other areas of remnant vegetation. For aquatic habitats these may be waterways that have been de-snagged and riparian vegetation removed, or constructed drains.
Moderate	Some habitat components are present but others are lacking. For terrestrial habitats an example is remnant vegetation may have a reasonably intact understorey but lack fallen timber and hollow bearing trees. Linkages with other remnant habitats in the landscape may be lacking or somewhat tenuous. For aquatic habitats these may be semi-natural streams (including artificial channels and wetlands) with varying degrees of overhanging and instream vegetation with some snags and connectivity.
High	Most habitat components are present. For terrestrial habitats, habitats with old-growth trees, fallen timber, lack of weeds, the remnant is large enough to support forest dependant species and is well connected or contiguous with other areas of

native vegetation. Habitat features such as rocky outcrops, steep jumps and areas supporting caves provide significant habitat features for a great many fauna species persisting within arid areas. For aquatic habitats these are natural water bodies (or water bodies designed along natural ecological functioning principles) with a high degree of in-stream and riparian features and good connectivity.

5.2.1 Existing Context and Connectivity

Since settlement the Site and surrounding areas have been and continue to be subject to a variety of agricultural activities (namely grazing or power infrastructure development). These impacts have resulted in large portions of the Site and surrounding rural landscape being subject to broad scale clearing.

Areas which occur on poorer quality soils (notably within and to the south of the Site) have not been subject to the same level of clearing and many areas remain in their remnant state. The two larger fingers of vegetation that frame the existing quarry area where noted as supporting relict canopy trees and good complex vegetative strata. Although these remnant areas support higher quality habitats, they currently exist as thin, nodal strips surrounded by cleared land on three sides, much of which supports young regrowth, quarry material or cleared paddocks. These strips of vegetation have also been severed from other more extensive parcels of remnant by the recent construction of the Powerlink high voltage power easement.

Other areas of mapped remnant vegetation within the Site occurs as isolated parcels surrounded by advanced regrowth or cleared paddocks. These isolated parcels of remnant vegetation support minimal levels of course woody debris given their young age coupled with historical grazing activities and ongoing management practices.

Vegetation and habitat surveys conducted over the Site identified that much of the remnant and regrowth vegetation found within Site lacked larger relict canopy trees due to the vegetation communities age and historical clearing regimes. The larger strips of remnant vegetation supported in the south of the Site and small components near the homestead on Ulinda Park do however, support numerous trees with hollow bearing features[5].

Many of the adjoining rural properties, particularly those to the south and east of the Site have retained tracts of remnant and non-remnant vegetation communities mostly on poorer quality soils or riparian corridors. These larger tracts of remnant vegetation on poorer quality soils currently provide varying levels of habitat connectivity for most fauna residing within the locality. Most lower areas on higher quality soils have been cleared and subjected agricultural activities; supporting minimum habitat features or connectivity.

The proposed development over the Site will retain all areas of mapped regulated vegetation as shown on **Figure 3**. A small component of regulated vegetation found on Lot 3 RP176346 will however, require clearing. As discussed in **Section 2**, the proposed Solar Farm requires connection it the Powerlink Sub-station within the Site. Due to the location and orientation of the existing High Voltage Electricity Transmission Lines and the Sub-station, Powerlink have advised the applicant that the only acceptable location for their Overhead 275kV Line is from the north. Due to necessary separation distances, the proposed Overhead 275kV Line will need to be co-located to the north of the existing Powerline Easement (**Figure 3b**). This will result in the expansion of the recently cleared Powerlink Easement to the north and the clearing of least concern regulated vegetation. The width of this clearing is 60m; however, will not result in the severance or isolation of any areas of regulated vegetation. The extent of clearing totals 1.45ha.

[5] Eucalyptus develop hollows at all ages, but hollows suitable for vertebrate fauna do not typically appear until trees are at least 120 years old. Hollows for larger species may not appear until trees are at least 220 years old (Gibbons. P. and Lindenmayer. D. 2002)

Regrowth vegetation surrounding these areas of remnant vegetation cannot feasible be retained due to the footprint required to establish the proposed Solar Farm. Although the development footprint will occur over most of the Site, connectivity between existing areas remnant vegetation will have only minor impacts. Remnant vegetation found in the north and south of the Site will remain connected to other areas of remnant vegetation as they currently do. The polygon of remnant vegetation within the central areas of the Site will be functionally isolated from other areas of vegetation; however, it currently has limited connectivity to other areas as it is completed bound by largely cleared paddocks.

5.2.2 Future Connectivity

It is difficult to predict future connectivity impacts or benefits which may occur within a locality; however, consideration at a cursory level has been undertaken. The majority of land within the locality is mapped as rural under the Superseded and current WDRC Planning Schemes. It is envisaged that the existing land uses will continue in a similar fashion and extent; however, similar power related activities may continue to occur and/or expand in the future; and result in further impacts to habitat connectivity. Given the extent of cleared agricultural land on lower lying areas to the north and west, it is highly unlikely that these areas will regenerate into remnant habitats in favour of cropping or grazing activities. The lands on poorer quality soils to the east and south which currently support larger tracts of woody vegetation are however, likely to remain in a similar state and extent given the localities rural nature.

5.2.3 Habitats Supported on Site

The majority of habitats supported within the Site are considered to of low to moderate quality. These habitats are relatively common within the immediate locality and broader region; particularly on this geology where areas have not been cleared and woody vegetation retained. Habitat type and quality supported within the Site is directly linked to vegetation communities and variation within them based on the levels of historical clearing. The location of woody vegetation communities; the extent of remnant and location of the proposed development is illustrated in **Figure 3a**. Due to historical broad scale clearing, the majority of the Site remains as maintained open grassy paddocks with scattered trees and regrowth vegetation. Wooded vegetation communities both remnant and advanced regrowth are suffering from edges impacts created along cleared interfaces or generally across the entire community. Many of these areas which remain clear or are supporting regenerating vegetation communities are likely to support increase abundances of sedentary aggressive fauna species such as miners, magpie and butcherbird as well as pest species such as cane toad, feral cats, dogs and foxes all of which were observed during site inspections. These edges can often create ecological impediments for many cryptic or forest dependant fauna. Habitats within the remnant vegetation in the south of the Site were noted as supporting a wide variety of habitat features and their vegetation structure was in good condition; however, these areas are thin in nature and surrounded by significant impacts from quarrying and grazing.

Although the habitats supported on Site are partially fragmented and support variable levels of ecological complexity, the Site does provide foraging and dispersal habitat for robust or wider ranging conservation significant fauna residing within the locality.

The habitats supported within the Site can be divided into four main categories being:

- Advanced regrowth box woodlands;
- Advanced regrowth brigalow and box woodlands;
- Relict ironbark-box woodlands; and
- Cleared paddocks and farm infrastructure.

Advanced regrowth box woodlands

This habitat type represents the most common of those vegetated areas on Site including remnant and non-remnant areas. Much of the remnant and non-remnant areas within this habitat type have been subject to broad-scale historical clearing and on-going agricultural maintenance and activities. Much of this habitat type occurs in the central areas of Ulinda Park and over the north and eastern allotments. Within these areas the level of bulloak in the sub-canopy and shrub layer is highly variable; however, most areas mapped as remnant support a high density of bulloak within these layers whereas the non-remnant areas typically do not support a shrub layer or have only scattered shrubs. A similar trend is apparent with regard to the abundance of hollow bearing trees; course woody debris and terrestrial habitat features. Mapped remnant areas support a greater level of woody debris and habitat features while non-remnant areas support little woody debris and appear to be subject to on-going land management. Based on historical aerial photography interpretation and current regional ecosystem mapping, this habitat type appears to be abundant and common within the locality.

Surveys have identified that the remnant components of this vegetation community represent better quality habitats within the Site and achieve a moderate quality. Impacts from historical clearing, grazing, fire regimes, weeds and their often-isolated nature has reduced their relict qualities. Non-remnant areas support low to moderate quality habitats. These areas allow fauna movement opportunities through the landscape; however, due to their relatively young nature, lack of habitat features they currently have limited qualities required by many fauna species of conservation significance; forest dependant species and/or cryptic species.

Advanced regrowth Brigalow and box woodlands

This habitat type is restricted to the north-western corner of Ulinda Park where heavier clay soils are present. These areas have been subject to broad-scale historical clearing and currently occur in varying stages of regrowth. A small sliver of this community has been identified on the RVMM as being remnant vegetation. Surveys undertaken in this area confirmed that this community does not reach the RE benchmarks. Much of this habitat type supports minimal habitat features outside of scattered clumps of regrowth Brigalow forming dense islands of vegetated refuge; however, much of the soil within the very western component of these areas supports gilgai relief. During wet periods, these areas would provide higher quality habitat for many amphibian, avian and reptilian fauna species. Although these areas supported gilgai micro-relief, minimal areas of cracking clay were observed potentially due to its higher relief in and transitional position in the landscape (merging into Landzone 5). Minimal course woody debris was present within these areas and is reflective of historical broad-scale clearing and grazing activities.

Relict ironbark-box woodlands

This habitat type is restricted to the southern remnants within Ulinda Park and occur as large linear fingers of vegetation surrounding cleared paddocks and quarry areas. These fingers of vegetation have been retained on higher poorer quality soils and are suffering from edge impacts primarily due to quarry activities. These fingers have also been recently severed by the clearing for and construction of a large high voltage Powerlink easement. Although these areas are thin, linear and surrounded by other impacts, they retain the best quality habitats within the Site. These areas support an abundance of larger relict trees with hollow bearing features, good levels of course woody debris and hollow logs and a well-structured, complex vegetation community supporting distinct vegetative strata.

5.3 Habitat for Conservation Significant Fauna Potentially Occurring within the Locality

The Site contains vegetation communities and habitat features which may be used as a component of habitat by broader ranging conservation-significant fauna species. An assessment of the likelihood of conservation significant fauna to utilise the habitats within the Site has been prepared in **Attachment 11**.

This assessment has considered the habitat requirements of each species, recent records of each species in the locality and assessed them against the habitats present within the Site as outlined above. It is noted, many migratory marine species identified within desktop searches are unlikely to be reliant on the Site for habitat; however, may overfly the habitats within the Site during their migration. These species have been identified as either known; likely to; or may potentially utilise the habitats supported within the Site for foraging, dispersal or breeding purposes. An assessment of each species against the impacts of the proposed development is provided in **Attachment 11**.

6 Impacts and Mitigation

6.1 Proposed Development Footprint Impacts

The proposed development includes: Access gates; access roads; solar array blocks; switchyard; battery energy storage solution (optional); transmission line; site office; temporary laydown area; temporary construction compounds; and 275Kv export substation and Overhead 275kV Line as illustrated in **Figure 3a**. The location of proposed Solar Farm in the broader landscape is restricted by spatial location of other power infrastructure. The proposed development has, for the most part, attempted to avoid mapped remnant vegetation. This is evidenced by the only component of the proposed Solar Farm requiring clearing of regulated vegetation being the Overhead 275kV Line (**Figure 3b**). As noted, there is a requirement from Powerlink for the Applicant to access their Sub-station from the north and extend the existing easement with a new easement (40-60m). Other options have been explored by the project team however it is the preference of Powerlink that the proposed alignment (per **Figure 3b**) is pursued.

All buildings and assets outside of solar array blocks have been sited away from any retained vegetation. This avoids the need to clear vegetation for bushfire management purposes as shown on **Figure 3a**. A review of the Bushfire hazards within and adjoining the Site identifies that all proposed buildings will be sited >100m from any retained hazardous vegetation within the Site and have sufficient access/egress and water supply to avoid an intolerable level of risk to life, property and the environment.

As outlined within **Section 2** of this report, the footprint of the proposed development has the opportunity to consider where practicable, on-ground ecological and environmental values when constructing access track and fencing alignments. Minor on-ground re-alignments to the proposed fences and access tracks can avoid the need to clear isolated mature trees which occur away from solar infrastructures, particularly in a woodland setting where canopy trees are spatially well separated; however, consideration of shading and limb or tree failure must be considered during clearing, construction and operational phases.

In the context of the locality and Site, the proposed development is likely to only result in minor impacts to regenerating woody vegetation communities and minimal, necessary impacts to remnant vegetation. The on-going management practices within the Solar Farm may change and/or reduce the floristic assemblages within the ground layer due to: the establishment of roads, pads and buildings; and shading out by solar panels; however, the areas proposed for impact currently support open pastoral paddocks or areas of regenerating woodland which are the most abundant vegetation communities within the locality.

6.2 Proposed Development Impacts to Habitat Types and Features

The proposed development will result in the loss of regrowth vegetation and habitats within areas within the Site. As noted, these areas of regrowth vegetation were observed to support minimal important habitat features such as hollow bearing limbs, hollow logs, course woody debris and were generally isolated from other areas in-tact remnant vegetation.

The proposed development has retained all areas of mapped regulated vegetation where practicable and minimised clearing by siting the Overhead 275kV Line to abut the existing cleared Powerlink easement. The areas of highest quality habitat within the south of Ulinda Park which have for the most part avoided clearing and logging since settlement have been retained within the Solar Farm design. As the proposed development and impact areas are for the most part isolated to cleared and non-remnant vegetation communities; and serviced with thin linear access tracks, impacts to habitats and connectivity are considered to also be minor in the context of the locality. Clearing to establish the Overhead 275kV Line will result in the clearing of 1.45ha of regulated vegetation adjoining the existing Powerlink High Voltage Electrical Transmission Line (**Figure 3b**).

Habitats within this area occur as older regrowth vegetation which has regenerated to remnant status. Lower levels of ecological features are present within these components of remnant due to their regrowth nature. The position and orientation of this impact means it will not server habitats or functionally isolate any areas of habitat as it is co-located with an existing cleared easement. Impacts are considered to be low within these areas due to the limited habitat features being impacted.

Given the likely suite of fauna species present within the Site, fencing and solar array blocks are unlikely to have any significant impacts to fauna of conservation significance or common fauna within the locality. The retention of remnant areas within the Site will allow most native fauna to move through higher quality habitats supported within the Site relatively unimpeded.

6.3 Impacts to Conservation Significant Species

6.3.1 Conservation Significant Vegetation Communities and Flora Species

Site surveys failed to detect any conservation significant vegetation communities or flora species. The location, orientation and type of development within the development footprint is unlikely to impact any flora species of conservation significance as it has been focused on cleared non-remnant areas which have been subject to significant historical and contemporary clearing and on-going maintenance. It is unlikely that the proposed development would impact any flora species of conservation significance.

6.3.2 Conservation Significant Fauna

The likelihood of occurrence of fauna species of conservation significance identified within desktop assessment was undertaken to establish those species may occur within the locality or Site (**Attachment 11**). An assessment of the likelihood of impact from the proposed development has been undertaken (**Attachment 11**).

This assessment found that the proposed development is unlikely to give rise to any significant impacts to MNES or MSES. For the most part, many fauna species identified within this desktop assessment are (i) unlikely to occur in or within proximity of the Site; (ii) not associated with habitats supported on Site; (iii) have no suitable breeding habitat within the Site; (iv) the proposed development retains the habitats and movement opportunities that many species are associated with; or (v) the establishment of the Solar Farm occurs in already impacted areas which could be subject to continued grazing and maintenance.

Where development is not proposed over the Site, there is opportunity to allow habitats in non-remnant areas of the Site to continue regenerating, notably the eastern components of the Site would benefit the greatest. This can assist in providing medium and longer-term benefits for many species of conservation significance and improve connectivity within the Site.

7 Mitigation Measures

As outlined within **Section 2**, the proposed development has taken the Sites ecological, environmental and landscape character in consideration. Impacts from the proposed development can be mitigated and minimised at the time of operation works through minor re-alignments of fence lines and access tracks. As noted, the applicant is motivated to retain canopy trees which are not immediately adjoining infrastructure (<20m); or causing potential shading or limb/tree failure impacts. There is also the opportunity to allow areas within the Site to regenerate re-connecting or expanding on areas of remnant vegetation, providing greater connectivity within the Site and locality.

Other mitigation measures can be adopted for the proposed development and any subsequent operational works, such as:

- Weed control across the Site;
- A fauna management plan to govern any clearing and construction works and identify that works should be conducted under the supervision of a suitably qualified and experienced fauna catcher and works are to be as a minimum undertaken in accord with Policy 6 of the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016*;
- Consideration of fauna friendly fencing for the permitter of the development (e.g. plain wire top strands on fencing etc.);
- Retained areas can be left to regenerate where practicable;
- Pest management measures for feral species such as: foxes; cats; dogs; and pigs.

8 Statutory Compliance

8.1 EPBC Act

An assessment of all MNES identified through desktop survey and on site ecological investigations has identified that the proposed action (clearing and construction of the proposed development and secondary actions) is unlikely to cause a Significant Impact on a MNES. It is not considered that the proposed development warrants a controlled action referral to the Commonwealth DotEE to obtain a decision on whether the project is a controlled action under the EPBC Act.

8.2 SDAP

The proposed development does not trigger referral under Module 5 or 11 of the SDAP; however, will result in the unavoidable clearing of regulated vegetation and has been assessed against Module 8 of the SDAP in **Section 8.2.1**. The proposed development footprint has been design and sited to avoid areas of mapped regulated vegetation where practicable. Access tracks traversing a small area of mapped remnant vegetation will avoid the requirement to clear vegetation by utilising existing vehicle tracks and powerline clearings. An assessment of the bushfire hazard to the proposed development has identified that no clearing is required to achieve setbacks for infrastructure within the Site and that all buildings are >100m from any hazardous vegetation.

Should the proposed development be approved and works are proposed within the state mapped watercourses on Site, a water barrier works application and permit to be issued for temporary works or permanent impacts.

Table 3: SDAP Module 8; Table 8.1.3 General

Performance Outcomes	Acceptable Solutions	Demonstrated Compliance
Clearing to avoid and minimise impacts		
PO_1 Clearing only occurs where the applicant has demonstrated that the development has first avoided, and then minimised the impacts of development.	No acceptable outcome is prescribed.	**Complies (Performance Outcome).** The proposed design has avoided all areas of mapped regulated vegetation within the Site and has provided them with a minimum 20m environmental buffer. A small area of regulated vegetation which occurs off Site on Lot 3 RP176346 will however, be impacted as result of the proposed Solar Farm. Due to development constraints imposed by Powerlink, the proposed Overhead 275kV Line is required to be sited along the northern boundary of Powerlink's existing Electricity Transmission Line and connect into the existing Sub-station from the north. This requires a small expansion of the existing electricity easement which have cleared remnant vegetation across the Site and adjoining properties as shown in **Figure 3b**. Other options have been explored by the design team and taken to Powerlink for review; however, it is the preference of Powerlink that the proposed alignment (per **Figure 3b**) is pursued. The proposed Overhead 275kV Line has been sighted to only impact the minimum area required to establish the easement based on the constraints imposed by Powerlink in concert with the position of the existing Sub-station and remnant vegetation. We note the applicant has made a conscious decision to completely avoid remnant vegetation; however, the final alignment of the Overhead 275kV Line has no other option but to be aligned in the proposed location.
Clearing on land where compliance notice, enforcement notice, exchange area or offset exists		
PO_2 Clearing in an area that is subject to any of the following: - **a restoration notice, or** - **a compliance notice containing conditions about the restoration of vegetation, or** - **a Land Act notice, or**	No acceptable outcome is prescribed.	**Not Applicable**

- **a trespass notice if the trespass related act under the Land Act 1994 for the notice is the clearing of vegetation on the relevant land, or** - **an enforcement notice under the Sustainable Planning Act 2009 issued for a vegetation clearing offence, or** - **an exchange area, or** - **an environmental offset** **must not be inconsistent with the notice or impact on the exchange area, unless a better environmental outcome can be achieved, or inconsistent with the environmental offset or another agreement related to the environmental offset**		
PO_3 Clearing on land that contains an existing environmental offset is consistent with the delivery plan or agreement for the environmental offset area. *Editor's note: Environmental offset agreements may also be described as an 'agreed delivery arrangement' or 'delivery agreement'. Clearing should be consistent with any agreement however described*	AO3.1 Clearing is consistent with the offset delivery plan or agreement for the environmental offset area. OR AO3.2 An additional environmental offset is provided that is consistent with the relevant *Queensland Environmental Offsets Policy*	**Complies (Performance Outcome)** The proposed development of the Solar Farm is not located on land that contains an existing environmental offset.

Table 4: SDAP Module 8; Table 8.1.4 Public Safety, Relevant Infrastructure and Co-ordinated Projects

PERFORMANCE OUTCOMES	ACCEPTABLE SOLUTIONS	DEMONSTRATED COMPLIANCE
Wetlands		
PO_2 Maintain the current extent of vegetation associated with any natural wetland to protect: **(1) water quality by filtering sediments, nutrients and other pollutants** **(2) aquatic habitat**	$AO_{2.1}$ Clearing does not occur in or within 100 metres of any natural wetland. OR	**Complies (Acceptable Outcome).** No clearing of mapped wetlands will occur.
	$AO_{2.2}$ Clearing only occurs within 100 metres of any natural wetland where: (1) the widths stipulated by Table 1 are not exceeded	**Not Applicable** There are no natural wetlands on the Site.

<table>
<tr><td>(3) terrestrial habitat.</td><td>(2) the clearing does not occur within 50 metres of the defining bank of any natural wetland.
OR</td><td></td></tr>
<tr><td></td><td>AO2.3 Where it can be demonstrated that clearing cannot be avoided, and the extent of clearing has been minimised, an environmental offset is provided for any impacts from clearing of vegetation associated with a natural wetland.
Editor’s note: Refer to Appendix A: Policy for vegetation management offsets of the code for guidance regarding the provision of an environmental offset.</td><td></td></tr>
<tr><td colspan="3">Watercourses</td></tr>
<tr><td rowspan="2">PO3 Maintain the current extent of vegetation associated with any watercourse to protect:
(1) bank stability by protecting against bank erosion
(2) water quality by filtering sediments, nutrients and other pollutants
(3) aquatic habitat
(4) terrestrial habitat.</td><td>AO3.1 Clearing does not occur:
(1) in any watercourse, or
(2) within the relevant distance stipulated by Table 2 of the defining bank of any watercourse.
Table 2
<table>
<tr><th colspan="2">Distance from defining banks of watercourses in which clearing cannot occur</th></tr>
<tr><th>Watercourse Stream Order</th><th>Distance from the defining bank (m)</th></tr>
<tr><td colspan="2">Non-coastal bioregions and sub-regions</td></tr>
<tr><td>1 or 2</td><td>25</td></tr>
</table>
OR</td><td>Complies.
All mapped watercourses on the site are natural drainage lines, and are all located in already cleared areas. No clearing of remnant vegetation within or proximate to regulated vegetation will occur.</td></tr>
<tr><td>AO3.2 Clearing only occurs within any watercourse or within the relevant distance stipulated by Table 2 of the defining bank of any watercourse where:
(1) the widths stipulated by Table 1 is not exceeded
Table 1
<table>
<tr><th colspan="3">Clearing limits per regional ecosystem structure</th></tr>
<tr><th>Structure Category</th><th>Width (m)</th><th>Area (ha)</th></tr>
<tr><td>Very Sparse</td><td>20</td><td>2</td></tr>
<tr><td>Grassland</td><td>25</td><td>5</td></tr>
</table></td><td>Not Applicable.
No clearing within a watercourse is proposed. See above.</td></tr>
</table>

	(2) the clearing does not occur within 5 metres of the defining bank. OR	
	$AO_{3.3}$ Where it can be demonstrated that clearing cannot be avoided, and the extent of clearing has been minimised, an environmental offset is provided for any impacts from clearing of vegetation associated with any watercourse. *Editor's note: Refer to Appendix A: Policy for vegetation management offsets of the code for guidance regarding the provision of an environmental offset.*	**Not Applicable.** No clearing within a watercourse is proposed. See above.
Connectivity (public safety and relevant infrastructure)		
PO_4 In consideration of vegetation on the subject lot(s) and in the landscape adjacent to the subject lot(s), vegetation is retained that: **(1) is of sufficient size and configured in a way that maintains ecosystem functioning** **(2) remains in the landscape despite threatening processes.**	$AO_{4.1}$ Clearing occurs in accordance with Table 3. **Table 3** **Maintaining connectivity** **Non-coastal bioregions and sub-regions** Clearing does not: (1) occur in areas of vegetation that are less than 50 hectares (2) reduce the extent of vegetation to less than 50 hectares (3) occur in areas of vegetation less than 200 metres wide (4) reduce the width of vegetation to less than 200 metres (5) occur where the extent of vegetation on the subject lot(s) is reduced to or less than 30 per cent of the total area of the lot(s).	**Complies (Acceptable Solution)** The proposed development will result in the clearing of a small area (1.45ha) of regulated vegetation due to Powerlink requirements. The design team have sighted the alignment of the Overhead 275kV Line so that is will maintain the ecosystem functioning and retain vegetation which will more broadly remain in the landscape despite threatening processes. The co-location of the Overhead 275kV line will not: 1. result in clearing of an area >50ha (clearing area = <1.5ha) 2. reduce the extent of vegetation to <50ha (minimum polygon size of >200ha and partially connective to other much larger polygons) 3. occur in areas of vegetation less than 200m wide (components of the remnant polygon are >2.7km wide) 4. the clearing will not be >200m (clearing is likely to be limited to a maximum of 50m) 5. Clearing will not reduce the extent of regulated vegetation to <30% of the Lot (>43ha of regulated vegetation on Lot, clearing to be <1.5ha (or ~0.3%)).
Connectivity (coordinated projects)		
PO_5 In consideration of vegetation on the subject lot(s) and in the landscape adjacent to the subject lot(s), vegetation is retained that: **(1) is of sufficient size and configured in a way that maintains ecosystem functioning**	$AO_{5.1}$ Clearing occurs in accordance with Table 3. OR	**Not Applicable** The proposed development is not a Coordinated Project.
	$AO_{5.2}$ Where it can be demonstrated that clearing cannot be avoided, and the extent of clearing has been minimised, an	**Not Applicable** The proposed development is not a Coordinated Project.

(2) remains in the landscape despite threatening processes or where this is not reasonably possible, maintain the current extent of vegetation.	environmental offset is provided for the clearing of vegetation that forms a connectivity area. *Editor's note: Refer to Appendix A: Policy for vegetation management offsets of the code for guidance regarding the provision of an environmental offset.*	
Soil Erosion		
PO_6 Clearing does not result in: **(1) mass movement, gully erosion, rill erosion, sheet erosion, tunnel erosion, stream bank erosion, wind erosion, or scalding** **(2) any associated loss of chemical, physical or biological fertility — including, but not limited to water holding capacity, soil structure, organic matter, soil biology, and nutrients within or outside the lot(s) that are the subject of the application.**	$AO_{6.1}$ Clearing is undertaken in accordance with a sediment and erosion control plan which avoids and minimises land degradation. OR	**Complies (Acceptable Outcome).** A Site Based Management Plan will be prepared that contains an Erosion Control Plan that will avoid and minimise land degradation as a result of the proposed development.
	$AO_{6.2}$ The application is a development application where a local government is the assessment manager.	**Complies (Acceptable Outcome).** The proposed development is subject to the provisions of the superseded Chinchilla Planning Scheme.
Salinity		
PO_7 Clearing does not contribute to land degradation through: **(1) waterlogging, or** **(2) the salinisation of groundwater, surface water or soil.**	$AO_{7.1}$ Clearing does not occur in or within 200 metres of a discharge area or recharge area. OR	**Complies (Acceptable Outcome).** No clearing is proposed within 200m of areas that are considered to be discharge or recharge areas as per the definitions provided in 8.4 of Module 8 of the State Development Assessment Provisions.
	$AO_{7.2}$ Clearing is less than: (1) 2 hectares, or (2) 10 metres wide.	**N/A**
Conserving endangered and of concern regional ecosystems		
PO_8 Maintain the current extent of endangered regional ecosystems and of concern regional ecosystems.	$AO_{8.1}$ Clearing does not occur in: (1) an endangered regional ecosystem, or (2) an of concern regional ecosystem. OR	**Complies (Acceptable Outcome).** No clearing of endangered or of concern vegetation is proposed. Areas of endangered vegetation were identified as non-remnant and have been subject to PMAV submission to DNRM.
	AO8.2 Clearing in an endangered regional ecosystem or an of concern regional ecosystem does not exceed the width or area prescribed in Table 1. OR	**Complies (Acceptable Outcome).** No clearing of endangered or of concern vegetation is proposed.
	AO8.3 Where it can be demonstrated that clearing cannot be avoided, and the extent of clearing has been minimised, an environmental offset is provided for the clearing of	**N/A.**

	endangered regional ecosystems and of concern regional ecosystems. *Editor's note: Refer to Appendix A: Policy for vegetation management offsets of the code for guidance regarding the provision of an environmental offset.*	
Essential habitat		
PO_9 Maintain the current extent of essential habitat.	$AO_{9.1}$ Clearing does not occur in an area of essential habitat. OR	**Complies (Acceptable Outcome).** No areas of mapped Essential Habitat occur within the Site.
	$AO_{9.2}$ Clearing in essential habitat does not exceed the widths or areas prescribed in Table 1. OR	**Complies (Acceptable Outcome).** No areas of mapped Essential Habitat occur within the Site.
	$AO_{9.3}$ Where it can be demonstrated that clearing cannot be avoided, and the extent of clearing has been minimised, an environmental offset is provided for the clearing of essential habitat. *Editor's note: Refer to Appendix A: Policy for vegetation management offsets of the code for guidance regarding the provision of an environmental offset.*	**Complies (Acceptable Outcome).** No areas of mapped Essential Habitat occur within the Site.
Acid Sulfate Soils		
PO_{10} Clearing activities do not result in disturbance of acid sulfate soils or changes to the hydrology of the location that will either: **(1) aerate horizons containing iron sulfides, or** **(2) mobilise acid or metals.**	$AO_{10.1}$ Clearing does not occur in land zone 1, land zone 2 or land zone 3. OR	**Complies.** Proposed clearing will not occur in land zones 1, 2 or 3.
	$AO_{10.2}$ Clearing in land zone 1, land zone 2 or land zone 3 in areas below the 5 metre Australian Height Datum only occurs where: (1) it does not involve mechanical clearing (2) the acid sulfate soils are managed consistent with the State Planning Policy, Department of State Development, Infrastructure and Planning, 2013 and with the Soil Management Guidelines in the Queensland Acid Sulfate Soil Technical Manual, Department of Natural Resources and Mines, 2002. OR	**N/A.**
	$AO_{10.3}$ The application is a development application where a local government is the assessment manager.	**N/A.**

8.3 Western Downs Regional Council – Rural Zone Code – for assessable Development

Table 5: WDRC Rural Zone Code – Table 4.1.3.4 (Part Assessment)

Performance Outcomes	Acceptable Solutions	Demonstrated Compliance
Infrastructure		
PC14 Water Supply All "Premises" have an adequate volume and supply of water for the "Use", which is also adequate for firefighting purposes.	**AS14.1** "Premises" are connected to Council's reticulated water supply system. OR **AS14.2** "Premises" are connected to an approved water allocation as provided by the relevant agency. OR For "Residential Activities": **AS14.3** "Premises" are connect to a rain water tank with a minimum capacity of: (a) 22 500 litres where not in a reticulated water supply area; (b) 11 000 litres where in a reticulated water supply area. For all "Uses" other than "Residential Activities": No acceptable solution is prescribed. For all "Premises" in Medium and High bushfire hazard areas as identified on Land Characteristics Map – Bushfire Hazard Areas: **AS14.4** On-site water storage of not less than 5000 litres is provided by way of dam, swimming pool or tank fitted with fire brigade tank fittings. OR **AS14.5** The reticulated water supply has flow and pressure characteristics of 10 litres a second at 200 kPa	**Complies with PC** The proposed development will result in the establishment of Site offices; however, offices will only be used during work hours or during maintenance periods. The only infrastructure outside of Site offices includes: • Battery Energy Storage Solution (Optional); • Solar array blocks (1MWp & 2MWp); • 275Kv export substation; • Transmission Line; • Temporary laydown areas; • Temporary Construction Compounds; and • Switchyard. All office and permanent structures outside of solar array blocks are >100m from any potentially hazardous vegetation. These areas are easily access by staff and emergency services. As these structures will be >100m from hazardous vegetation; surrounded solar arrays; and not have people residing within them (rare maintenance visits). A number of existing dams will be retained within the Site which are considered adequate for firefighting purposes.
PC20 Roads, Firebreaks and Fire Maintenance Trails Adequate all-weather road access is provided between the "Premises" and the existing road network.	AS20.1 Roads are designed and constructed in accordance with Schedule 1, Division 2: Standards for Roads, Carparking, Manoeuvring Areas and Access, Section 2.1(1)	**Complies with PC** The proposed development will require all-weather access roads throughout the Solar Farm to enable 24/7 access and repair to infrastructure. The Site has three road frontages with existing and proposed access points totalling 3 points.

In High and Medium Bushfire hazard areas, adequate road access is provided for fire fighting/other emergency vehicles and for safe evacuation.	For "Uses" in High or Medium Bushfire hazard areas as identified on the Land Characteristics Map – Bushfire Hazard Areas: AS20.2 Roads, firebreaks and fire maintenance trails are designed and constructed in accordance with Schedule 1, Division 6: Standards for Roads in Bushfire Hazard Areas, Firebreaks and Fire Maintenance Trails, Sections 6.1, 6.2.	Adequate road access is provided from Banana Ridge Road to the east of the Site with two access points and all-weather roads. Other alternate access from Whyalla and Sixteen Mile Hall Roads is possible.
PC21 "Electricity transmission line easement" – Vegetation Transmission lines within an "Electricity transmission line easement" are protected from vegetation.	**AS21.1** Planted vegetation within an "Electricity transmission line easement" shall have a mature height not exceeding 2.5 metres as shown in Schedule 2, Division 3: Powerline / Electricity Easements, Section 3.2 Diagram 3. **AS21.2** No part of planted vegetation, at its mature size, is located closer than 2.5 metres to an electricity transmission line as shown in Schedule 2, Division 3: Powerline / Electricity Easements, Section 3.2 Diagram 3.	**Complies with PC** All easements will be maintained and protected from vegetation regeneration or growth over 2.5m. The larger existing transmission line easements are in favour of Powerlink and are subject to regular maintenance. The proposed Overhead 275kV Line will be maintained in the same fashion as the Powerlink easements.
PC22 "Electricity transmission line easement" - Vegetated Buffers Vegetated buffers adjoining an "Electricity transmission line easement" are maintained to provide: (a) a visual buffer to the easement; and (b) a separation distance from the easement.	**AS22** Existing vegetation, comprising trees and/or shrubs, shall be retained within 20 metres of an "Electricity transmission line easement" as shown in Schedule 2, Division 3: Powerline / Electricity Easements, Section 3.2 Diagram 4.	**Complies with PC** All easements within the Site are currently buffered with vegetation. A small component of non-remnant vegetation will be removed to support solar arrays adjoining the existing Powerlink Sub-station.
Environmental		
PC24 "Watercourses" and "Lakes" "Development" ensures the maintenance of riparian areas and water quality including protection from off-site transfer of sediment.	**AS24** A minimum 50 metre wide buffer area is provided extending out from the high bank of any "Watercourse" or "Lake". Buffer areas include a cover of vegetation, including grasses.	**Complies with PC** The proposed development does not occur on any mapped watercourses or lakes in the "Land Characteristics Map – Features Map 1"
PC25 Vegetation Retention "Development" retains vegetation for the:	**AS25** Vegetation comprising 20% of each regional ecosystem type is retained within each lot with retained vegetation made up of woody remnant, regrowth or replanted natural species, excluding deep-rooted crops and clear fell plantation forestry. The	**Complies with PC** This ecological assessment report has identified the areas of higher quality habitat and vegetation within the Site. The proposed development will retain all areas of existing mapped remnant vegetation within the Site; however, a small area of remnant vegetation (1.45ha) on the adjoining Lot

(a) protection of scenic quality; (b) protection of general habitat; (c) protection of soil quality; and (d) establishment of open space corridors and networks	shade lines are a minimum of 10 metres in width; clumps have an area greater than 2 hectares.	3 RP176346 as identified in this report. It is unlikely that this will have a significant impact on habitats. The clearing of vegetation will retain >95% of remnant vegetation from the property. Further, the development footprint allows for the retention of regenerating vegetation in components of the Site such as the central east, east and north of the Site. Development will not result in significant impacts to connectivity; however, will isolate one small parcel of remnant vegetation which is currently surrounded by cleared paddocks and impacted by more intensive agricultural uses (e.g. pig and horse agistment).
PC27 Air Emissions Air emissions from "Premises" do not cause environmental harm or nuisance to adjoining properties or "Sensitive land uses".	No acceptable solution is prescribed.	**Complies with PC** Although no detailed study has been completed, the proposed development is unlikely result in air emissions which cause environmental harm.
PC28 Noise Emissions Noise emissions from "Premises" do not cause environmental harm or nuisance to adjoining properties or "Sensitive land uses"	No acceptable solution is prescribed.	**Complies with PC** Although no detailed study has been completed, the proposed development will not result in noise emissions which cause environmental harm; nor will the development create noise with a greater ambient level than that of the existing Powerlink substation or Kogan Power Station.
PC29 Water Quality The standard of effluent and / or stormwater runoff from "Premises" ensures the quality of surface and underground water is suitable for: (a) the biological integrity of aquatic ecosystems; (b) recreational use; (c) supply as drinking water after minimal treatment; (d) agricultural use; or (e) industrial use.	No acceptable solution is prescribed.	The proposed development will require the establishment of solar arrays, access tracks over these drainage features; however, contemporary engineering design and sediment and erosion control measures will ensure that sediment loss and maintain natural flows to offsite areas. A standard residential effluent disposal system will be installed as a part of the office structure. This system will be capable of treating a standard residence which would have a far greater usage than the office facility which would only operate during business hours and host a small amount of staff.

PC30 Excavation or Filling Excavating or filling of land: (a) ensures safety and amenity for the users of the "Premises" and land in close proximity; (b) minimises soil erosion; and (c) limits detrimental impacts on water quality.	**AS30.1** Batters have a maximum slope of 25%, are terraced at every rise of 1.5 metres and each terrace has a minimum depth of 750mm. **AS30.2** Excavation or filling within 1.5 metres of any site boundary is battered or retained by a wall that does not exceed 1 metre in height. **AS30.3** Excavation or filling is undertaken in accordance with Schedule 1, Division 1: Standards for Construction Activities, Section 1.1	**Complies with PC** The proposed development will only result in minor levels of filling/excavation to achieve flat pad areas for solar arrays and the construction of access tracks. All works will be designed using contemporary engineering design to ensure safety to all staff. Detailed stormwater engineering plans will ensure development is constructed and operated in a manner that avoids the loss of sediment from the Site and maintains high levels of water quality.
PC31 Construction Activities Erosion control measures and silt collection measures ensure that environmental values are protected during construction activities.	AS31 During construction soil erosion and sediment is controlled in accordance with standards contained in Schedule 1, Division 1: Standards for Construction Activities, Section 1.1	**Complies with PC** The proposed development will be designed and have implemented a construction and environmental management plan which will ensure that industry best practice IECA guidelines are utilised during construction and operation of the Solar Farm.
PC37 Bushfire Hazard "Development" is located to maintain the safety of people and property from Bushfire Hazard	**AS37** "Development" is undertaken in Low Bushfire Hazard Areas as identified on Land Characteristics Map – Bushfire Hazard Areas.	**Complies with PC** The proposed development will result in the clearing of regrowth vegetation from the Site and a small amount of remnant from the adjoining Lot 3 on RP176346. The proposed development will result in the establishment of uninhabited infrastructure and access tracks in proximity to retained remnant vegetation. All building structures are in low bushfire hazard areas and occur >100m from any potentially hazardous vegetation. All-weather access roads are proposed throughout the development area and allow emergency access to all areas of the Site for emergency services. All solar arrays are sighted a minimum of 20m from any retain hazardous vegetation providing sufficient separation space to defend any assets that may be proximate to fire fronts.
PC38 High and Medium Bushfire Hazard Areas "Development" in High or Medium Bushfire Hazard Areas, as identified on Land Characteristics Map – Bushfire Hazard Areas, maintains the safety of people and property by mitigating the risk through: (a) the siting of buildings, ensuring setbacks from hazardous vegetation are maximised and elements	For "Development" in areas of High or Medium Bushfire Hazard as identified on Land Characteristics Map – Bushfire Hazard Areas, and on lots greater than 2500m2: **AS38.1** "Buildings" and "Structures": (a) are sited within the lowest bushfire hazard area; (b) achieve minimum setback distances from hazardous vegetation of 1.5 times the predominant mature	**Complies with PC** The proposed development will result in the establishment of operational infrastructure and access tracks in proximity to retained remnant vegetation. All building structures are located in low bushfire hazard areas and occur >100m from any potentially hazardous vegetation. All-weather access roads are proposed throughout the development area and allow emergency access to all areas of the Site for emergency services. All solar arrays (being the least susceptible to fire) are sighted a minimum of 210m

least susceptible to fire are sited closest to the bushfire hazard; and (b) the provision of firebreaks to ensure adequate setbacks between "Buildings", "Structures" and "Hazardous vegetation"	canopy tree height or 10 metres, whichever is the greater; and (c) achieve a setback distance from any retained vegetation strips or small areas of vegetation of 10 metres. For "Development" in areas of High or Medium Bushfire Hazard as identified on Land Characteristics Map – Bushfire Hazard Areas, and on lots less than or equal to 2500m2: No acceptable solution is prescribed. For "Development" in areas of High or Medium Bushfire Hazard as identified on Land Characteristics Map – Bushfire Hazard Areas: **AS38.2** Firebreaks or fire maintenance trails are provided in accordance with Schedule 1, Division 6: Standards for Roads in Bushfire Hazard Areas, Firebreaks and Fire Maintenance Trails, Section 6.2.	from any retain hazardous vegetation providing sufficient separation to defend any assets that may be proximate to fire fronts. The developments least susceptible use (solar array) will be sited between all other infrastructures and hazardous vegetation.
PC40 Protected Areas "Development" is undertaken to ensure the protection of: (a) areas of significant biodiversity and habitat value and high scenic quality; and (b) essential habitat for endangered, rare or threatened species.	No acceptable solution is prescribed.	**Complies with PC** This ecological assessment has identified that the proposed development will avoid all areas of mapped remnant vegetation and all areas within the Site which provide higher quality habitats, particularly for species of conservation significance. The retained non-remnant areas, notable in the east of the Site, if left to regenerate can assist in the improvement of connectivity and habitat within the Site.

9 Summary and Conclusion

9.1 General

This ecological assessment report provides supporting environmental planning considerations as well as ecological assessment of the Site and its context in the locality.

The Site occurs approximately 23 km south-east of the Chinchilla town centre. All adjoining properties share the same zone designation (RuC). The Site is bound to: the east by Banana Ridge Road; to the west by Sixteen Mile Hall Road; to the north by Whyalla Road; and to the south by similar large rural allotments. The Site is collectively 897.05 ha in size and is formed by flat sandy or clay plains.

9.2 Site Investigations

Surveys did not record any plant communities or plant species listed as MNES under the EPBC Act. Surveys also failed to record plant species listed as Endangered, Vulnerable or Near Threatened (EVNT) under the NC Act. Site surveys confirmed that most areas mapped as Regulated Vegetation conform to their mapped extent and RE type; however, the small sliver of Endangered RE11.4.3 does not meet the benchmark criteria for this community and is not considered to be remnant vegetation. Historical disturbances for agricultural pursuits has resulted in the majority of the Site being completely cleared at some point in time apart from two fingers of vegetation in the south of Ulinda Park. The majority of the Site has been subject to minor historical alteration and cattle grazing; however, various areas of the Site have been allowed to regenerate since the mid-1990s and a number of parcels have been mapped as remnant regulated vegetation. Recent clearing for a Powerlink high voltage power easement has occurred, traversing portions of the east and south of the Site.

Surveys identified two main vegetation communities within the Site. Of these vegetation communities, one represents regrowth vegetation on heavier clays while the other represents taller vegetation on Cainozoic sediments. Regrowth Brigalow Woodland is restricted to the north-west of Ulinda Park and occurs on heavier clay soils; and the Box-Ironbark Woodlands occur in scattered patches of remnant and regrowth across the remaining portions of the Site typically where soil quality is reduced. As noted, all of the Site barring the two remnant fingers of Box-Ironbark Woodland in the south of Ulinda Park have been subject to broad-scale historical clearing.

Surveys identified that the majority of wooded remnant and non-remnant habitats supported within the Site support moderate to low-moderate quality habitat types common to the region. Historical vegetation clearing, cattle grazing, and potentially historical burning regimes have contributed to most cleared or regenerating habitats within the Site lacking floristic or microhabitat diversity which would be commonly found in relic habitats (e.g. trees; course woody debris, hollow logs etc.). It is considered unlikely many of the threatened species identified within desktop searches would rely on the Site for their survival. Although the habitats supported on Site are partially fragmented, the Site does provide foraging and dispersal habitat for common and robust fauna residing within the locality as well as wide ranging mobile species of conservation significance. Surveys did identify that the relict vegetation within the south of Ulinda Park provided a higher quality habitat with a good vegetative strata and complexity expected from remnant vegetation; however, these areas are thin and suffering edge impacts from quarrying and grazing.

The proposed development areas are not considered to be significant with regard to any conservation significant fauna. This does not preclude conservation significant fauna from foraging, moving through or overflying the Site; however, it does indicate the Site is highly unlikely to form a core component of their respective habitats.

9.3 Proposed Development

The proposed development is outlined within **Section 2** and illustrated with relation to vegetation communities supported on Site in **Figure 3**.

The proposed development layout will result in the loss of vegetated non-remnant habitats within areas within the Site. As noted, these areas of regrowth vegetation were observed to support minimal important habitat features such as hollow bearing limbs, hollow logs, course woody debris and were generally isolated from other areas in-tact remnant vegetation.

The proposed development has retained all areas of mapped remnant vegetation within the Site including the areas of highest quality habitat within the south of Ulinda Park which have for the most part avoided clearing and logging since settlement. The proposed Solar Farm will have result in the clearing of a small amount of remnant vegetation (1.45ha) on the adjoining Lot 3 RP167346 as outlined in this report.

9.4 Compliance

9.4.1 EPBC Act

It is unlikely the proposed development will give rise to significant impacts to MNES. It is not considered that the proposed development warrants a controlled action referral to the Commonwealth DotEE to obtain a decision on the project's controlled action status under the EPBC Act. We do however, note that a referral to the Commonwealth DotEE would provide legal surety to the project if a decision was made that the project is "not a controlled action".

9.4.2 SDAP

The proposed development does not trigger assessment against Modules 5 & 11 of the SDAP; however, will result in the unavoidable clearing of regulated vegetation and has been assessed against Module 8 of the SDAP in **Section 8.2.1**. This assessment has demonstrated that the proposed clearing is compliant with the provisions of Module 8 of the SDAP.

9.4.3 Chinchilla Shire Planning Scheme

The proposed development has been assessed against the provisions of the Chinchilla Shire Planning Scheme – Rural Zone Code. The proposed development will not result in impacts to areas mapped as 'Biodiversity Planning Assessment' under the Planning Scheme Overlay Mapping. An Assessment of the Zone Code demonstrates the proposed development is compliant with relevant Rural Zone provisions.

9.5 Recommendations

It is recommended that the proposed development incorporate the following mitigation and management measures:

- Weed control across the Site;
- A fauna management plan to govern any clearing and construction works and identify that works should be conducted under the supervision of a suitably qualified and experienced fauna catcher and works are to be as a minimum undertaken in accord with Policy 6 of the *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016*;

- Consideration of fauna friendly fencing for the permitter of the development (e.g. plain wire top strands on fencing etc.);
- Retained areas can be left to regenerate where practicable;
- Pest management measures for feral species such as: foxes; cats; dogs; and pigs.

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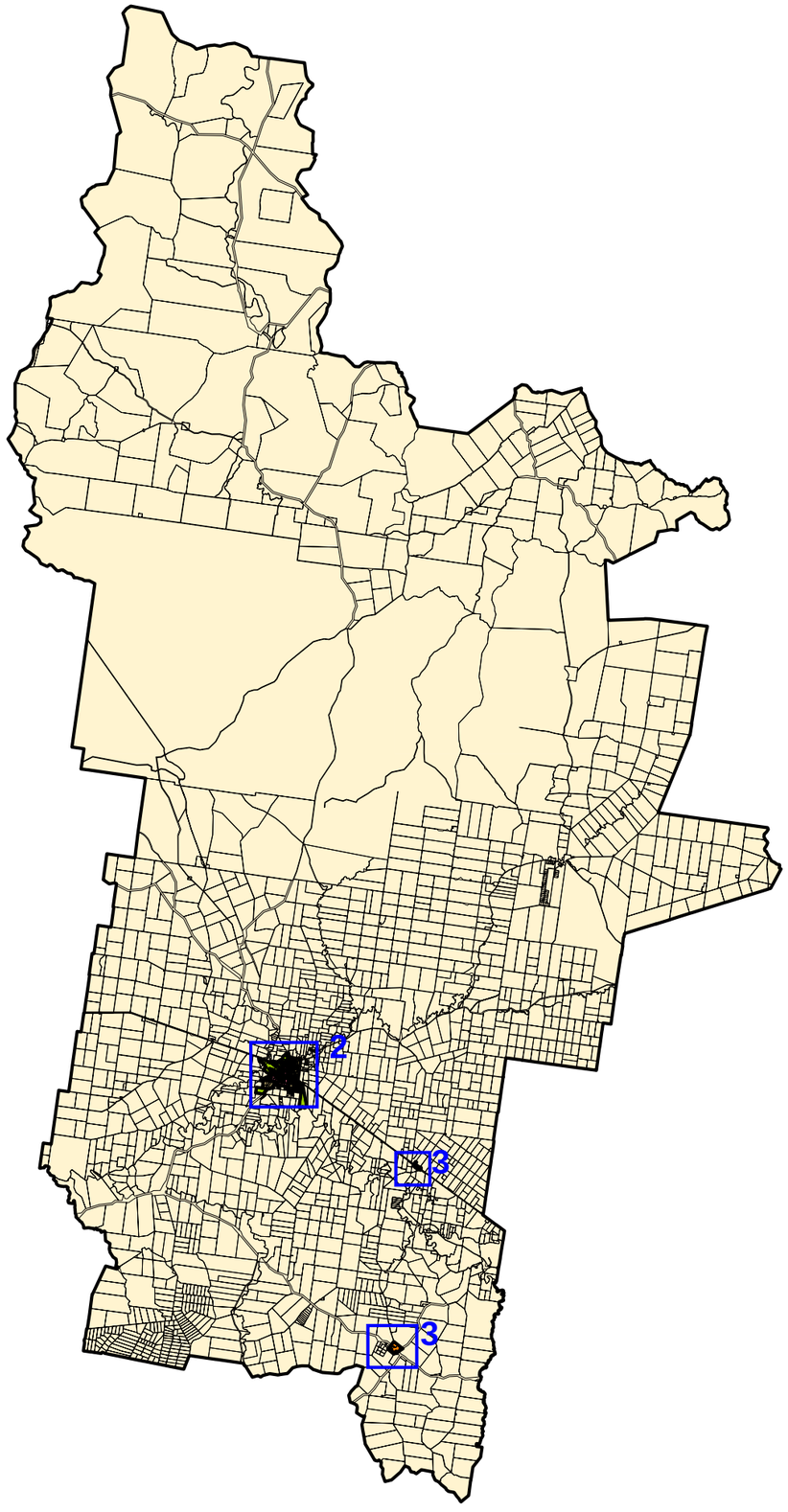
ATTACHMENT 1 – Chinchilla Zoning



Campbell Higginson Town Planning

Disclaimer:

Legend:

ZONING

- Commercial (Co)
- Industrial (In)
- Mixed Use (MU)
- Open Space and Recreation (OSR)
- Rural (Ru)
- Rural Residential (RR)
- Small Town (ST)
- Urban (Ur)

Detailed Zoning Map Sheet Area and Reference

N

0 15 30

kilometres

1:700,000

Amendments:

CHINCHILLA SHIRE COUNCIL PLANNING SCHEME ZONING MAP

LOCAL GOVERNMENT AREA CHINCHILLA SHIRE

Drawn by: **S.L.B.**	Drawing No:
Date: **19 - 03 - 04**	**SHEET 1 OF 3**
Ref: **W402_070802**	

Effective: 30 June 2006

ATTACHMENT 2 – EPBC Protected Matters Search Tool

Australian Government
Department of the Environment and Energy

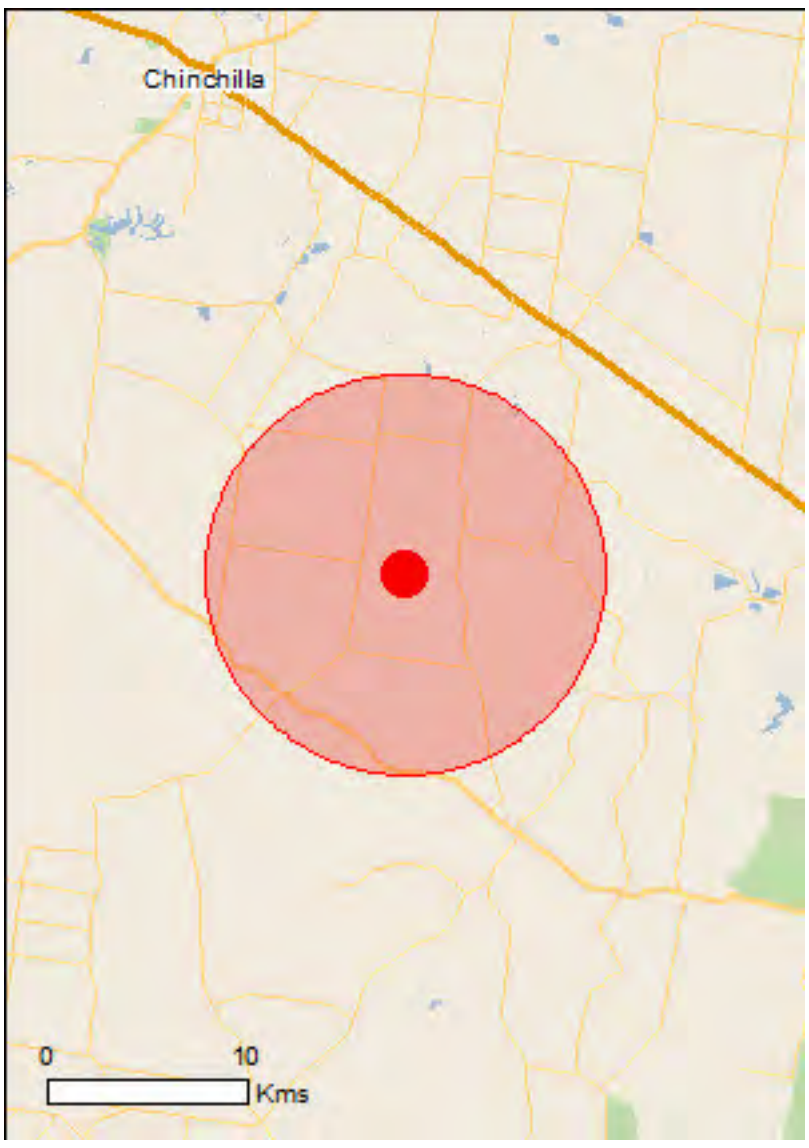
EPBC Act Protected Matters Report

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.

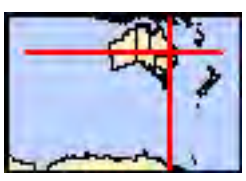
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 01/06/17 12:01:58



Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	24
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	19
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	1200 - 1300km
Narran lake nature reserve	400 - 500km upstream
Riverland	1200 - 1300km
The coorong, and lakes alexandrina and albert wetland	1400 - 1500km

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Listed Threatened Ecological Communities		[Resource Information]
Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		

Name	Status	Type of Presence
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus		
Northern Quoll, Digul [331]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Other		
Adclarkia cameroni		
Brigalow Woodland Snail [83886]	Endangered	Species or species habitat likely to occur within area
Adclarkia dulacca		
Dulacca Woodland Snail [83885]	Endangered	Species or species habitat likely to occur within area
Plants		
Cadellia pentastylis		
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat may occur within area
Homopholis belsonii		
Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area
Philotheca sporadica		
Kogan Waxflower [64944]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Anomalopus mackayi		
Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat may occur within area
Delma torquata		
Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat likely to occur within area
Furina dunmalli		
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-26.94041 150.7174

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

ATTACHMENT 3 – Wildlife Online

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -26.9404
Longitude: 150.7174
Distance: 10
Email: Mitch@28south.com.au
Date submitted: Thursday 01 Jun 2017 12:02:31
Date extracted: Thursday 01 Jun 2017 12:10:02

The number of records retrieved = 253

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufonidae	***Rhinella marina***	cane toad	Y			1
animals	amphibians	Hylidae	***Cyclorana alboguttata***	greenstripe frog		C		1
animals	amphibians	Limnodynastidae	***Limnodynastes terraereginae***	scarlet sided pobblebonk		C		2
animals	amphibians	Limnodynastidae	***Platyplectrum ornatum***	ornate burrowing frog		C		2
animals	birds	Acanthizidae	***Acanthiza chrysorrhoa***	yellow-rumped thornbill		C		2
animals	birds	Acanthizidae	***Acanthiza nana***	yellow thornbill		C		5
animals	birds	Acanthizidae	***Acanthiza apicalis***	inland thornbill		C		1
animals	birds	Acanthizidae	***Acanthiza uropygialis***	chestnut-rumped thornbill		C		1
animals	birds	Acanthizidae	***Chthonicola sagittata***	speckled warbler		C		2
animals	birds	Acanthizidae	***Smicrornis brevirostris***	weebill		C		3
animals	birds	Accipitridae	***Accipiter cirrocephalus***	collared sparrowhawk		C		1
animals	birds	Accipitridae	***Accipiter fasciatus***	brown goshawk		C		1
animals	birds	Accipitridae	***Elanus axillaris***	black-shouldered kite		C		2
animals	birds	Accipitridae	***Aquila audax***	wedge-tailed eagle		C		2
animals	birds	Anatidae	***Anas superciliosa***	Pacific black duck		C		4
animals	birds	Anatidae	***Chenonetta jubata***	Australian wood duck		C		1
animals	birds	Anseranatidae	***Anseranas semipalmata***	magpie goose		C		2
animals	birds	Ardeidae	***Ardea pacifica***	white-necked heron		C		1
animals	birds	Ardeidae	***Egretta novaehollandiae***	white-faced heron		C		1
animals	birds	Artamidae	***Cracticus tibicen***	Australian magpie		C		5
animals	birds	Artamidae	***Strepera graculina***	pied currawong		C		1
animals	birds	Artamidae	***Cracticus torquatus***	grey butcherbird		C		6
animals	birds	Artamidae	***Cracticus nigrogularis***	pied butcherbird		C		4
animals	birds	Cacatuidae	***Cacatua sanguinea***	little corella		C		1
animals	birds	Cacatuidae	***Nymphicus hollandicus***	cockatiel		C		4
animals	birds	Cacatuidae	***Eolophus roseicapilla***	galah		C		11
animals	birds	Cacatuidae	***Cacatua galerita***	sulphur-crested cockatoo		C		7
animals	birds	Campephagidae	***Coracina novaehollandiae***	black-faced cuckoo-shrike		C		6
animals	birds	Campephagidae	***Coracina papuensis***	white-bellied cuckoo-shrike		C		1
animals	birds	Campephagidae	***Lalage tricolor***	white-winged triller		C		2
animals	birds	Casuariidae	***Dromaius novaehollandiae***	emu		C		2
animals	birds	Charadriidae	***Vanellus miles***	masked lapwing		C		1
animals	birds	Columbidae	***Ocyphaps lophotes***	crested pigeon		C		4
animals	birds	Columbidae	***Phaps chalcoptera***	common bronzewing		C		1
animals	birds	Columbidae	***Geopelia humeralis***	bar-shouldered dove		C		2
animals	birds	Coraciidae	***Eurystomus orientalis***	dollarbird		C		2
animals	birds	Corcoracidae	***Struthidea cinerea***	apostlebird		C		6
animals	birds	Corcoracidae	***Corcorax melanorhamphos***	white-winged chough		C		2
animals	birds	Corvidae	***Corvus coronoides***	Australian raven		C		1
animals	birds	Corvidae	***Corvus orru***	Torresian crow		C		8
animals	birds	Cuculidae	***Centropus phasianinus***	pheasant coucal		C		1
animals	birds	Estrildidae	***Taeniopygia bichenovii***	double-barred finch		C		2
animals	birds	Falconidae	***Falco berigora***	brown falcon		C		1
animals	birds	Halcyonidae	***Dacelo novaeguineae***	laughing kookaburra		C		4
animals	birds	Halcyonidae	***Todiramphus sanctus***	sacred kingfisher		C		2
animals	birds	Hirundinidae	***Petrochelidon nigricans***	tree martin		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Hirundinidae	***Hirundo neoxena***	welcome swallow		C		1
animals	birds	Maluridae	***Malurus lamberti***	variegated fairy-wren		C		1
animals	birds	Maluridae	***Malurus cyaneus***	superb fairy-wren		C		4
animals	birds	Meliphagidae	***Ptilotula penicillata***	white-plumed honeyeater		C		2
animals	birds	Meliphagidae	***Lichenostomus melanops***	yellow-tufted honeyeater		C		1
animals	birds	Meliphagidae	***Manorina melanocephala***	noisy miner		C		10
animals	birds	Meliphagidae	***Philemon citreogularis***	little friarbird		C		2
animals	birds	Meliphagidae	***Acanthagenys rufogularis***	spiny-cheeked honeyeater		C		1
animals	birds	Meliphagidae	***Plectorhyncha lanceolata***	striped honeyeater		C		3
animals	birds	Meliphagidae	***Melithreptus brevirostris***	brown-headed honeyeater		C		1
animals	birds	Meliphagidae	***Ptilotula fusca***	fuscous honeyeater		C		1
animals	birds	Meliphagidae	***Caligavis chrysops***	yellow-faced honeyeater		C		2
animals	birds	Meliphagidae	***Entomyzon cyanotis***	blue-faced honeyeater		C		5
animals	birds	Meliphagidae	***Manorina flavigula***	yellow-throated miner		C		1
animals	birds	Meliphagidae	***Gavicalis virescens***	singing honeyeater		C		1
animals	birds	Meliphagidae	***Lichmera indistincta***	brown honeyeater		C		1
animals	birds	Meliphagidae	***Nesoptilotis leucotis***	white-eared honeyeater		C		1
animals	birds	Meliphagidae	***Philemon corniculatus***	noisy friarbird		C		3
animals	birds	Meropidae	***Merops ornatus***	rainbow bee-eater		C		1
animals	birds	Monarchidae	***Myiagra inquieta***	restless flycatcher		C		1
animals	birds	Monarchidae	***Myiagra rubecula***	leaden flycatcher		C		1
animals	birds	Monarchidae	***Grallina cyanoleuca***	magpie-lark		C		4
animals	birds	Nectariniidae	***Dicaeum hirundinaceum***	mistletoebird		C		6
animals	birds	Pachycephalidae	***Colluricincla harmonica***	grey shrike-thrush		C		2
animals	birds	Pachycephalidae	***Pachycephala rufiventris***	rufous whistler		C		5
animals	birds	Pardalotidae	***Pardalotus striatus***	striated pardalote		C		3
animals	birds	Pardalotidae	***Pardalotus punctatus***	spotted pardalote		C		2
animals	birds	Petroicidae	***Microeca fascinans***	jacky winter		C		1
animals	birds	Petroicidae	***Petroica goodenovii***	red-capped robin		C		1
animals	birds	Phasianidae	***Coturnix ypsilophora***	brown quail		C		1
animals	birds	Pomatostomidae	***Pomatostomus temporalis***	grey-crowned babbler		C		5
animals	birds	Psittacidae	***Aprosmictus erythropterus***	red-winged parrot		C		2
animals	birds	Psittacidae	***Trichoglossus chlorolepidotus***	scaly-breasted lorikeet		C		4
animals	birds	Psittacidae	***Northiella haematogaster***	blue bonnet		C		2
animals	birds	Psittacidae	***Platycercus adscitus***	pale-headed rosella		C		5
animals	birds	Psittacidae	***Alisterus scapularis***	Australian king-parrot		C		2
animals	birds	Psittacidae	***Parvipsitta pusilla***	little lorikeet		C		1
animals	birds	Rhipiduridae	***Rhipidura albiscapa***	grey fantail		C		5
animals	birds	Rhipiduridae	***Rhipidura leucophrys***	willie wagtail		C		6
animals	birds	Strigidae	***Ninox boobook***	southern boobook		C		1
animals	birds	Threskiornithidae	***Platalea flavipes***	yellow-billed spoonbill		C		1
animals	birds	Timaliidae	***Zosterops lateralis***	silvereye		C		1
animals	insects	Lycaenidae	***Jalmenus eubulus***	pale imperial hairstreak		V		2
animals	mammals	Bovidae	***Capra hircus***	goat	Y			1
animals	mammals	Canidae	***Vulpes vulpes***	red fox	Y			3
animals	mammals	Canidae	***Canis lupus dingo***	dingo				1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Felidae	***Felis catus***	cat	Y			1
animals	mammals	Leporidae	***Lepus europaeus***	European brown hare	Y			2
animals	mammals	Leporidae	***Oryctolagus cuniculus***	rabbit	Y			1
animals	mammals	Macropodidae	***Macropus dorsalis***	black-striped wallaby		C		1
animals	mammals	Macropodidae	***Wallabia bicolor***	swamp wallaby		C		3
animals	mammals	Macropodidae	***Macropus giganteus***	eastern grey kangaroo		C		1
animals	mammals	Muridae	***Mus musculus***	house mouse	Y			2
animals	mammals	Phascolarctidae	***Phascolarctos cinereus***	koala		V	V	1
animals	mammals	Suidae	***Sus scrofa***	pig	Y			1
animals	reptiles	Colubridae	***Boiga irregularis***	brown tree snake		C		1/1
animals	reptiles	Elapidae	***Pseudonaja textilis***	eastern brown snake		C		1
animals	reptiles	Elapidae	***Demansia psammophis***	yellow-faced whipsnake		C		1
animals	reptiles	Gekkonidae	***Heteronotia binoei***	Bynoe's gecko		C		1
animals	reptiles	Pygopodidae	***Lialis burtonis***	Burton's legless lizard		C		1
animals	reptiles	Scincidae	***Carlia pectoralis sensu lato***			C		1
animals	reptiles	Varanidae	***Varanus varius***	lace monitor		C		1
animals	reptiles	Varanidae	***Varanus gouldii***	sand monitor		C		2
plants	conifers	Cupressaceae	***Callitris glaucophylla***	white cypress pine		C		10
plants	ferns	Adiantaceae	***Cheilanthes distans***	bristly cloak fern		C		3
plants	ferns	Adiantaceae	***Cheilanthes sieberi subsp. sieberi***			C		1
plants	higher dicots	Acanthaceae	***Brunoniella australis***	blue trumpet		C		8
plants	higher dicots	Amaranthaceae	***Alternanthera nana***	hairy joyweed		C		7
plants	higher dicots	Amaranthaceae	***Amaranthus macrocarpus***	dwarf amaranth		C		1/1
plants	higher dicots	Amaranthaceae	***Alternanthera denticulata***	lesser joyweed		C		1
plants	higher dicots	Apocynaceae	***Parsonsia lanceolata***	northern silkpod		C		1
plants	higher dicots	Asteraceae	***Brachyscome multifida***			C		1/1
plants	higher dicots	Asteraceae	***Vittadinia cuneata var. hirsuta***			C		1
plants	higher dicots	Asteraceae	***Sphaeromorphaea australis***			C		2
plants	higher dicots	Asteraceae	***Vittadinia tenuissima***	western New Holland daisy		C		10
plants	higher dicots	Asteraceae	***Peripleura hispidula***			C		6
plants	higher dicots	Asteraceae	***Calotis cuneifolia***	burr daisy		C		1
plants	higher dicots	Brassicaceae	***Rorippa eustylis***			C		1/1
plants	higher dicots	Cactaceae	***Opuntia tomentosa***	velvety tree pear	Y			8
plants	higher dicots	Cactaceae	***Opuntia stricta***		Y			4
plants	higher dicots	Caesalpiniaceae	***Senna artemisioides subsp. coriacea***			C		1
plants	higher dicots	Capparaceae	***Capparis mitchellii***			C		1/1
plants	higher dicots	Capparaceae	***Capparis lasiantha***	nipan		C		1/1
plants	higher dicots	Casuarinaceae	***Allocasuarina luehmannii***	bull oak		C		9
plants	higher dicots	Chenopodiaceae	***Maireana microphylla***			C		2
plants	higher dicots	Chenopodiaceae	***Einadia hastata***			C		5
plants	higher dicots	Chenopodiaceae	***Dysphania carinata***			C		3
plants	higher dicots	Elatinaceae	***Elatine gratioloides***	waterwort		C		1
plants	higher dicots	Fabaceae	***Pultenaea petiolaris***			C		1/1
plants	higher dicots	Fabaceae	***Macroptilium lathyroides***		Y			1/1
plants	higher dicots	Fabaceae	***Lotus cruentus***	red-flowered lotus		C		1/1
plants	higher dicots	Fabaceae	***Hovea planifolia***			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Fabaceae	***Melilotus indicus***	hexham scent	Y			1/1
plants	higher dicots	Goodeniaceae	***Goodenia delicata***			C		1/1
plants	higher dicots	Goodeniaceae	***Goodenia disperma***			C		3
plants	higher dicots	Haloragaceae	***Gonocarpus urceolatus***			C		1/1
plants	higher dicots	Lamiaceae	***Spartothamnella juncea***	native broom		C		1
plants	higher dicots	Lamiaceae	***Stachys arvensis***	stagger weed	Y			1/1
plants	higher dicots	Loranthaceae	***Amyema cambagei***			C		1
plants	higher dicots	Loranthaceae	***Amyema biniflora***			C		1
plants	higher dicots	Loranthaceae	***Lysiana exocarpi subsp. tenuis***			C		1
plants	higher dicots	Malvaceae	***Sida cunninghamii***			C		4
plants	higher dicots	Malvaceae	***Hibiscus sturtii var. sturtii***			C		5
plants	higher dicots	Malvaceae	***Sida trichopoda***			C		6
plants	higher dicots	Mimosaceae	***Acacia muelleriana***			C		1/1
plants	higher dicots	Mimosaceae	***Acacia melvillei***			C		1/1
plants	higher dicots	Mimosaceae	***Acacia neriifolia***	pechey wattle		C		1/1
plants	higher dicots	Mimosaceae	***Acacia leiocalyx subsp. leiocalyx***			C		3
plants	higher dicots	Mimosaceae	***Acacia excelsa subsp. excelsa***			C		1
plants	higher dicots	Mimosaceae	***Acacia blakei subsp. blakei***			C		1
plants	higher dicots	Mimosaceae	***Acacia crassa subsp. crassa***			C		11
plants	higher dicots	Mimosaceae	***Acacia stenophylla***	belalie		C		1/1
plants	higher dicots	Myrtaceae	***Kardomia jucunda***			C		2/2
plants	higher dicots	Myrtaceae	***Eucalyptus crebra***	narrow-leaved red ironbark		C		11
plants	higher dicots	Myrtaceae	***Eucalyptus elegans***			C		1/1
plants	higher dicots	Myrtaceae	***Angophora leiocarpa***	rusty gum		C		3
plants	higher dicots	Myrtaceae	***Eucalyptus coolabah***	coolabah		C		1/1
plants	higher dicots	Myrtaceae	***Eucalyptus populnea***	poplar box		C		1
plants	higher dicots	Myrtaceae	***Corymbia clarksoniana***			C		7
plants	higher dicots	Myrtaceae	***Eucalyptus microcarpa***	inland grey box		C		2
plants	higher dicots	Myrtaceae	***Homalocalyx polyandrus***			C		3/3
plants	higher dicots	Myrtaceae	***Eucalyptus fibrosa subsp. nubilis***			C		1
plants	higher dicots	Phyllanthaceae	***Phyllanthus virgatus***			C		1
plants	higher dicots	Picrodendraceae	***Petalostigma pubescens***	quinine tree		C		3
plants	higher dicots	Pittosporaceae	***Bursaria incana***			C		1/1
plants	higher dicots	Polygonaceae	***Emex australis***		Y			4
plants	higher dicots	Portulacaceae	***Portulaca filifolia***			C		2
plants	higher dicots	Proteaceae	***Grevillea striata***	beefwood		C		1
plants	higher dicots	Rhamnaceae	***Alphitonia excelsa***	soap tree		C		4/1
plants	higher dicots	Rubiaceae	***Pomax umbellata***			C		1
plants	higher dicots	Rubiaceae	***Psydrax oleifolia***			C		2
plants	higher dicots	Rubiaceae	***Oldenlandia mitrasacmoides subsp. trachymenoides***			C		1/1
plants	higher dicots	Rutaceae	***Boronia occidentalis***			C		2/2
plants	higher dicots	Rutaceae	***Geijera parviflora***	wilga		C		4
plants	higher dicots	Rutaceae	***Boronia bipinnata***	rock boronia		C		2
plants	higher dicots	Rutaceae	***Philotheca sporadica***			NT	V	3/3
plants	higher dicots	Santalaceae	***Santalum lanceolatum***			C		1
plants	higher dicots	Sapindaceae	***Dodonaea triangularis***			C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Scrophulariaceae	***Eremophila debilis***	winter apple		C		1
plants	higher dicots	Scrophulariaceae	***Eremophila deserti***			C		1/1
plants	higher dicots	Solanaceae	***Solanum parvifolium***			C		8
plants	higher dicots	Solanaceae	***Nicotiana megalosiphon subsp. megalosiphon***			C		1/1
plants	higher dicots	Solanaceae	***Solanum tetrathecum***			C		5
plants	higher dicots	Solanaceae	***Solanum ellipticum***	potato bush		C		1
plants	higher dicots	Stackhousiaceae	***Stackhousia muricata***			C		1/1
plants	higher dicots	Stylidiaceae	***Stylidium eglandulosum***			C		1/1
plants	higher dicots	Verbenaceae	***Glandularia aristigera***		Y			1
plants	higher dicots	Zygophyllaceae	***Zygophyllum apiculatum***	gall weed		C		1/1
plants	lower dicots	Ranunculaceae	***Ranunculus sessiliflorus var. pilulifer***			C		1/1
plants	monocots	Commelinaceae	***Murdannia graminea***	murdannia		C		1/1
plants	monocots	Cyperaceae	***Gahnia aspera***			C		7
plants	monocots	Cyperaceae	***Eleocharis blakeana***			C		1/1
plants	monocots	Cyperaceae	***Scleria mackaviensis***			C		1
plants	monocots	Cyperaceae	***Cyperus***			C		3
plants	monocots	Cyperaceae	***Cyperus iria***			C		4
plants	monocots	Cyperaceae	***Carex inversa***	knob sedge		C		1
plants	monocots	Cyperaceae	***Cyperus gracilis***			C		1
plants	monocots	Cyperaceae	***Cyperus betchei***			C		1
plants	monocots	Cyperaceae	***Eleocharis cylindrostachys***			C		1
plants	monocots	Cyperaceae	***Eleocharis philippinensis***			C		1
plants	monocots	Cyperaceae	***Fimbristylis dichotoma***	common fringe-rush		C		5
plants	monocots	Hemerocallidaceae	***Dianella revoluta***			C		6/1
plants	monocots	Hemerocallidaceae	***Dianella brevipedunculata***			C		3/1
plants	monocots	Hypoxidaceae	***Hypoxis hygrometrica var. villosisepala***			C		1/1
plants	monocots	Juncaceae	***Juncus subsecundus***			C		1
plants	monocots	Laxmanniaceae	***Laxmannia gracilis***	slender wire lily		C		4
plants	monocots	Laxmanniaceae	***Lomandra filiformis***			C		6
plants	monocots	Laxmanniaceae	***Lomandra multiflora***			C		8
plants	monocots	Laxmanniaceae	***Lomandra leucocephala***			C		3
plants	monocots	Orchidaceae	***Cymbidium canaliculatum***			C		2
plants	monocots	Orchidaceae	***Pterostylis***			C		1/1
plants	monocots	Poaceae	***Aristida leichhardtiana***			C		8
plants	monocots	Poaceae	***Eragrostis leptostachya***			C		1
plants	monocots	Poaceae	***Eragrostis spartinoides***			C		2
plants	monocots	Poaceae	***Paspalidium caespitosum***	brigalow grass		C		7
plants	monocots	Poaceae	***Paspalidium constrictum***			C		3
plants	monocots	Poaceae	***Thyridolepis mitchelliana***	mulga mitchell grass		C		2
plants	monocots	Poaceae	***Diplachne fusca var. fusca***			C		1
plants	monocots	Poaceae	***Aristida calycina var. calycina***			C		6
plants	monocots	Poaceae	***Dinebra decipiens var. peacockii***			C		7
plants	monocots	Poaceae	***Bothriochloa decipiens var. decipiens***			C		3
plants	monocots	Poaceae	***Aristida jerichoensis var. jerichoensis***			C		1
plants	monocots	Poaceae	***Calyptochloa gracillima subsp. gracillima***			C		4
plants	monocots	Poaceae	***Ancistrachne uncinulata***	hooky grass		C		7

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	***Enteropogon acicularis***	curly windmill grass		C		7
plants	monocots	Poaceae	***Cleistochloa subjuncea***			C		6
plants	monocots	Poaceae	***Aristida caput-medusae***			C		10
plants	monocots	Poaceae	***Eragrostis parviflora***	weeping lovegrass		C		1
plants	monocots	Poaceae	***Digitaria breviglumis***			C		9
plants	monocots	Poaceae	***Tripogon loliiformis***	five minute grass		C		1
plants	monocots	Poaceae	***Sporobolus scabridus***			C		1
plants	monocots	Poaceae	***Eragrostis lacunaria***	purple lovegrass		C		11
plants	monocots	Poaceae	***Cymbopogon refractus***	barbed-wire grass		C		4
plants	monocots	Poaceae	***Paspalidium distans***	shotgrass		C		3
plants	monocots	Poaceae	***Eragrostis elongata***			C		1
plants	monocots	Poaceae	***Enteropogon ramosus***			C		6
plants	monocots	Poaceae	***Enneapogon gracilis***	slender nineawn		C		1
plants	monocots	Poaceae	***Eriachne mucronata***			C		8/1
plants	monocots	Poaceae	***Eragrostis sororia***			C		6
plants	monocots	Poaceae	***Chrysopogon fallax***			C		3
plants	monocots	Poaceae	***Chloris ventricosa***	tall chloris		C		1
plants	monocots	Poaceae	***Sporobolus caroli***	fairy grass		C		1
plants	monocots	Poaceae	***Panicum effusum***			C		9
plants	monocots	Poaceae	***Aristida vagans***			C		6
plants	monocots	Poaceae	***Panicum simile***			C		1
plants	monocots	Poaceae	***Aristida ramosa***	purple wiregrass		C		9
plants	monocots	Pontederiaceae	***Monochoria cyanea***			C		1

CODES

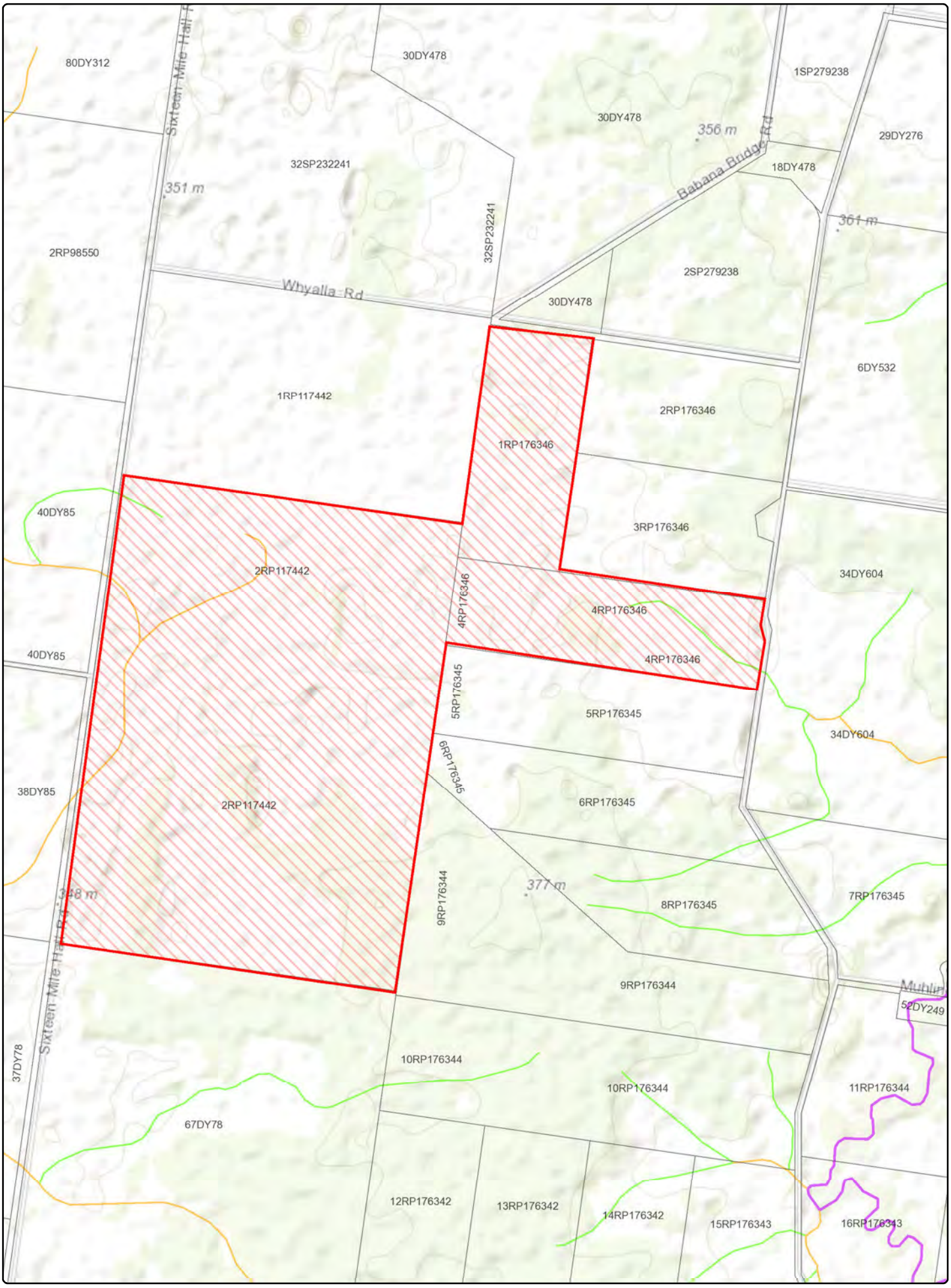
I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the ***Nature Conservation Act 1992.*** The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the ***Environment Protection and Biodiversity Conservation Act 1999.*** The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

ATTACHMENT 4 – Fisheries Resources



DA Mapping System – Print Screen

Date: 01/06/2017

Department of Infrastructure, Local Government and Planning

0 580 1,160 1,740 2,320

Metres

N

Disclaimer:
This map has been generated from the information supplied to the Department of Infrastructure, Local Government and Planning for the purposes of Development Assessment Mapping Online but is a print screen only and should not be used for development application (DA) purposes. For DA purposes the user should use the Print Report function to obtain a list of DA triggers. The map generated has been prepared with due care based on the best available information at the time of publication. The State of Queensland holds no responsibility for any errors, inconsistencies or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties.

Legend

Drawn Polygon Layer


Override 1

Cadastre (50k)


Cadastre (50k)

Qld waterways for waterway barrier works

1 - Low

2 - Moderate

3 - High

4 - Major

Fish habitat management area A


FHAA

Fish habitat management area B


FHAB

Tidal waterways


Tidal waterways

DA Mapping System – Print Screen

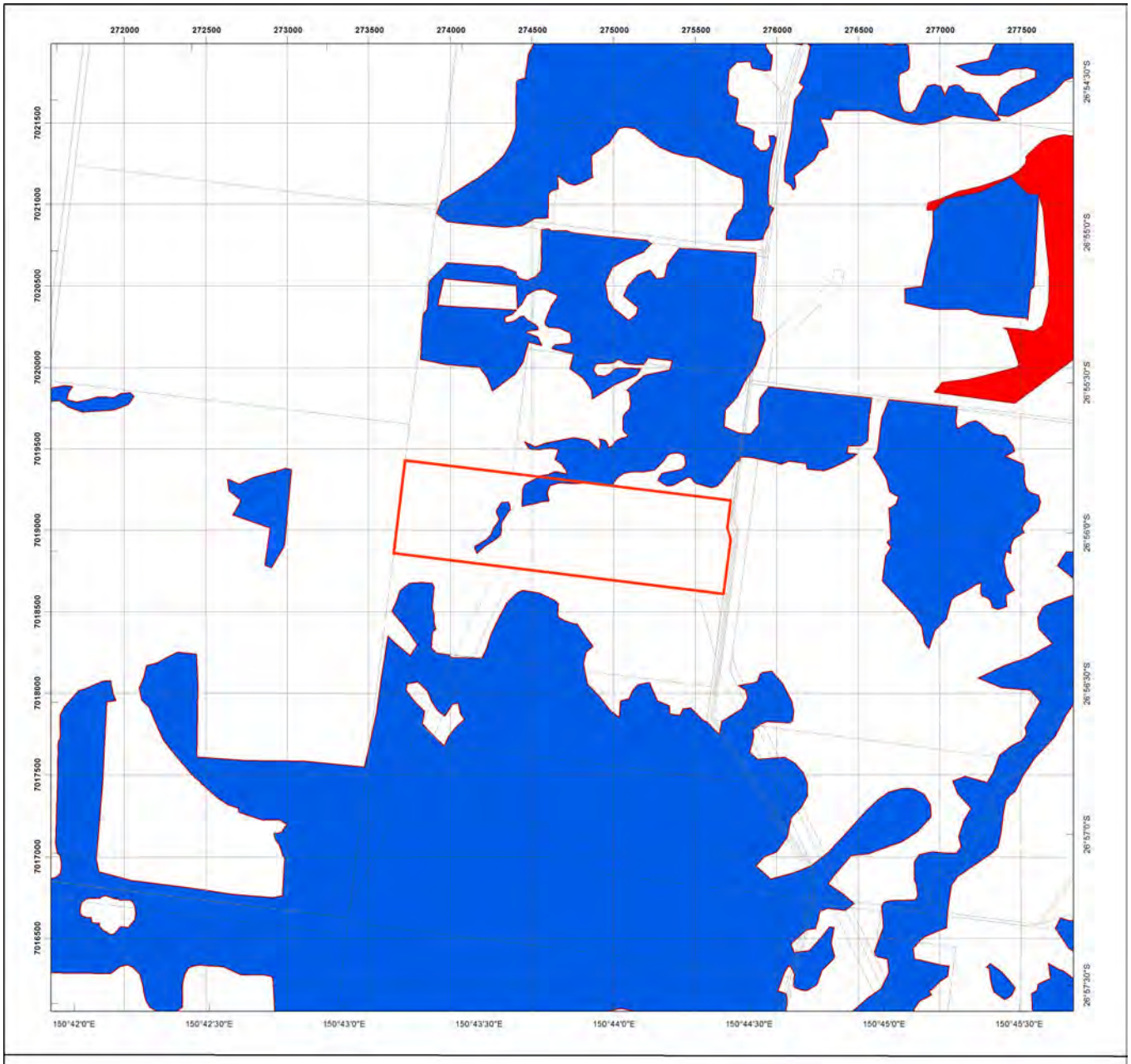
Queensland Government

Department of Infrastructure, Local Government and Planning

Date: 01/06/2017

ATTACHMENT 5 – Vegetation Management Report

5.1 Regulated vegetation management map

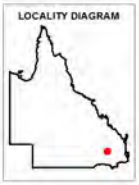


Regulated Vegetation Management Map

Legend

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt on Freehold, Indigenous and Leasehold land)
- Water
- Area not categorised
- Cadastral line
- Property boundaries shown are provided as a locational aid only

LOCALITY DIAGRAM



N

0 340 680 1,020 1,360 1,700 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incurr as a result of the product being inaccurate or incomplete in any way and for any reason.

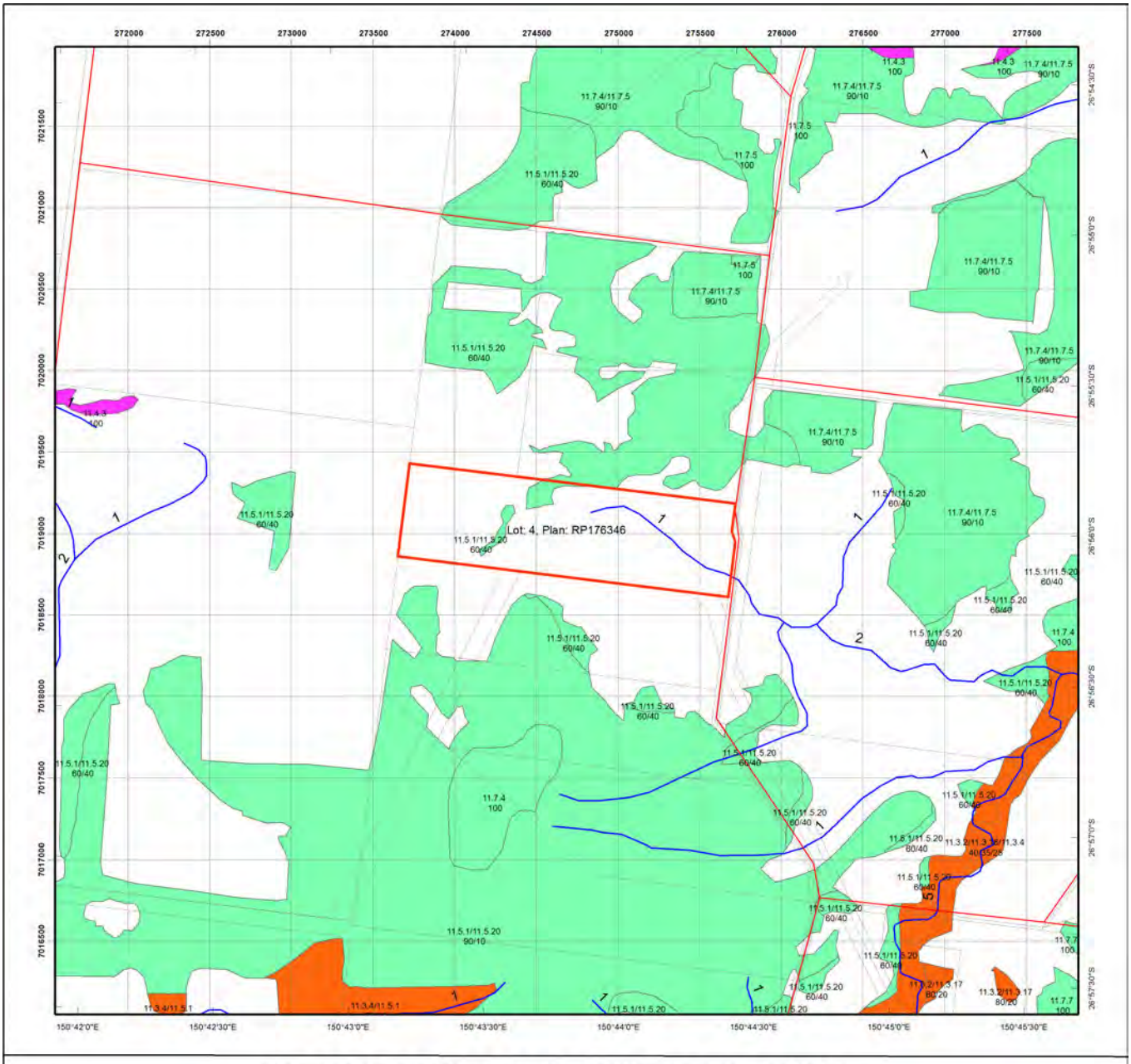
Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

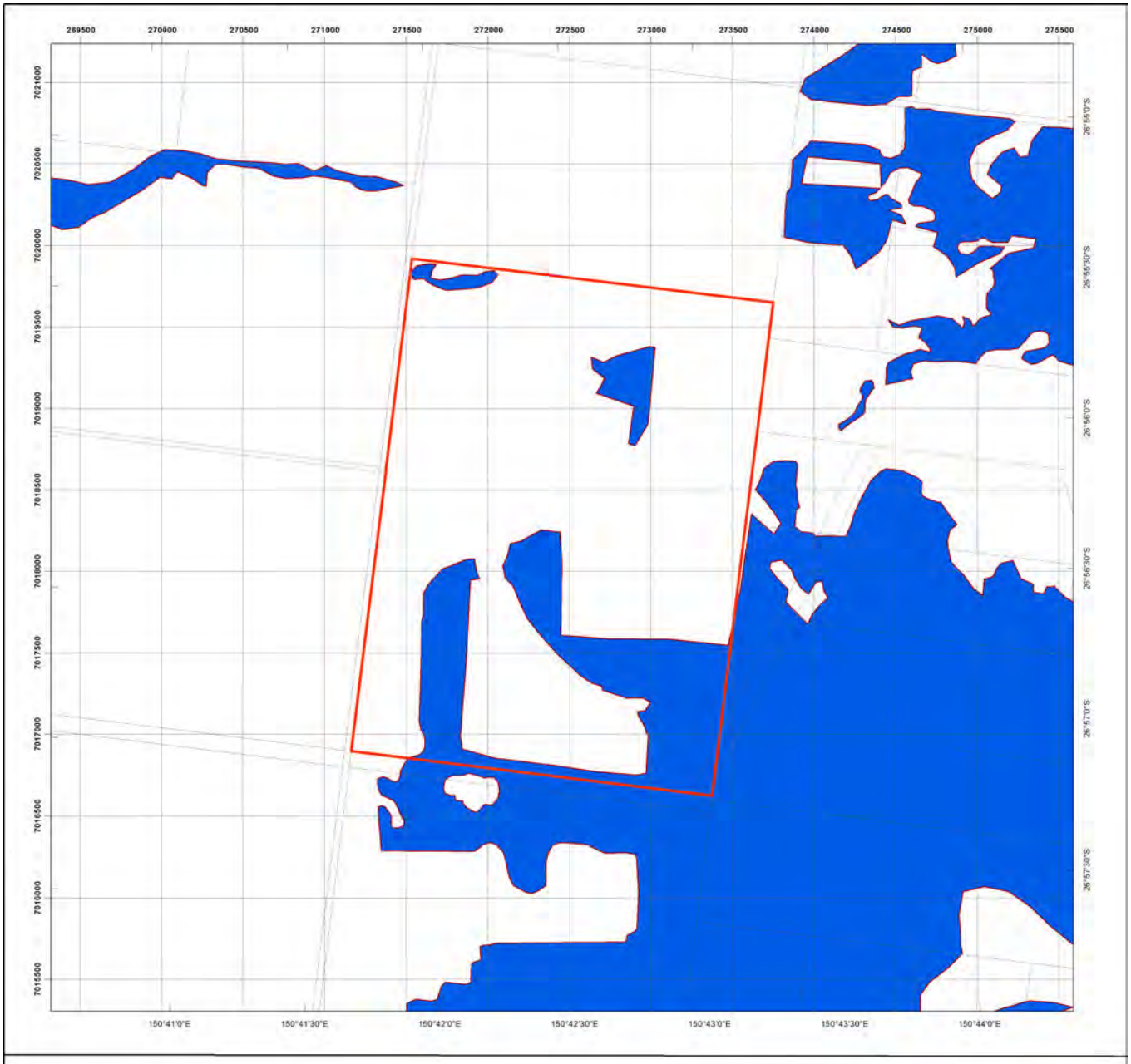
This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

5.2 Vegetation management supporting map



5.1 Regulated vegetation management map



Regulated Vegetation Management Map

Legend

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt on Freehold. Indigenous and Leasehold land)
- Water
- Area not categorised
- Cadastral line
- Property boundaries shown are provided as a locational aid only

LOCALITY DIAGRAM

N

0 340 680 1,020 1,360 1,700 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incurr as a result of the product being inaccurate or incomplete in any way and for any reason.

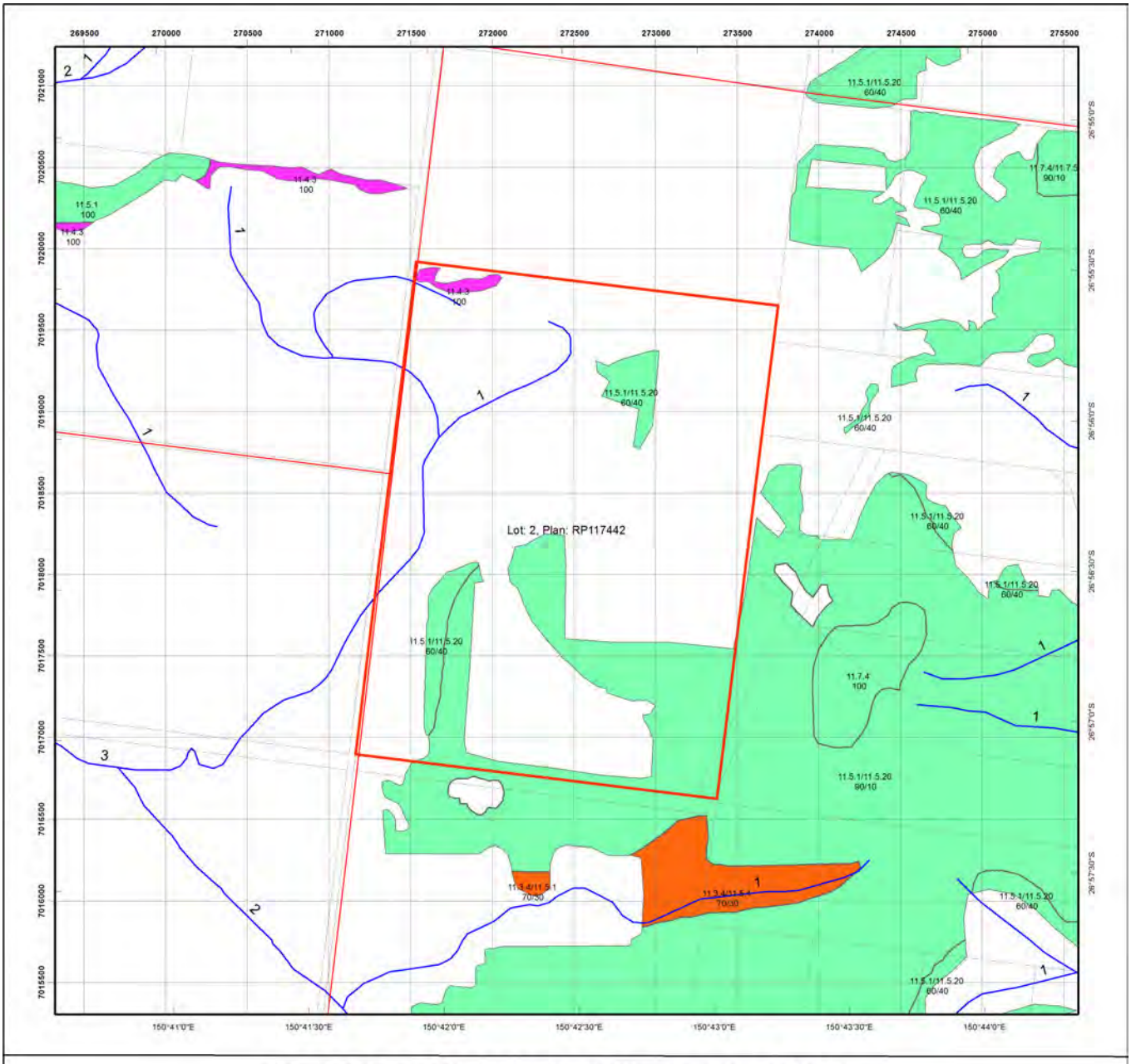
Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

5.2 Vegetation management supporting map



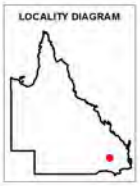
Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area containing remnant vegetation
- Category A or B area under Section 20AH
  These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area containing high value regrowth vegetation
- Category C area under Section 20AI
  These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourse on the vegetation management watercourse and drainage feature map
  (Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM



N

0 240 480 720 960 1,200 m

This product is projected into:
GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
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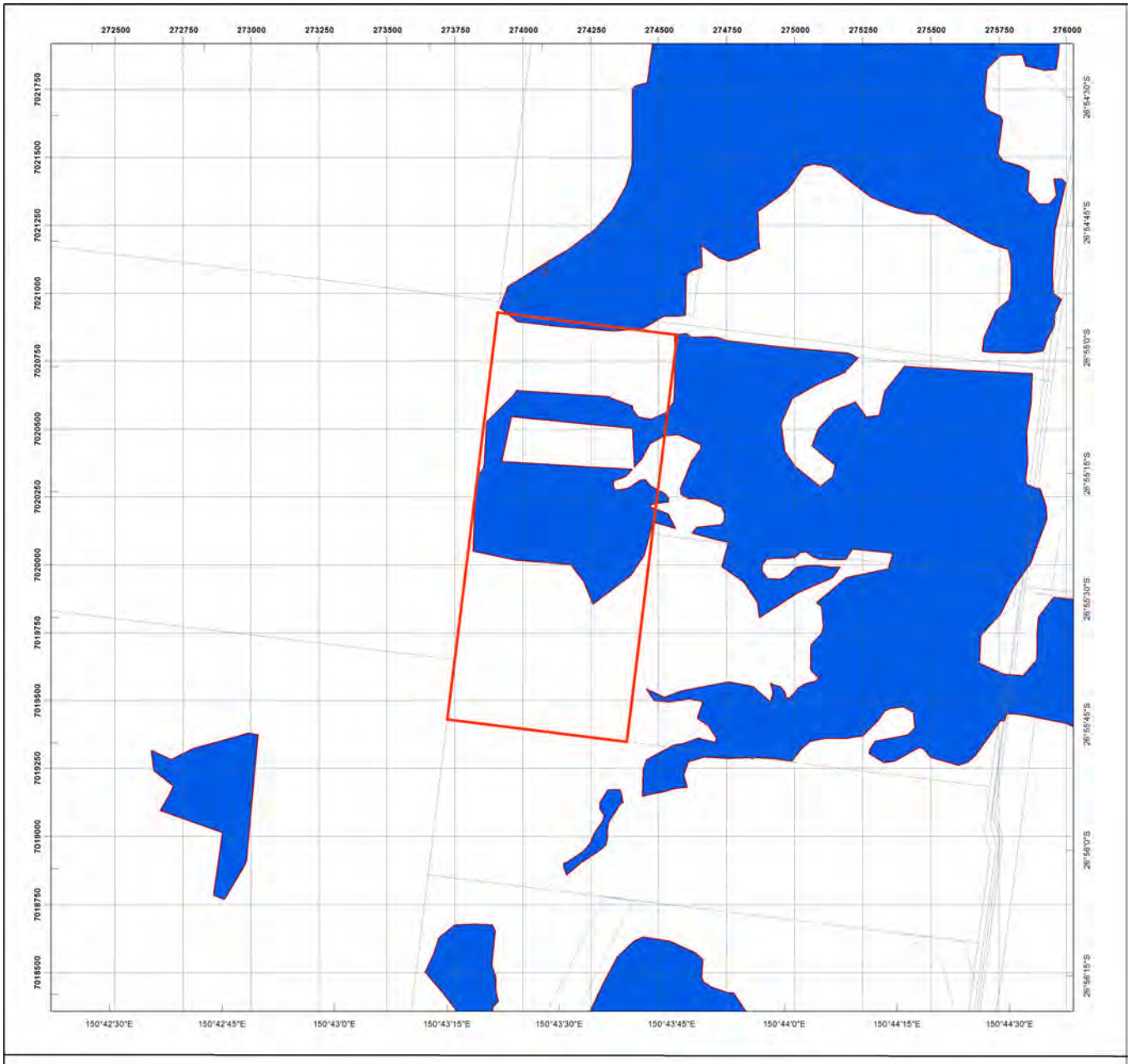
Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.dnrm.qld.gov.au or contact the Department of Natural Resources and Mines.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

5.1 Regulated vegetation management map



Regulated Vegetation Management Map

Legend

- Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt on Freehold. Indigenous and Leasehold land)
- Water
- Area not categorised
- Cadastral line
- Property boundaries shown are provided as a locational aid only

LOCALITY DIAGRAM

N

0 200 400 600 800 1,000 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
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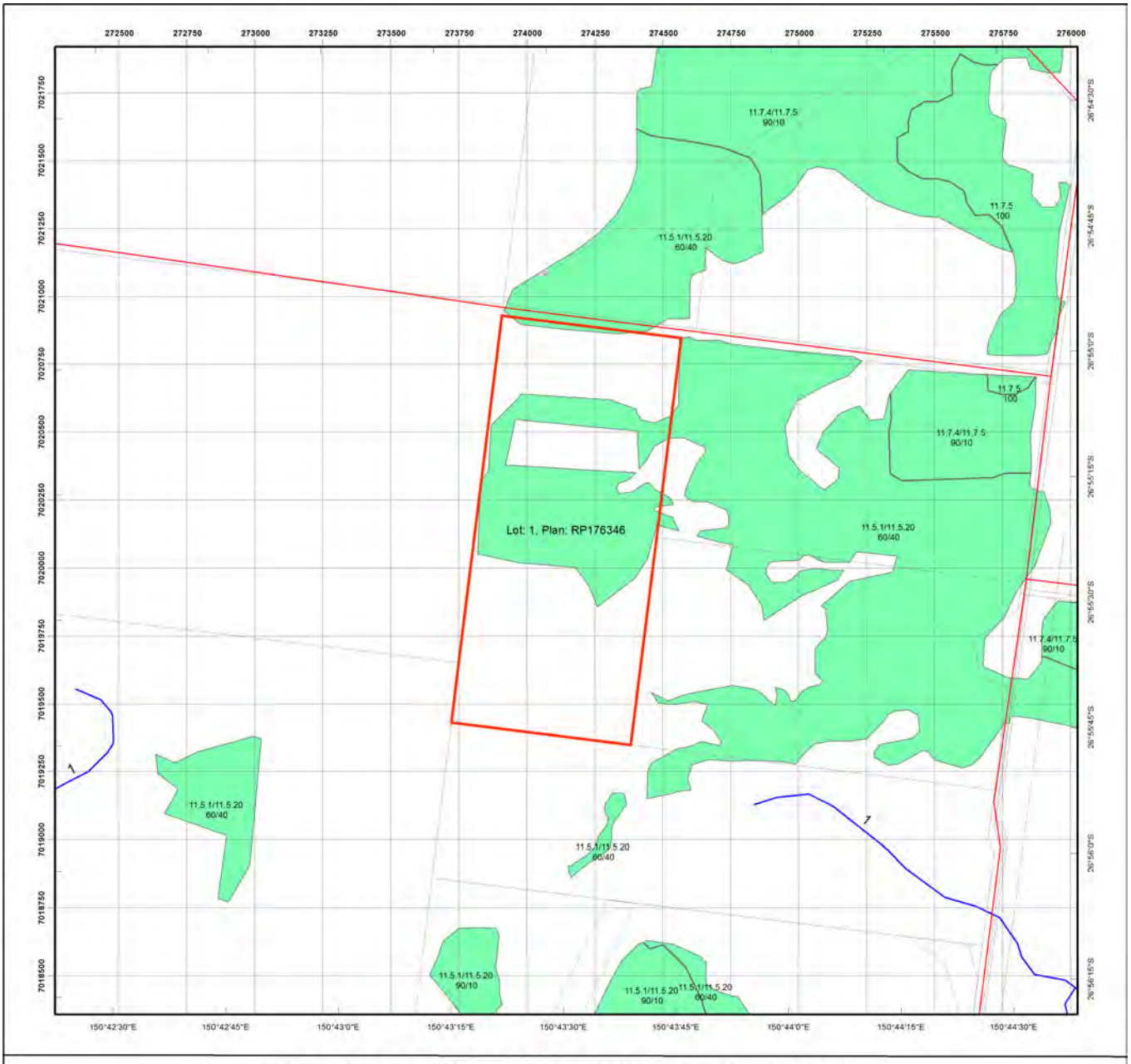
Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

5.2 Vegetation management supporting map



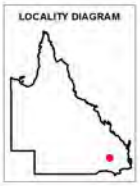
Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area containing remnant vegetation
- Category A or B area under Section 20AH
  These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area containing high value regrowth vegetation
- Category C area under Section 20AI
  These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourse on the vegetation management watercourse and drainage feature map
  (Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM



N

0 150 300 450 600 750 m

This product is projected into:
GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
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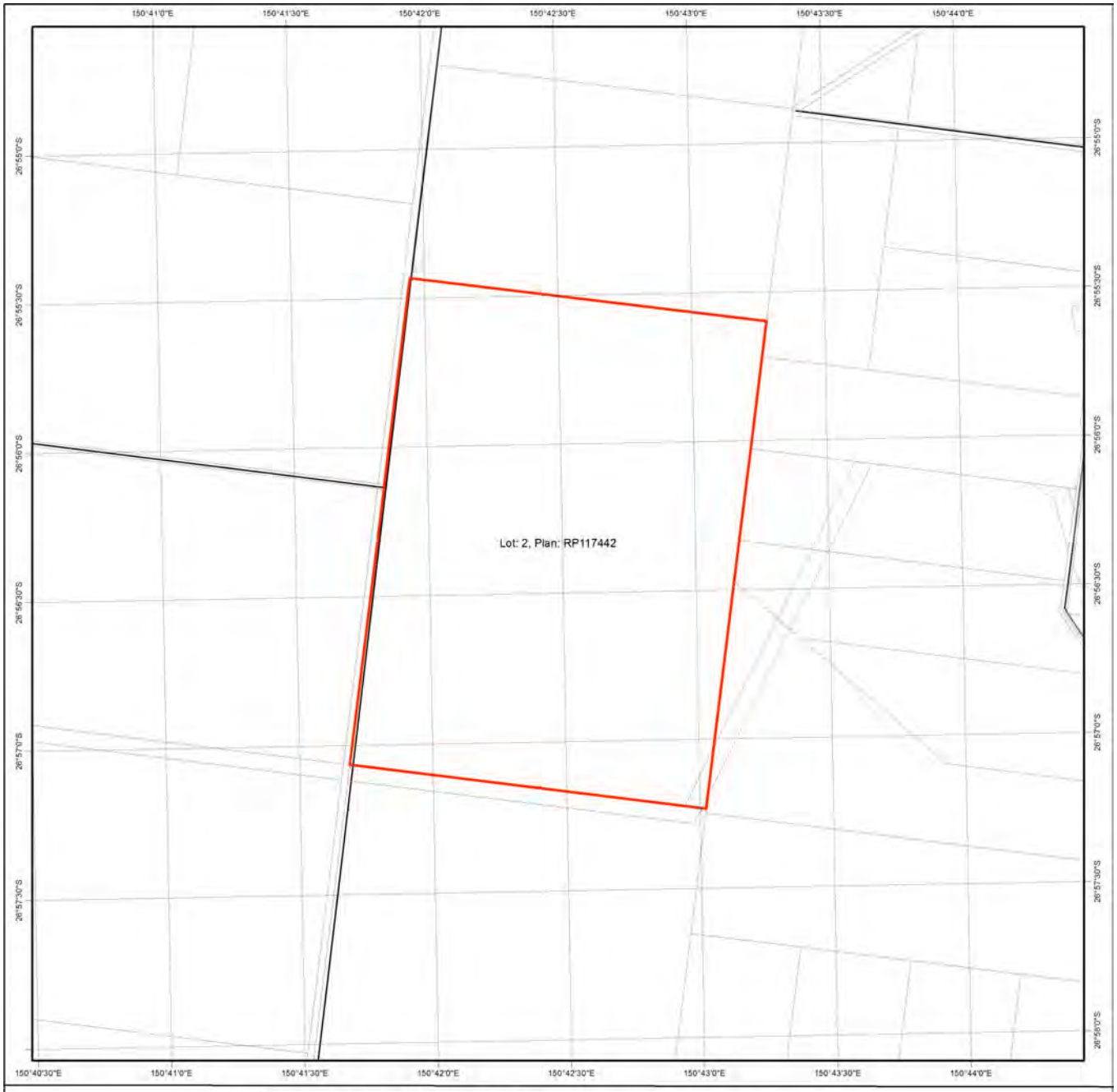
Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

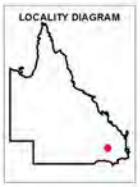
5.4 Protected plants map



Protected Plants Flora Survey Trigger Map

Legend

- Lot and Plan
- High risk area
- Cadastral line
  Property boundaries shown are provided as a locational aid only
- Freeways / motorways / highways
- Secondary roads / streets



This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Heritage Protection at palm@ehp.qld.gov.au

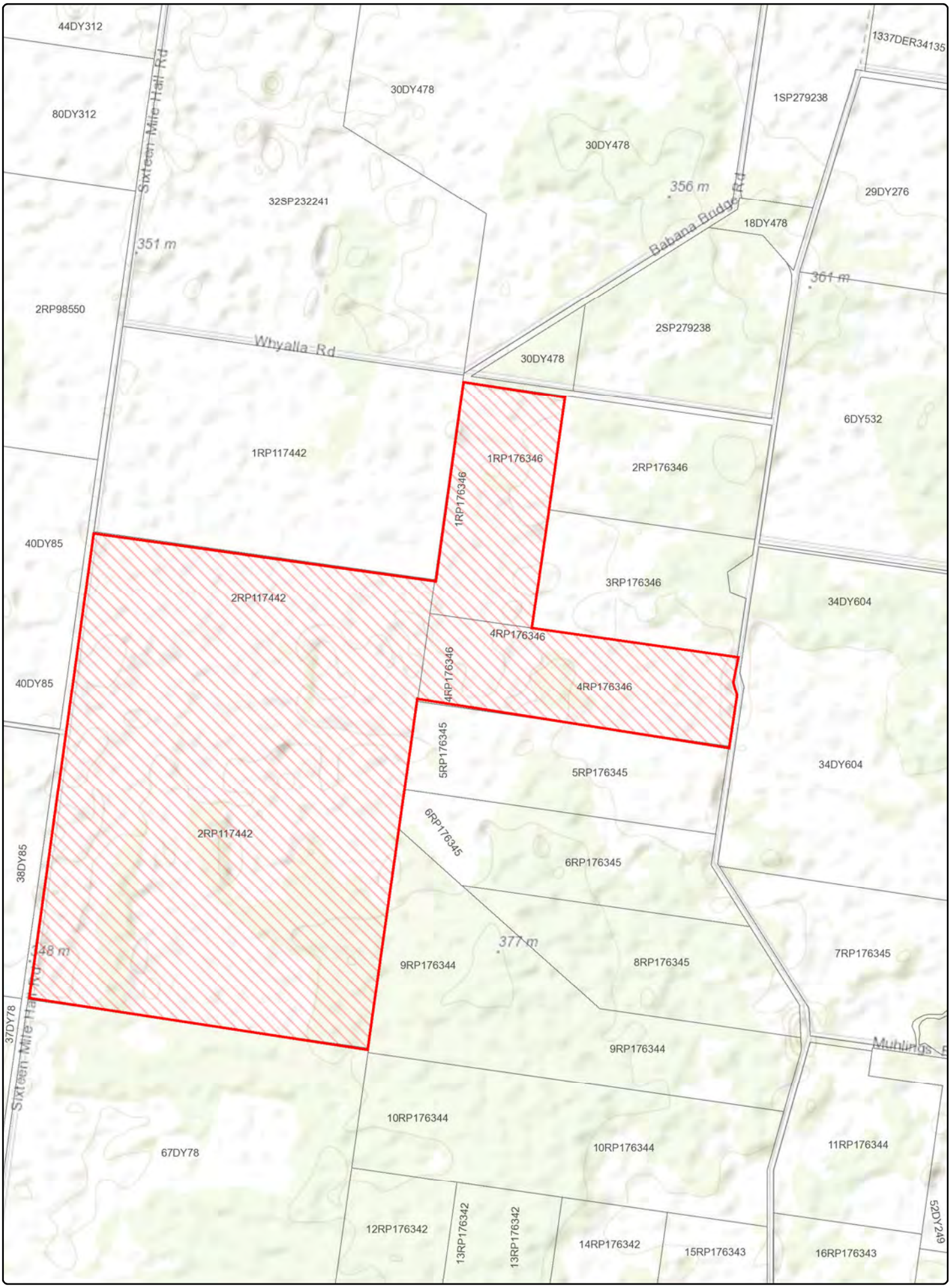
N

0 240 480 720 960 1,200 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

ATTACHMENT 6 – Wetland Protection Areas



DA Mapping System – Print Screen

Date: 01/06/2017

0 580 1,160 1,740 2,320

Metres

Department of Infrastructure, Local Government and Planning

Queensland Government

Disclaimer:
This map has been generated from the information supplied to the Department of Infrastructure, Local Government and Planning for the purposes of Development Assessment Mapping Online but is a print screen only and should not be used for development application (DA) purposes. For DA purposes the user should use the Print Report function to obtain a list of DA triggers. The map generated has been prepared with due care based on the best available information at the time of publication. The State of Queensland holds no responsibility for any errors, inconsistencies or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties.

Legend

Drawn Polygon Layer


Override 1

Cadastre (50k)


Cadastre (50k)

Wetland protection area trigger area

Wetland protection area trigger area

Wetland protection area wetland


Wetland protection area wetland

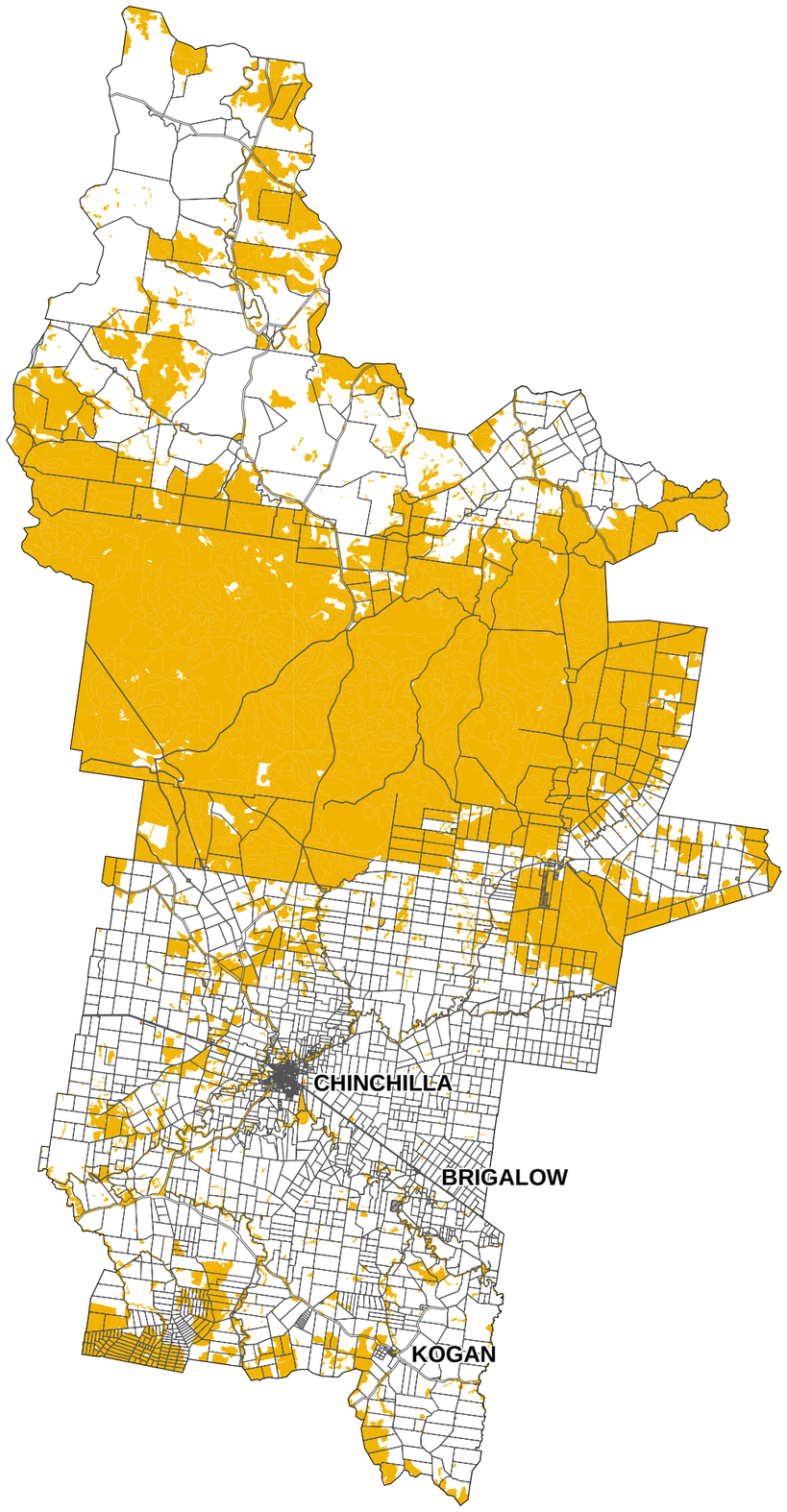
DA Mapping System – Print Screen

Queensland Government

Department of Infrastructure, Local Government and Planning

Date: 01/06/2017

ATTACHMENT 7 – Features Map 2 – Biodiversity Planning Assessment



Campbell Higginson Town Planning

Disclaimer:

Legend:

Shire Features

- Bidiversity Planning Assessment

N

0 15 30

kilometres

1:700,000

Amendments:

CHINCHILLA SHIRE COUNCIL PLANNING SCHEME LAND CHARACTERISTICS MAP

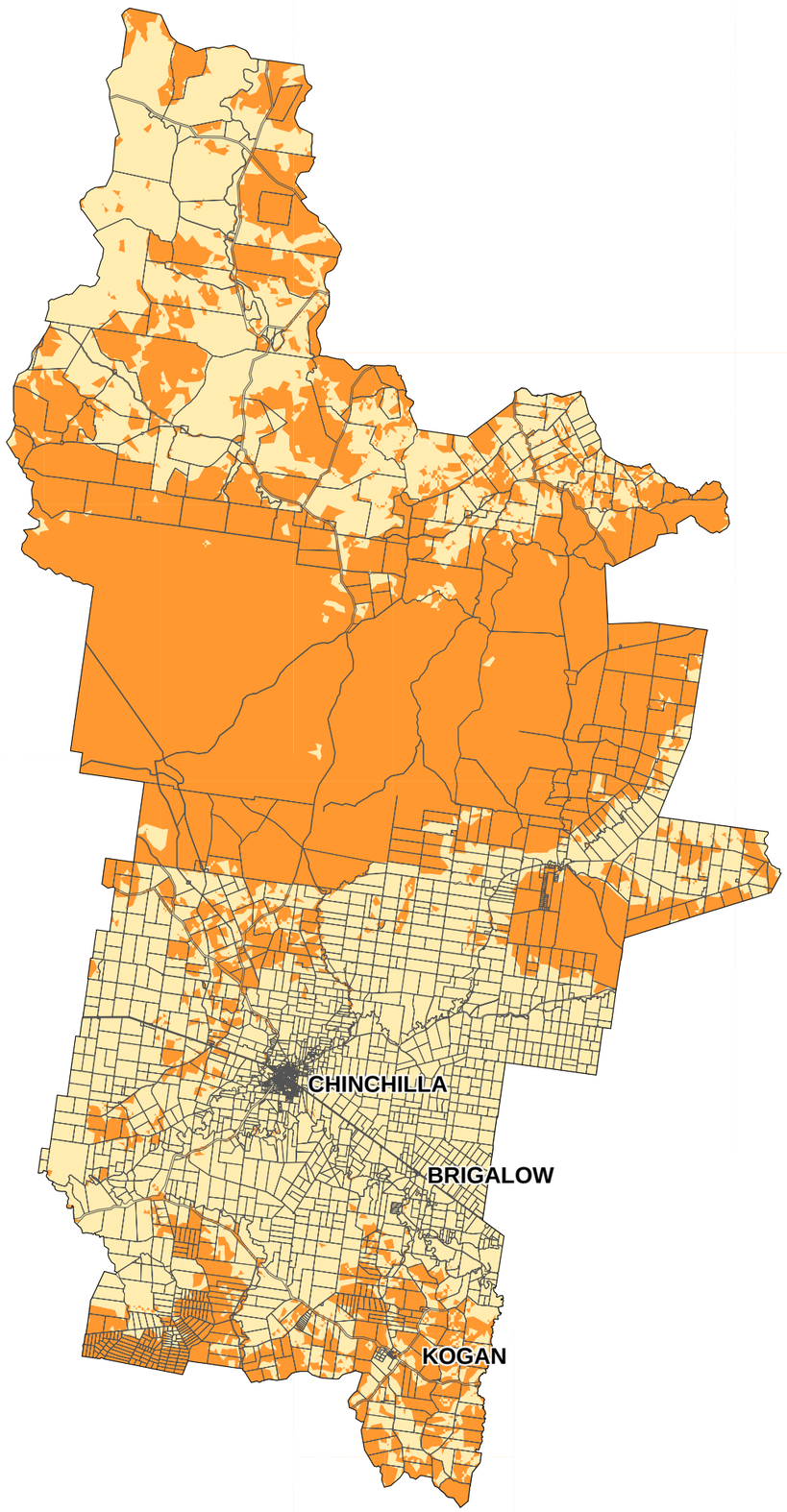
- FEATURES MAP 2 -

CHINCHILLA SHIRE LOCAL GOVERNMENT AREA

Drawn by: **S.G.K.**	Drawing No:
Date: **19 - 09 - 05**	**SHEET 6 OF 7**
Ref: **W623_190905**	

Effective: 30 June 2006

ATTACHMENT 8 – Bushfire Hazards Map



Campbell Higginson Town Planning

Disclaimer:

Legend:

BUSHFIRE HAZARD AREAS

- Low Hazard
- Medium Hazard
- High Hazard

N

0 15 30

kilometres

1:700,000

Amendments:

CHINCHILLA SHIRE COUNCIL PLANNING SCHEME LAND CHARACTERISTICS MAP

- BUSHFIRE HAZARD AREAS-

CHINCHILLA SHIRE LOCAL GOVERNMENT AREA

Drawn by: **S.L.B.**	Drawing No:
Date: **19 - 03 - 04**	**SHEET 4 OF 7**
Ref: **W398_070802**	

Effective: 30 June 2006

ATTACHMENT 9 - CVs

Bruce McLennan

Professional summary

Bruce is an experienced ecologist with over 10 years working on a range of projects in Queensland and Northern NSW. The last six years have been focussed on professional support to the major gasfields, mining and commercial projects in a number of capacities with a skills focus around the botanical sciences. Bruce has significant experience undertaking pre-clearance vegetation surveys and mapping regional ecosystems. Having worked as a Vegetation Planning Officer with Greening Australia for a number of years, Bruce has a wide knowledge of property planning, vegetation management and rehabilitation techniques at a property scale. Bruce has particular experience in environmental offsets. Bruce was an integral member of the offsets team at Amec Foster Wheeler, playing a key role in landholder engagement, ground-truthing offset sites including BioCondition assessments and preparing offset management plans and costings.

Education

Bachelor of Business, Rural Management, University of Queensland, Gatton, Queensland, Australia,
Master of Sustainability Science, University of Southern Queensland, Toowoomba, Queensland, Australia,

Relevant training and endorsements

Vegetation Structure Training – Queensland Herbarium
Regional Ecosystem Training – O2 Ecology
BioCondition Assessment Training – Queensland Herbarium
Grass Identification training – Greening Australia
Native seed collection training – Florabank
Working With Wildlife – Catch and relocate venomous snakes for regional areas
RTD2313A Clean machinery of plant, animal and soil material
RTD2312A Inspect machinery for plant, animal and soil material
DotE approved suitable ecologist for APLNG terrestrial ecology surveys (Individual 31/03/2011)
DotE approved suitable ecologist for QCLNG terrestrial ecology surveys (Unidel 2011)
Mining Supervisor (S123) training – OHSA
CPB Phase 1 Project Induction (March 2016)
Generic 11 Coal Mine Induction
Coal Board Medical
Senior First Aid and CPR
MC Class Drivers Licence
Operate and Maintain 4WD RIIVEH305E
Construction blue card
Aurizon TLIF2080C Safely access the rail corridor
Aurizon TLIW2001A Operate under track protection rules
Fauna handling training – Geckoes Wildlife
Approved NSW BioBanking, BioCertification & Framework for Biodiversity Assessment Assessor (December 2015) (Assessor number: 189)
Member of EIANZ
Basic level competency with Arc Map and MapInfo
Competent in field data collection with Trimble, Leica and Garmin GPS products.
AHCMOM211A – side by side safety certificate
Energy Industry Skills Pass

Employment history

2016 to Present | Arcadian Ecology | Senior Ecologist
2013 to 2016 | Amec Foster Wheeler | Senior Environmental Scientist (Unidel was purchased by AMEC in mid-2013)
2010 to 2013 | Unidel | Senior Environmental Scientist
2010 | Unidel | Land Access Consultant
2009 to 2010 | Greening Australia Queensland | Bunya Biolink Implementation Manager
2008 to 2009 | Greening Australia Queensland | Regional Supervisor Vegetation and Business (West Region)
2007 to 2008 | Greening Australia Queensland | Vegetation Planning Officer (West Region)
2003 to 2007 | Toowoomba Landscape Supplies | Customer relations, estimates and quotes, manufacturing
2002 to 2003 | Westbank Feedlot | Yardman
2001 to 2002 | Queensland Department of Primary Industries | Landholder Liaison and Group Coordinator
2000 to 2001 | Conservation Farmers Inc | Field Services Officer
1985 to 2001 | Broad-acre farming enterprise, Wallumbilla, Queensland | Owner/Manager

Publications

Andrew Somervaille and Bruce McLennan, "2nd Fallow Weed Management Handbook", Toowoomba, 2003.
Bruce McLennan, "Cooyar Creek Riparian Management Project – Community Update", Cooyar, 2009

Website

www.arcadianecology.com.au

Representative and recent projects

Unitywater - Redcliffe Sewage Treatment Plant Rehabilitation Project.
Red Sands Ecology, Queensland, Australia, 2017
Bruce completed the flora assessment and protected plants survey for the ocean outfall corridor. Tasks completed included reporting on the accuracy of regional ecosystem mapping, completed threatened flora surveys and recording of native and exotic flora species on site.

Pembroke Resources – Terrestrial Ecology Surveys
Resource Strategies, Queensland, Australia, 2016 -2017
Bruce led the flora assessment for the terrestrial ecology component of the Olive Downs South and Willunga Environmental Impact Study. Works completed to date include a desktop assessment of vegetation mapping, threatened ecological communities, threatened flora species and weed infestations. The first phase of field assessments involving regional ecosystem and threatened ecological communities across 125 quaternary and tertiary sites is complete along with preliminary field data on threatened species and weeds.

Australia Pacific LNG Project – Soils and Weeds Surveys
CPB Contractors, Queensland, Australia, 2016
Bruce assisted in collecting soil data and samples, weeds data and watercourse crossings data across the APLNG construction footprint on many properties in the Orana North, Orana South and Spring Gully development areas. This data is used to inform the soil amelioration report as well as the site sediment and erosion control management plan. The collection of data on weed species listed under national and state legislation is used to inform pre-construction control teams and contribute to reporting conditions

Australia Pacific LNG Project – Peat Soils and Weeds Surveys
Australia Pacific LNG, Queensland, Australia, 2016
Bruce assisted in collecting weed data, watercourse crossings data, soil data and samples for flow lines, access routes and well pads for the APLNG construction footprint on a number of private properties north east of Wandoan. This data is used to inform the soil amelioration report as well as the site sediment and erosion control management plan. The collection of data on weed species listed under national and state legislation is used to inform pre-construction control teams and contribute to reporting conditions.

North Maclean EPBC Offsets
28 South Environmental, Queensland, Australia, 2016
Bruce has provided technical input to offset requirements for a development proposal at North Maclean including running EPBC offset calculations. Bruce has located a number of potential offset sites for the federally listed Koala, Swift parrot and Grey-headed flying fox within the Wivenhoe Valley area and initiated contact with a number of landholders, arranged property inspections and prepared high level costings for the potential offset sites.

Australia Pacific LNG Project – Wybara and Moorabinda Weeds Surveys
Australia Pacific LNG, Queensland, Australia, 2016
Bruce assisted in the collection of weeds and waterway crossing data across Phase 2 gasfields works on Wybara property and Exploration and Assessments early works on Moorabinda near Origin Energy's Spring Gully and Eurombah Creek gas projects.

Central Highlands Regional Council – Water Pipeline Survey and TEC Evaluations
28 South Environmental, Queensland, Australia, 2016
Bruce provided technical advice and field survey expertise on flora species and vegetation communities along a 22km water pipeline route from Emerald to a proposed development site. Bruce also provided advice and field survey sufficient to allow the delineation of threatened ecological community (Brigalow EPBC listing) units within a broader polygon of mapped endangered vegetation under the Qld Vegetation Management Act.

Eugene Street – Vegetation Assessment
28 South Environmental, Queensland, Australia, 2016
Bruce conducted an assessment of vegetation extent and quality on a planned private development site at Bellbird Park, in the Ipswich City Council area in south east Queensland. Key considerations were the accuracy of regulated vegetation mapping, the presence of MNES and/or EVNT species, habitat quality and any other conservation values on the site. The client was provided with a vegetation report and plant species list for the area.

Keperra Quarry – Vegetation Assessment
28 South Environmental, Queensland, Australia, 2016

Bruce conducted a vegetation assessment on Keperra Quarry in Brisbane for a private developer. An assessment of the extent and health of mapped regulated vegetation, assessment of weed infestations and a species list were provided to the client.

Central Highlands Regional Council – Regional Ecosystem Map Change
28 South Environmental, Queensland, Australia, 2016
Bruce provided technical advice on threatened ecological communities and field surveyed across three properties to define vegetation mapping units at a property scale. Bruce prepared sufficient site assessment documents using the Queensland Herbarium's Map Modification Kit to allow the remapping of vegetation on the properties.

Terranora Interconnector Fire Management System – Vegetation Assessment
APA Group, Sydney, New South Wales, Australia, 2016
Bruce conducted a weed and vegetation quality assessment on APA's power asset at Mullumbimby, NSW. The purpose of the assessment was to identify impacts to plant communities, the presence of MNES and vegetation listed under the NSW TSC Act.

Bowen Gas Pipeline and Bowen Gas Project – Environmental Offsets
Arrow Energy Pty Ltd, 2015
Bruce was part of the Amec Foster Wheeler team which developed the offset strategy for the Bowen Gas Project in Central Queensland. Bruce's contribution included assessment of MNES impacts and input into the Offsets Strategy report. Subsequent to this Bruce was involved in the assessment of suitable properties within the vicinity of the project that would allow the offsetting of Brigalow, SEVT and Natural Grasslands Threatened Ecological Communities as well as a number of identified MNES and MSES which included threatened flora and fauna, wetlands, regional ecosystems and riparian vegetation. Bruce made initial contact with potential landholders and arranged field visits on properties from Nebo west to Gemfields and south to Rolleston. Bruce conducted field visits where landholders were introduced to the offset concept and preliminary property assessments were made where vegetation allowed suitable offset opportunity. Subsequent to field visits Bruce shortlisted suitable properties and developed high level costings and high level vegetation management plans for each offset property and contributed to a final report for the client.

Woolgoolga To Ballina Pacific Highway Upgrade - Threatened Rainforest Communities And Rainforest Plants Management Plan
NSW Roads and Maritime Services, New South Wales, Australia, 2015
Bruce reviewed and updated sections of various threatened species management plans and threatened plant community management plans for the Byron Bay to Ballina Pacific Highway upgrade project.

Central Queensland Offset Monitoring
Greening Australia Queensland, Brisbane, 2015
Bruce provided photo monitoring and condition reporting for offset sites on five properties at Nebo, Mt Coolon, Hibernia and Dingo in Central Queensland. Bruce also provided advice to the offset manager on grazing, weeds and general site condition.

Abermain to Karrabin Power line upgrades – VMR
Energex, Queensland, Australia 2015
Bruce provided ecological advice on this upgrade in the North Ipswich area which included an assessment and advice on weed species in the corridor and an assessment of vulnerable plant species and native wildlife habitat. Bruce provided input into the VMR report.

Mount Isa Mines – Biodiversity Study (Wet Season)
Glencore - Mount Isa Mines, Queensland Australia 2015
Bruce led the flora team survey effort in which 40 BioCondition sites, within the Mount Isa Mines ML8058, were surveyed for species composition, canopy covers and heights, weediness and general site condition to provide baseline and comparative data for ongoing monitoring of biodiversity within the lease.

Walton Coal Project – Environmental Offsets Advice
Aquila Resources, Queensland, Australia, 2015
Bruce contributed to the high level environmental offsets advice for the Walton development near Dingo and was responsible for assessing likely offset requirements, locating suitable rural properties for offset locations and providing a high level costing.

Wiggins Island Balloon Loop (WIBL) Offsets.
Aurizon, Queensland, Australia, 2012-2015
Bruce played a significant role in delivery of vegetation offset requirements for the WIBL development near Gladstone. Bruce has assisted in the identification of suitable offset sites to meet the project's requirements through a combination of desktop analysis and ground-truthing. Bruce was responsible for engaging with landholders and assessing the suitability of potential offset sites in the field. Bruce completed vegetation surveys to confirm regional ecosystems, completed BioCondition assessments and identified key management requirements and overall offset suitability. Bruce completed the first monitoring assessment of the site on behalf of Greening Australia (offset manager) in July 2015 and provided sufficient reporting to satisfy client and regulatory requirements.

Wiggins Island Coal Export Terminal (WICET) environmental offsets monitoring.
Greening Australia Queensland, Queensland, Australia 2013-2015
Bruce led the monitoring program for the WICET offset which involved the annual recording of data from a number of sites at the offset location near Bororen south of Gladstone. Disciplines involved include BioCondition assessments, photo monitoring and a

range of landholder liaison issues including fire and firebreak management, weed control measures, fencing and repair, grazing management, feral animal control and erosion control. Bruce also completed final reporting for the client and regulator.

Ergon Energy environmental offsets monitoring,
Greening Australia Queensland, Queensland, Australia 2013-2015
Bruce led the monitoring program for the Ergon offset which has involved the annual recording of data from a number of sites at the offset location near Bororen south of Gladstone. Disciplines included BioCondition assessments, photo monitoring and a range of landholder liaison issues including fire and firebreak management, weed control measures, fencing and repair, grazing management, feral animal control and erosion control. Bruce provided field data and information sufficient to allow the client to prepare the required reporting for the regulator.

Gladstone Area Water Board (GAWB) environmental offsets monitoring,
Greening Australia Queensland, Queensland, Australia 2015
Bruce led the GAWB monitoring program which involved the annual recording of data from two separate offset areas near Bororen south of Gladstone. Disciplines included BioCondition assessments, photo monitoring and a range of landholder liaison issues including fire and firebreak management, weed control measures, fencing and repair, grazing management, feral animal control and erosion control. Bruce provided information sufficient to allow the client to prepare the required final reporting for the regulator to allow remapping of the offset.

Australia Pacific LNG Project – Gasfields Pre-Clearance Ecological Surveys
Australia Pacific LNG, Queensland, Australia, 2011-2015
Bruce filled a team lead and mentoring role in the pre-clearance ecological surveys for gas fields infrastructure in the Injune, Miles, Condamine and Chinchilla area involving ground truthing of regional ecosystems, identifying and recording MNES constraints such as TECs, flora and fauna species, potential habitat sites, weed species distribution and abundance, assessment of referable wetlands and ordered streams, general site data including current land use and disturbances. Bruce also contributed to and reviewed final reporting.

Mount Isa Mines – Biodiversity Study (Dry Season)
Glencore - Mount Isa Mines, Queensland Australia 2014
Bruce led the flora team survey effort in which 40 BioCondition sites, within the Mount Isa Mines ML8058, were surveyed for species composition, canopy covers and heights, weediness and general site condition to provide baseline data for ongoing monitoring of biodiversity within the lease.

Southern Georgina Basin Exploration Program - Preclearance Surveys for Exploration Wells and Access
Central Petroleum, Queensland, Australia, 2014
Bruce completed ecology surveys for a number of proposed well sites in the Simpson Desert west of Bedourie and Boulia including access track environmental clearances. Involved in the surveys was the ground truthing of regional ecosystems, habitat assessment, survey for MNES and MSES, wetland and ordered stream impacts, record flora and fauna species.

Camp Cable Road Deviation Powerline Upgrade – Potholing VMR
Energex, Queensland, Australia, 2014
Bruce provided ecological input to a vegetation management report on a pre-construction potholing program in the Camp Cable Road area at Jimboomba to assess effects on vegetation and habitat.

Camp Cable Road Deviation Ecological Assessment – Powerline Upgrade
Energex, Queensland, Australia, 2014
Bruce completed an ecological survey through koala habitat on the Jimboomba to Loganlea Energex powerline upgrade. The survey involved ground truthing of regional ecosystems, collection of BioCondition data in remnant communities, quantifying koala habitat trees, assessing koala habitat quality, surveying for MNES and EVNT flora and fauna, weed assessment and fauna habitat.

Undullah Offset Assessment and Management Plan
Energex, Queensland, Australia, 2014
Bruce completed a survey of the Energex property 'Undullah' at Undullah, south east of Ipswich to advise on suitability as an advance offset for Koala habitat and other ofsettable powerline impacts. The survey involved BioCondition assessments of regrowth vegetation, detailed weed survey, botanical survey and feral animal impact survey. Bruce has also prepared a draft management plan for Undullah which includes a rehabilitation plan, fire management and weed management plan.

Surat Gas Project – EPBC Act Offsets Plan
Arrow Energy Pty Ltd, 2014
Bruce provided high level costing advice and contributed to the offset strategy for the Surat Gas development in southern Queensland. Bruce helped identify a number of suitable offset properties via GIS desktopping and developed costing models for Brigalow, Natural Grasslands and Semi Evergreen Thicket Threatened Ecological Communities as well as a number of EPBC listed fauna species.

Mt Margaret Mine – Purple-Necked Rock Wallaby offset
Xstrata Copper, Queensland, Australia 2013

Bruce provided field advice on regional ecosystems and habitat suitability for Purple Necked Rock Wallabies on an Xstrata owned property to the north of Mount Isa. The survey involved the location and spatial identification of areas of suitable habitat as well as the survey of detailed baseline BioCondition transects. Bruce provided technical input into the final offset size and location.

Rolleston Coal Mine Expansion Offsets
Glencore/Xstrata Coal, Rolleston, Queensland, Australia, 2013
Bruce's role in delivery of offsets for this project entailed surveying proposed offset sites in proximity to Rolleston including assessing the presence and BioCondition of offset values such as the natural grassland threatened ecological community, brigalow threatened ecological community and semi-evergreen vine thicket threatened ecological community. Bruce also prepared three offset management plans to identify the required management actions and associated timeframes, monitoring requirements, identification of key risks and how they would be mitigated. Bruce also liaised with on-ground contractors and Xstrata Coal to prepare costings for the implementation of the management plans including on-going monitoring and reporting.

Australia Pacific LNG Project – Spring Gully Pond C ecology surveys
Georgiou Group, Queensland, Australia, 2013
Bruce led the pre-clearance ecological survey for production and RO water (Pond C) at Durham Downs North East of Roma in the Spring Gully area. The survey involved assessment of MNES and MSES as well as habitat, watercourses and weeds.

Australia Pacific LNG Project – Analogue Site Vegetation Surveys
Australia Pacific LNG, Queensland, Australia, 2012-2013
Bruce led the field survey of 150 analogue vegetation sites for benchmarking APLNG project impacts for assessing rehabilitation effort. The sites were surveyed in accordance with the Queensland Herbarium Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Sites were selected from an area bounded by Millmerran, Injune, Dululu and Gladstone. Bruce's role included:

- Identifying best on offer analogue sites using desktop information and GIS for the required regional ecosystems
- Arranging land access including contacting landholders and gaining their agreement for entry
- Field trip preparation including safety assessments and documentation, setting up GPS and field sheets etc.
- Completing ecosystem community assessments in the field
- Writing up results of the site assessments.

Queensland Curtis LNG – Land Access
Queensland Gas Company, Queensland, Australia, 2013
In late 2013 at the completion phase of the mainline to Gladstone Bruce provided land access for landholders in the Mt Alma to the Narrows section of the pipeline during construction as well as monitoring rehabilitation works on the southern collection header near Chinchilla and the Wolleebee Creek pipeline west of Wandoan. Tasks included meeting with landholders with construction grievances, monitoring the right of way during work for breaches of access agreements and providing a landholder liaison during inspections of works by government departments.

Santos Gasfields Decommissioning Ecological Assessments
Santos, Queensland, Australia, 2013
Bruce completed ecological surveys of infrastructure footprints planned for decommissioning in the Wallumbilla area: involving ground truthing regional ecosystems, identifying MNES including threatened vegetation communities and plant species, identifying habitat with potential for fauna species and identifying current usage and weed pest incursions. Bruce contributed to final reporting requirements.

Queensland Curtis LNG – Pre-clearance Surveys
Queensland Gas Company, Queensland, Australia, 2010-2012
Bruce conducted ecological surveys which included export pipelines, well locations and other supporting infrastructure for QGC. Surveys included identification and mapping locations of Threatened Ecological Communities (TEC); Ecologically Sensitive Areas; Endangered, Vulnerable and Near Threatened flora species and likely habitat; MNES, Essential Habitat features for flora and fauna; field verification of High Value Regrowth for TECs, waterways and wetlands; flora and fauna pests; wildlife corridors and regional ecosystems. Bruce has provided all reporting of surveyed areas.

Wiggins Island Balloon Loop Preclearance Survey
Aurizon, Queensland, Australia, 2012
Bruce conducted a field survey to allow the widening of parts of the existing rail corridor which involved regional ecosystem ground truthing and identification of impacts to habitat and EVNT flora species. Bruce provided input to reporting.

Australia Pacific LNG Project – Detailed Environmental Infield Surveys (DEIS)
Australia Pacific LNG, Queensland, Australia, 2011-2012
Bruce was a team leader on the DEIS for the Condabri Lateral, Wandoan to Gladstone Mainline, Woleebee Lateral, Western Pipeline and Spring Gully to Fairview Pipeline involving regional ecosystem identification and recording of structural characteristics, identification of MNES constraints, identification and quantification of EVNT plant species, identification of habitat features, identification of wetland and watercourse constraints, identification of weed issues, detailed species lists, and a number of other features such as disturbance, erosion, current land use etc. from Condamine to The Narrows north of Gladstone and from Wandoan west to Reedy Creek (Yuleba) and north to Santos' Fairview gasfields.

Australia Pacific LNG Project – Environmental Offsets (APLNG Project)

Australia Pacific LNG, Queensland, Australia, 2011-2012
Bruce was involved in the field assessments of potential offset sites suitable to allow offsetting of the vegetation and habitat impacts of the APLNG project in two phases over 2011 and 2012. The areas covered were from Hannaford in the south to Monto in the north and Durong in the east to Injune in the west. The assessments involved landholder discussions and field verification of regrowth values followed by preparation of detailed site reports, costing of the offsets and recommendations to the client.

Australia Pacific LNG Project – Route Alignment Walks (RAW) Survey
Australia Pacific LNG, Queensland, Australia, 2011
Bruce provided in field environmental advice on critical constraints to construction during the RAW survey in the planning stages of the Condabri Lateral and Wandoan to Gladstone Mainlines in the area stretching from Miles to east of Biloela. In this rapid assessment process critical tasks involved the identification of MNES such as Threatened Environmental Communities, identification of EVNT plant species and identification of habitat likely to contain EVNT fauna species.

Australia Pacific LNG Project – Environmental Offsets (Origin owned properties)
Australia Pacific LNG, Queensland, Australia, 2011
Bruce conducted rapid field assessments of the offset potential of Origin owned properties in the Chinchilla, Miles, Yuleba and Injune districts involving regional ecosystem identification of regrowth vegetation, calculation of useable areas and preparation of property reports to the client.

Australia Pacific LNG Project – Environmental Offsets (Spring Gully BioCondition Survey)
Australia Pacific LNG, Queensland, Australia, 2011
Bruce led the team which completed BioCondition surveys of the Origin owned "Scott's Creek" property in the Injune district involving the recording of 21 regrowth vegetation sites in Brigalow and SEVT regrowth and 6 reference sites on surrounding properties.

Queensland Curtis LNG – Land Access
Queensland Gas Company, Queensland, Australia, 2010
Bruce was part of the QGC Land Access team based at Windibri and Kenya south of Chinchilla for six months. Bruce was responsible for negotiating land access agreements with landholders as well as organising survey parties for proposed infrastructure footprints. This area of operation extended from Wandoan south to Condamine and east to Broadwater near Dalby

Origin Energy – Spring Gully Biodiversity Offset Potentials Survey
Origin Energy, Queensland, Australia, 2009
Bruce was part of a Greening Australia team which conducted surveys of Brigalow and SEVT regrowth on the Origin owned Spring Gully and Scott's Creek properties in the Injune district. Assessments involved regional ecosystem identification, measurement of structural characteristics and preparation of a report and recommendations on perceived offset potential in the lead up to the release of the Qld Biodiversity Offset Policy.

GAQ Rural – Vegetation Management Consultancy
Greening Australia Queensland, Queensland, Australia, 2007-2009
Bruce provided and oversaw a range of land management projects aimed at helping landholders comply with the Queensland Vegetation Management Act 1999 and VMOLA 2004 while at the same time enabling them to run their rural businesses in line with best management practices. Bruce was involved in a number of initiatives from preparing and presenting workshops on the VMA, providing PMAV (Property Map of Assessable Vegetation) services to landholders, completing map change applications, delineation of regional ecosystems and management advice to landholders.

Bunya Biolink – Cooyar Creek Riparian Zone Rehabilitation
Caring For Our Country, Commonwealth of Australia, 2008-2009
Bruce project managed the on-ground component of this Greening Australia project in the headwaters of the Brisbane River catchment. Key tasks involved initial community engagement with ongoing update meetings, full financial planning and disbursement of commonwealth funding, oversight of work program, organisation of project inputs, and input into reporting and financial reconciliation. A significant portion of the project involved the on-ground management of a weed control program and subsequent rehabilitation effort which involved replanting with locally provenanced canopy species.

Condamine Priority Wetlands Project
Condamine Alliance, Queensland, Australia, 2009
Bruce managed this project which involved rehabilitation and protection works on five significant wetlands in the Condamine Catchment. Key tasks involved initial desktop analysis of identified priority wetlands, landholder engagement in the planning phase, funding disbursement, oversight of works and final reporting.

Kings Creek Riparian Protection Project
Condamine Alliance, Queensland, Australia, 2008
Under a Greening Australia contract with Condamine Alliance Bruce managed this rehabilitation project in the headwaters of Kings Creek at Upper Pilton. Key tasks involved initial site selection and landholder engagement, contract negotiations, funding disbursement, oversight of on-ground works and ongoing reporting.

Longswamp Wetlands Project
Condamine Alliance, Queensland, Australia, 2008

Bruce was involved in the management of this fencing and rehabilitation project south west of Dalby. Key tasks included disbursement of funding, oversight of on-ground works, landholder engagement, landholder education and final project reporting.

Mitchell Taylor (Senior Ecologist)

Professional Summary

Mitchell is a senior ecologist with over twelve years consulting experience in Queensland and New South Wales. He has worked on a range of projects across many industry sectors including mining and extractive industries, coal seam gas, eco-tourism, rail, road and water infrastructure, strategic, industrial and urban development for private, public and government clients. The scale of these has ranged from small single lot developments through to the country's most significant mining, industrial and residential developments.

Mitchell has managed teams undertaking broad and specific ecological assessments for the mining sector, authoring ecological impact assessment reports and liaising directly with Commonwealth, State and Local government agencies on a range of projects. Mitchell has undertaken many applications under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) as well as the various principal Queensland environmental legislations and approval requirements.

Mitchell has provided a wide range of services to clients covering many aspects of ecological management. Through his experience, Mitchell understands the practical application of ecology and the need to identify and liaise directly with clients to achieve a sound scientific outcome whilst incorporating the ultimate goal of the project. Mitchell's ability to thing laterally and pragmatically to address ecological constraints and management issues.

Education

Bachelor of Environmental Science, Australian Catholic University, North Sydney, Australia.

Memberships/Affiliations/Permits/Licenses

NSW Rural Fire Service.
Queensland Environmental Law Association.
Scientific Purposes Permit (QLD).
Animal Ethics Permit (QLD).
Wildlife Rehabilitation Permit (QLD).

Employment history

2015 to present | 28 South Environmental | Senior Ecologist.
2011 to 2015 | Amec Foster Wheeler | Senior Ecologist.
2007 to 2011 | PLACE Design Group | Senior Ecologist / Environmental Scientist.
2005 to 2007 | Cumberland Ecology | Ecologist.

Recent representative projects

Mitchell is a Senior Ecologist with 28 South Environmental. In this role he is responsible for project management, as well as coordinating applied ecological studies servicing Commonwealth, State and Local Government Regulatory Approvals for the energy, mineral, infrastructure, industrial and urban development sectors.

Petrie Mill Redevelopment – Ecological and Environmental Assessments and Approvals
Moreton Bay Regional Council, Australia 2016 - Ongoing
Mitchell conducted detailed Koala and Botanical surveys over the broader Petrie Mill site and co-authored the projects EPBC Controlled Action referral. During this project, Mitchell spatially mapped out the Sites vegetation communities and koala habitat areas with reference to the Koala State Planning Regulator Provisions (Division 9 mapping amendment). These works were a critical component in addressing the proposed impacts to koala and other MNES/MSES and identifying the potential opportunities surrounding the Sites development and offset carrying capacity.

Emerald Industrial Precinct Investigations – Ecological Assessment and PMAV
Central Highlands Regional Council, Queensland, Australia 2016-2017
Mitchell conducted detailed site investigations over a number large rural allotments to determine each site's environmental constraints and opportunities for strategic industrial developments critical to the economic growth of the CHRC LGA. Surveys involved the ground-truthing of on-ground ecological and environmental constraints and opportunities. Our work lead to a significant reduction in constraints and identified greater opportunities to consolidate development areas avoid fragmented and disassociated development.

Warner Structure Plan – Ecological Assessment and Strategic Structure Planning
AUSBUILD Development Corporation, Queensland, Australia 2015-2017
Mitchell undertook detailed on-ground ecological assessment surveys to spatially map vegetation communities and fauna habitats across large areas within the suburb of Warner. Results from these surveys and mapping provided the basis for the development of a strategic structure planning exercise over these lands to ensure ecological and environmental matters were considered and incorporated into the structure plans design. This structure planning exercise also involved collaboratively working with a range of other design disciplines and MBRC to establish the most logical plan over these lands.

Birkdale Relocatable Home Park – Flying Fox Management Plan and Implementation
Gateway Lifestyle Pty Ltd, Queensland, Australia 2016-2017
Mitchell worked closely with his internal colleagues, Redlands City Council and the Department of Environment and Heritage Protection to assess potential impacts that may arise from the construction and establishment of a relocatable home park adjoining a flying fox camp in Birkdale, Queensland. Mitchell and the 28 South team successfully developed and implemented a flying fox management plan which saw the construction of the park without significant impacts to the flying fox camp. Surveys remain on-going and will spatially map the camps extent over the course of a year to identify movements and core camp locations over the course of inhabitation of the park.

Mt Margret Mine – Purple-Necked Rock Wallaby offset
Xstrata Copper, Queensland, Australia 2012-2013
Mitchell undertook detail ecological equivalence surveys to identify suitable habitats for the purple-necked rock wallaby within ML5058 and other adjacent MLs to the north. Data obtained from these surveys was

spatially reviewed and synthesized into preferential habitat mapping for the purple-necked rock wallaby and subsequently into an approved offsets program.

Selwyn Mining Lease Microbat Management
Ivanhoe Cloncurry Mines, Queensland, Australia, May 2011
Proposed re-engagement of discontinued mining declines within the Selwyn mining lease. During previous surveys Mitchell identified that significant population of microbat species were inhabitation mining declines which are proposed for re-engagement works, including threatened species. Together with Ivanhoe Cloncurry Mines staff Mitchell co-authored a microbat management plan to allow the re-engagement works to be conducted after the passive relocation of the microbat populations inhabiting the mining declines. This included the tracking of 12 individual microbats to observe the movement and confirm the re-location roost sites.

Moranbah Gas Project - Ecological and Environmental Approval Surveys
Arrow Energy, Queensland, Australia 2013-2014
Mitchell conducting ecological and environmental approval surveys over the four tenements which are being focused on during this project. He conducted these assessments with a focus on their two and three dimension seismic surveys and pilot wells. Further, Mitch has looked at all legacy wells on these four development areas as well as all other arrow sites in the Bowen basin except their Baralaba site.

Mt Isa Open Pit – Ecological Gap Analysis
Xstrata Mt Isa Mines, Queensland, Australia 2012
Mitchell oversaw the development of a detailed ecological gap analysis for Xstrata MIM which provided an overview of the effort and adequacy of historical ecological surveys completed within Site (ML5058). This analysis was undertaken with a view to identifying potential long-lead ecological surveys that may be required for the Environmental Impact Statement (EIS) for the MIOP Project and provide advice on the most appropriate direction forward to achieve an approval through the EIS process from an ecological perspective.

Selwyn Mining Leases Ecological Impact Assessments
Ivanhoe Cloncurry Mines, Queensland, Australia, 2010 - 2011
Established and proposed underground/open cut gold and copper mining activities in the Selwyn Ranges, North Western Queensland (southern extent of the Mt Isa Inlier/Northern extent of Mitchell Grass Downs bioregions). Mitchell oversaw detailed flora and fauna surveys of all Ivanhoe Cloncurry Mines mining leases. These investigations provided the client with detailed mapping of all vegetation and habitat types present within each mining lease. Mitchell managed a number of ecological teams as well as leading the detailed fauna assessment and habitat mapping of 20 mining leases. This work provided Ivanhoe Cloncurry Mines with a detailed and geo-referenced constraint mapping tool to implement within their Environmental Management Plan going forward.

Surat and Bowen gas fields
APLNG/Origin, Queensland, Australia, 2011 - Present
Mitchell carried out pre-clearance and ecological surveys for Origin Energy. These surveys involved surveying and reporting on a broad range of environmental constraints for the APLNG Project. Areas covered include identification and locations of Threatened Ecological Communities (TEC); Ecologically Sensitive Areas; Endangered, Vulnerable and Near Threatened flora species and likely habitats; Essential Habitat features for flora and fauna; field verification of High Value Regrowth for TECs, waterways and wetlands; weeds and pests; wildlife corridors and regional ecosystems. All field information has been

collected using Trimble GeoExplorers with corrected capabilities.

Surat Basin gas fields
QGC, Queensland, Australia, 2011 - Present
Mitchell undertook various gas pipeline projects, extensive flora and fauna surveys within the Surat and Bowen Basins gas fields. These flora and fauna surveys included identification of species listed in both the *Nature Conservation Act* (NC Act) and *Environment Protection and Biodiversity Act* 1999 (EPBC Act) (2011-2012).

Byerwen Coal Mine EIS
QCOAL, Queensland, Australia, April – November 2011
Proposed open cut and underground coal mining activity located in the Bowen basin south of Collinsville, Queensland. Mitchell conducted detailed fauna assessments utilizing a wide variety of trapping and habitat assessment techniques which provided field data for the EIS process as well as authoring the terrestrial fauna component of the report.

Curragh Coal Mine - Blackwater Creek Diversion Project
Westfarmers, Queensland, Australia, 2009
Established open cut coal mine near Blackwater Queensland, 10 kilometer diversion of Blackwater Creek. Mitchell was responsible for assisting in background research and co-authoring the Blackwater Creek Diversion Rehabilitation Management Plan to allow the expansion of the current mining operations. He was involved in ongoing monitoring of the rehabilitation works and compliance with the approved Rehabilitation Management Plan.

Wandoan Coal Project EIS
Xstrata, Queensland, Australia, 2007
Proposed open cut coal mining activity located in the area surround the township of Wandoan, Queensland. Mitchell conducted detailed fauna assessments utilizing a wide variety trapping and habitat assessment techniques which provided field data for the EIS process.

ATTACHMENT 10 – Botanical Site Assessments

21 3.
22 4.
20.8.
22.5

12.7.
15
14
7

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. 319 01 Recorder: B. M'Kenzie. Day/Date: 23-5-17

Purpose Remap - Remnant to Non-Rem

Locality: (inc. distance/direction to nearest town)

GPS: 56 0271776 7019783 GDA 94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D.M.S.V)
E		-	
T1	21	19 - 23	25
T2	13.5	8 - 15	5
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height)

woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D.	E. woollsiana
T2	D	A. harpophylla
S1	D	A. harpophylla
	S	C. parviflora

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain.

Soils: clay with light gilgai

Field observation and notes: Grassy and open. - all native grasses

Landzone: 4

RE code changes

Existing RE code: 11.4.3

Proposed RE code: non-rem.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Brig Q2 Recorder: B. Wilson MH Taylor Day/Date: 23-5-17

Purpose Remap - Remnant to non-Rem

Locality: (inc. distance/direction to nearest town)

GPS: 56 0271658 7019788 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	20	18 - 22	15.
T2	11	9 - 14	5%
T3		-	
S1	4.5	4 - 5	20%
S2		-	
G		-	

Structural formation: (including height)

Sparse woodland 20m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. woollsiana
T2	D.	A harpophylla.
S1	D	A. harpophylla.
	A.	Apophyllum anomalum
T2	A.	A melvillei

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain

Soils: Clay soils with light gilgai relief

Field observation and notes: Large open spaces - grass cover 20-40%.

Landzone: 4

RE code changes

Existing RE code: 11.4.3

Proposed RE code: Non-remnant

END

14 - 21 T1
(19)
1 - 4 S1
(25)

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box QL Recorder: B. McKenna / M Taylor Day/Date: 23-5-17

Purpose determination of status

Locality: (inc. distance/direction to nearest town)

GPS: 56 0272981 7019592 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D.M.S.V)
E		-	
T1	19	14 - 21	40
T2	8	6 - 10	5
T3		-	
S1	25	1 - 4	25
S2		-	
G		-	

Structural formation: (including height) Woodland to 21 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. woollsiana.
T2	D	E. woollsiana
	A	A. leichmannii
S1	D	E. mitchelli
	S	G. parviflora
	S	D. viscosa
	A	P. eucalyptofolia
	A	Atalaya angustifolia
T1	A	E. populnea

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain

Soils: Sandy topped clay soils

Field observation and notes: Regrowth - advanced

Landzone: 5

RE code changes

Existing RE code: non - rem.

Proposed RE code: 11.5.20.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box 82 Recorder: B. McKenna / M. Taylor Day/Date: 23-5-17.

Purpose Determine vegetation status

Locality: (inc. distance/direction to nearest town)

GPS: 56 0272841 7019565 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	18	16 - 22	25
T2	8	7 - 10	10
T3		-	
S1		1 - 4	30
S2		-	
G		-	

Structural formation: (including height)

~~open~~ woodland to 22m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E woollsiana
T2	D	E mitchellii
	S	E woollsiana
S1	D	D. viscosa.
	A	G. parviflora
T2	A	A leuhmannii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain.

Soils: Sandy topped clay soils – cracking

Field observation and notes: Sparser advanced regrowth community

Landzone: 5

RE code changes

Existing RE code: Non-Reg.

Proposed RE code: 11.5.20.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box 93 Recorder: B. McKenna / M Taylor Day/Date: 23-5-17

Purpose verification of veg + fauna

Locality: (inc. distance/direction to nearest town)

GPS: 55 0272793 7019468 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	15	12 - 17	30
T2	8	6 - 10	10
T3		-	
S1	2	1 - 3.5	25
S2		-	
G		-	

Structural formation: (including height) Woodland to 17 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	C	E. woollsiana.
	C	E. populnea.
T2	~~D~~	A. leichmannii
	S	E. melliodora
S1	D	D. viscosa.
	S	E. melliodora
	A	C. glauca.
	A	G. parviflora

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain

Soils: Sandy topped clay

Field observation and notes: advanced regrowth - ecotone between 11.5.1 and 11.5.20 Landzone: 5.

RE code changes

Existing RE code: Non-remnant

Proposed RE code: 11.5.1a / 11.5.20

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No: Box 04 Recorder: B. McKernan / M. Taylor Day/Date: 25-5-17

Purpose verification of re mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 | 0272916 | 7018868 | D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E	24	20 - 27	15
T1	14	12 - 18	30
T2	9	7 - 12	55
T3		-	
S1	3	1 - 4	10
S2		-	
G		-	

Structural formation: (including height) Woodland to 16m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
E	D	E. woollsiana.
T1	C	E populnea.
	C	E woollsiana
	S	C glaucophylla
T2	D	A. leuhmannii
	S	C. glaucophylla
	A	A tetragx
S1	D	A leuhmannii
	S	C glaucophylla
	A	G parviflora

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Duplex - sandy top - Plain

Soils:

Field observation and notes:

Landzone: 5

RE code changes

Existing RE code: 11.5.1 / 11.5.1a / 11.5.29

Proposed RE code: 11.5.1a.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box 05 Recorder: B. McKenna / M. Taylor Day/Date: 23-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0272832 7018949 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	16	10 - 20	25
T2	8	6 - 10	25
T3		-	
S1	2.5	1 - 3	30
S2		-	
G		-	

Structural formation: (including height) Woodland: to 22 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. woollsiana
	A	E. populnea
T2	C	E. woollsiana
	C	A. leichhardtii
	S	C. glaucophylla
	S	E. populnea
S1	D	C. glaucophylla
	S	G. parviflora
	S	A. leichhardtii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain

Soils: clay soil with sandy top

Field observation and notes: old clearing with advanced regrowth

Landzone: 5.

RE code changes

Existing RE code: Non-Ref

Proposed RE code: 11.5.20 - meets remnant criteria (?)

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box 06 Recorder: B McLennan / M. Taylor Day/Date: 23-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0272692 7018910 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	13	10 - 14	15.
T2	7	6 - 10	15.
T3		-	
S1	2	1 - 25	25
S2		-	
G		-	

Structural formation: (including height)
Woodland to 15m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E woollsiana
T2	D.	E woollsiana
	C	A. lehmannii
	S	C glaucophylla
S.	D.	D. viscosa
	S	E. ant dell.
	A	G parviflora

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain

Soils: Sandy topped duplex clay (ironstone nodules)

Field observation and notes: old regrowth - not as advanced as other non-rem regrowth

Landzone: 5.

RE code changes

Existing RE code: non-rem

Proposed RE code: non-rem / boundline 11.5.20.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. ROK 47 Recorder: B. McKenna / M. Taylor Day/Date: 23-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0272547 7018892 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	7	6 - 10	30
T2		-	
T3		-	
S1	1.5	0.5 - 3	20
S2		-	
G		-	

Structural formation: (including height)

Low woodland to 10m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	A leichhardtii
	A	E. woollsiana
	A	C glaucophylla
S1	D	D. virgata
	S	C. glaucophylla

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Sandy topped clay.

Field observation and notes: old regrowth - v. patchy

Landzone:

RE code changes

Existing RE code: non-remnant

Proposed RE code: non-remnant

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. BOX 06 Recorder: B. McKenna / M. Taylor Day/Date: 23/5/17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 | 0272841 | 7019161 | D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	16	12 - 22	15-20
T2	7	6 - 12	60
T3		-	
S1	2	1 - 3.5	5-10
S2		-	
G		-	

Structural formation: (including height)

woodland - to 22 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; **c** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E woollsiana
	A	E. populnea.
T2	D	A. harpophylla
	A	C. glaucophylla.
S1	D	G. parviflora
	A	C. glaucophylla
	A	P. Jacksonii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Sandy topped clay

Field observation and notes: possible historical disturbance to Eucalyptus Component but has good structure Landzone:

RE code changes

Existing RE code: 11.5.20 / 11.5.1 / 11.5.1a

Proposed RE code: 11.5.20.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No: BOT 09 Recorder: B. McKenna / M. Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0274442 7020473 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	16	12 - 18	20-
T2	9	7 - 12	10-60
T3		-	
S1	1.5	1 - 3	20
S2		-	
G		-	

Structural formation: (including height) woodland to 18m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
	S	E. woollsiana
	A	E. dichroclada
T2	D	A. leichhardtii
	A	C. glaucophylla
S1	C	A. ixiophylla
	A	C. parviflora
	C	A. leichhardtii
	A	A. spectabilis
T1	A	C. glaucophylla

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Sandy topped duplex clay – Plain gently undulating

Soils:

Field observation and notes: Patchy sb canopy varying from dense uniform stand to scattered trees under dominant eucalypt woodland Landzone: 5

RE code changes

Existing RE code: 11.5.20 / 11.5.1a / 11.5.1

Proposed RE code: 11.5.1a

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box Q10 Recorder: B. McLennan / M Taylor Day/Date: 24-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0273925 7020738 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	15.	13 - 17	15.
T2	9	7 - 10	50
T3		-	
S1	1.5.	1 - 2	<5%
S2		-	
G		-	

Structural formation: (including height)
Woodland to

Ecologically dominant layer: T2

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
T2	D	A. pulchmanii
	A	E. populnea
	A	C. glaucophylla
S1	A	Myoporum acuminatum
	A	G. parviflora

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently inclined plain

Soils: Sandy topped duplex clay.

Field observation and notes: old treated country with non mature E. populnea possibly 50-70yrs old throughout

Landzone: 5.

RE code changes

Existing RE code: Non Rem

Proposed RE code: 11.5.1a

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No: Box 01 Recorder: B McLennan / M Taylor Day/Date: 24-5-17

Purpose: Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0273926 7020560 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	13	11 - 15	10-15
T2	8	6 - 9	50
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height)
woodland to 15m

Ecologically dominant layer: T2

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – co-dominant; **s** - subdominant, *a* – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E populnea
T2	D	A lehmannii
S1	C	A leiana
	C	Acacia decora
	C	G parvifolia

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently inclined plain

Soils: Sandy topped duplex clay

Field observation and notes: old regrowth / remnant - Pop bor has been removed many years ago and regrowth

Landzone: 3

RE code changes

Existing RE code: 11.5.20 / 11.5.1a / 11.5.1

Proposed RE code: 11.5.1a

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box Q12 Recorder: B. McLennan / M. Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0273928 7020220 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	15	12 - 17	30
T2	8	6 - 9	40
T3		-	
S1	1.5	1 - 2.5	5
S2		-	
G		-	

Structural formation: (including height) Woodland to 17m.

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; **c** – co-dominant; **s** - subdominant, ***a*** – associated

Str.	Rel. dom.	Scientific Name
T1	D	E populnea
T2	D	A leichhardtii
S1	D	G parvifolia
T1	A	Acacia sp

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Sandy topped duplex clay - gently inclined plain

Soils:

Field observation and notes: mostly young E. populnea

Landzone: 5

RE code changes

Existing RE code: 11.5.20 / 11.5.1a / 11.5.1

Proposed RE code: 11.5.1a

END

20m

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. BOX Q13 Recorder: B. McKenzie / M. Taylor Day/Date: 24-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56J 0274257 7020106 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	18	15 - 20	30
T2	7.5	6 - 9	25.
T3		-	
S1	2	1 - 3.5	5.
S2		-	
G		-	

Structural formation: (including height)

Woodland to 20m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. woollsiana
	A	E. populnea
T2	D	A. leichhardtii
S1	A	G. parviflora
	A	Myoporum accuminatum
	A	E. woollsiana

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently sloping plain

Soils: sandy toppled clay duplex.

Field observation and notes:

Landzone: 5

RE code changes

Existing RE code: 11.5.20 / 11.5.1a / 11.5.1

Proposed RE code: 11.5.20.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. 30x 014 Recorder: B. McKenna / M Taylor Day/Date: 24-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0274409 7702179 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	21	16 - 25	40
T2	8	6 - 10	20
T3		-	
S1	2	1 - 3	5
S2		-	
G		-	

Structural formation: (including height)

woodland to 25 m.

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. woollsiana
T2	D	A. leichhardtii
	A	E. populnea
	S	E. woollsiana
S1	A	G. parviflora
		A. leichhardtii
		E. woollsiana.

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently inclined plane.

Soils: Clay soil with thin veneer of surface sand

Field observation and notes: Canopy trees coppiced indicating old disturbance (fire or clearing)

Landzone: 5.

RE code changes

Existing RE code: 11.5.20 / 11.5.1a / 11.5.1

Proposed RE code: 11.5.20

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box QLS Recorder: B. McKernan / M. Taylor Day/Date: 24-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 | 0272206 | 7020316 | D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	14	11 - 16	30
T2	8	6 - 9	50
T3		-	
S1	1	1 - 2	<5%
S2		-	
G		-	

Structural formation: (including height) woodland to 16 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
T2	D	A. leichhardtii
S1	d	M. acuminata

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently inclined plain

Soils: sandy lopped clay duplex.

Field observation and notes:

Landzone: 5.

RE code changes

Existing RE code: 11.5.20 / 11.5.1a / 11.5.1

Proposed RE code: 11.5.1a

END

12.6
12.5
17

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No: BOXQ16 Recorder: B. McKenna / M. Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0273868 7019174 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	13	10 - 17	15-25
T2	8	6 - 10	15
T3		-	
S1	2	1 - 3	15
S2		-	
G		-	

Structural formation: (including height) Woodland (open) to 17m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	C	E. bopulnea
	C	E. crebra
	A	E. woollsiana
T2	D	A. leuhmannii
	A	C. glaucophylla
S1	D	A. leuhmannii
	A	Acacia rhodophylla
		A. cretsa
		E. mitchellii
		C. glaucophylla

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently inclined plain

Soils: Sandy surface - clay duplex

Field observation and notes: Patchy - old recovering vegetation parts approaching remnant status

Landzone: 5

RE code changes

Existing RE code: 11.5.20 /11.5.1/11.5.1a/

Proposed RE code: 11.5.1

END

13.5
13.8

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box Q17 Recorder: B. McKenna / M Taylor Day/Date: 24-5-17.

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0273831 7018943 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	13	10 - 14	25-30
T2	8	7 - 10	30
T3		-	
S1	2	1 - 3	15
S2		-	
G		-	

Structural formation: (including height)

Woodland to 14 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – co-dominant; **s** - subdominant, *a* – associated.

Str.	Rel. dom.	Scientific Name
T1	C	E crebra
	C	E populnea
T2	D	A. leuhmannii
	A	C. glaucophylla.
	A	E. crebra.
	A	S. lanceolatum
S1	A.	A leuhmannii
		D. viscosa
		C. glaucophylla
		A leiocalyx

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: Plain

Soils: Sandy topped clay Duplex

Field observation and notes: Signs of old and recent (fire perhaps) disturbance recovering community - wider patch is not uniform in condition

Landzone: 5

RE code changes

Existing RE code: 11.5.1 - 11.5.1

Proposed RE code: 11.5.1 possibly exceeds min benchmark -

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box Q18 Recorder: B McKenna / M. Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 | 0274180 | 7019272 | D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	16	14 - 18	10
T2	8	6 - 9	5
T3		-	
S1	2.5	1 - 3	60
S2		-	
G		-	

Structural formation: (including height)
Open woodland to 18 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
T2	C	C. glaucophylla
	C	A. peuhmannii
S1	D	D. viscosa
	A	C. parviflora
		E. mitchelliana

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: sandy surface over clay soils

Soils: plain gently inclined

Field observation and notes: Sparse canopy - very poor subcanopy - dense shrub layer

Landzone: 5

RE code changes

Existing RE code: non-rem

Proposed RE code: non-rem.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No: Box 819 Recorder: B. McKenna / M. Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0274665 7019195 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D.M.S.V)
E		-	
T1	20	17 - 22	35-45
T2	8	7 - 10	10
T3		-	
S1	2.5	1 - 3.5	45
S2		-	
G		-	

Structural formation: (including height) Woodland to 22 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E woollsiana
	S	E. populnea
	S	A leiocarpa
T2	C	E. woollsiana
	C	A leichmannii
	C	E populnea
	C	Callitris endlicheri
S1	D	A sixraphylla
	A	Melaleuca decora.
	A	M. viridiflora

'S A leichmannii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: plain sloping to SE

Soils: Sandy / clay Duplex

Field observation and notes: Appears to have been understrubbed up to 20 yrs ago - dense acacia understory Landzone: 5

RE code changes

Existing RE code: non-rem.

Proposed RE code: 11.5.20.

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No: BOX 020 Recorder: B. McLean / M. Taylor Day/Date: 24-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 | 0279790 | 7018927 | D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	12	9 - 14	30
T2	8	5 - 9	15
T3		-	
S1	2.5	1 - 3	35
S2		-	
G		-	

Structural formation: (including height) Woodland to 16 m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
	A	A. leiocarpa
	A	C. glaucophylla
T2	C	E. populnea
	A	C. glaucophylla.
	S	Acacia crassa
	A	A. leuhmannii
S1	D	A. leuh.mannii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: plain - gentle slope to SE

Soils: fine sandy topped - clay Duplex

Field observation and notes: Area has been undescrubbed last 10-15 yrs with windrows still evident

Landzone: 5.

RE code changes

Existing RE code: Non - rem

Proposed RE code: potentially 11.5.1a

END

185
197

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Box 021 Recorder: B. McLennan / M. Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0275541 7018857 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	18	13 - 20	20
T2	10	7 - 13	30
T3		-	
S1	2.5	1 - 4	30
S2		-	
G		-	

Structural formation: (including height) Woodland to 20m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
T2	D	E. populnea
	S	Acacia excelsa
S1	D	D. viscosa
	A	A. leiocalyx
	S	A. excelsa

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: fine sand layer over clays / Duplex

Field observation and notes: Scattered larger E pop with mostly young denser regrowth

Landzone:

RE code changes

Existing RE code: non-rem

Proposed RE code: borderline 11.5.1a

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. BOX 012 Recorder: B. McLenna / M Taylor Day/Date: 24-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 0275456 7019134 D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	14	12 - 16	30-35
T2	9	7 - 12	20
T3		-	
S1	2	1 - 3	10
S2		-	
G		-	

Structural formation: (including height) Woodland to 16m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – co-dominant; *s* - subdominant, *a* – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E. populnea
T2	C	A. leichhardtii
	S	C. glaucophylla
	S	E. populnea
S1	C	A. kempeana
		D. viscosa
		P. angustifolium

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: plain gently sloping E/SE

Soils: loamy top over clay

Field observation and notes: old cleared area with advanced regrowth

Landzone: 5

RE code changes

Existing RE code: NEW REM

Proposed RE code: –

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Jack | Recorder: B McKernan | Day/Date: 25-5-17

Purpose: Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS coordinates: Zone 56 E 0272893 N 7017861 D GDA 94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D.M.S.V)
E		-	<5%
T1		-	
T2		-	
T3		-	
S1	4 5	3 - 5	90
S2		-	
G		-	

Structural formation: (including height)

Shrubland – non-rem

Ecologically dominant layer:

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***s*** – subdominant, ***a*** - associated

Str.	Rel. dom.	Scientific Name
E		E crebra
		A leiocarpa
S1	~~D~~ C	Acacia leiocalyx
	C	A crassa

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: plain

Soils: sandy soils - large pebble to 30mm

Field observation and notes: Dense regrowth wattle on cleared land – Occasional retained/regrown Candy

Landzone: 5

RE code changes

Existing RE code: non-rem

Proposed RE code: non-rem

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. 1 & 2 Recorder: B. McKennan / M. Taylor Day/Date: 25-5-17

Purpose Verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS coordinates: Zone 56 E 0271782 N 7017938 DGDA 94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	19	12 - 22	40
T2	10	6 - 12	30
T3		-	
S1	1	0.5 - 1.5	5
S2		-	
G		-	

Structural formation: (including height)

Woodland to 22m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – codominant; *s* – subdominant, *a* - associated.

Str.	Rel. dom.	Scientific Name
T1	D	E crebra / elecans
	A	C glaucophylla
T2	D	G glaucophylla
	A	A. leuhmannii
S1	D	A. leuhmannii
		A. leiocalyx
		A. deanii
		A crassa
T1	A	E populnea

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: mid slope - Gentle

Soils: Skeletal Sandy loam - ironstone pebble

Field observation and notes: remnant community has species more characteristic of L2.7 Community – suggest 11.7.6 may be better fit. Landzone: 5

RE code changes

Existing RE code: 11.5.1a / 11.5.1 / 11.5.20

Proposed RE code: 11.5.1

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. QUARRY Recorder: B. McLennan Day/Date: 25-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS coordinates: Zone 56 E 0272354 N 7017304 DGDA 94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	20	-	
T2		-	
T3		-	
S1	4	1 - 5	30
S2		-	
G		-	

Structural formation: (including height)

non-rem

Ecologically dominant layer:

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***s*** – subdominant, ***a*** - associated.

Str.	Rel. dom.	Scientific Name
T1	D	E crebra (scattered retained trees only)
S1	D	E crassa - dense to sparse

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: crest

Soils: latensed soils - skeletal - high iron nodule content over sandstone

Field observation and notes: highly disturbed quarry & rubbish dumping

Landzone: 5/7

RE code changes

Existing RE code: non-rem

Proposed RE code: non-rem

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. IRON Q3 Recorder: B. McKennan / M. Taylor Day/Date: 25-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS coordinates: Zone 56 E 0272319 N 7017969 DGDA 94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	18	12 - 20	45
T2	8	6 - 12	30
T3		-	
S1	2	1 - 4	10
S2		-	
G		-	

Structural formation: (including height)

woodland to 20m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; ***s*** – subdominant, ***a*** - associated.

Str.	Rel. dom.	Scientific Name
T1	C	E. crebra
	C	E woollsiana
	A	C. glaucophylla
T2	C	A leuhmannii
	C	C. glaucophylla
S1	D	A leiocalyx
	A	A. crassa
	S	A leuhmannii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: mid slope / upper slope V. Gentle

Soils: sandy topped clay loam

Field observation and notes: possibly more like 427 as per IRON Q2

Landzone: 5

RE code changes

Existing RE code: 11.5.1a / 11.5.1 / 11.5.20

Proposed RE code: 11.5.1

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. check 2 Recorder: B. McLennan Day/Date: 25-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS coordinates: Zone 56 E 0272870 N 7018304 D GDA 94

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D.M.S.V)
E		-	
T1	35	1 - 4	10
T2		-	
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height)

Cleared.

Ecologically dominant layer:

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; *c* – codominant; *s* – subdominant, *a* - associated.

Str.	Rel. dom.	Scientific Name
T1	D	Callitris hadleyana

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform:

Soils: Sandy - Rocky Duplex

Field observation and notes: Cleared paddock with scattered regrowth Cypress pine.

Landzone: 5

RE code changes

Existing RE code: non-rem

Proposed RE code: non-rem

END

A 3.3 Sheet D – Regional Ecosystem type assessment site

Location

Site No. Iron RJ Recorder: B McLennan / M Taylor Day/Date: 26-5-17

Purpose verification of RE mapping

Locality: (inc. distance/direction to nearest town)

GPS: 56 | 0274489 | 7019215 . D

Vegetation structure

Median height of the EDL is to be measured

Stratum	Median height	Height interval	Est. cover density (D,M,S,V)
E		-	
T1	15	12 - 16	45
T2	8	6 - 9	5
T3		-	
S1		-	
S2		-	
G		-	

Structural formation: (including height)
Woodland to open forest to 16m

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – co-dominant; **s** - subdominant, ***a*** – associated.

Str.	Rel. dom.	Scientific Name
T1	D	E fibrosa subsp nubila
T2	A	Callitris glaucophylla
	A	A. leichhardtii

Geology, landform, soils

Geology map/scale/year:

Geology code and rock types:

Land system:

Landform: gently inclined plain

Soils: Sandy topped clay - probable Duplex

Field observation and notes: Intermediate age vegetation - possibly original clearing dates from rest of property. Very small patch. Landzone: 5/7

RE code changes

Existing RE code: 11.5.20/11.5.1/11.5.1a

Proposed RE code: 11.7.7

END

ATTACHMENT 11 – Fauna Species Of Conservation Significance Assessment

Common Name	Scientific Name	Likelihood of Occurrence	Potential for Impacts
AVAIN SPECIES			
Australasian Bittern	*Botaurus poiciloptilus*	Marginal habitat for this species occurs in lower clay plains; however, these areas are heavily impacted by historical clearing and grazing. The distribution of this species does not overlap the Brigalow TEC (DotEE 2017e).	**Unlikely.** The proposed development will result in impacts to a small area of clay plain which forms only marginal temporal potential foraging habitat for this species which is highly abundant in the immediate and broader locality.
Red Goshawk	*Erythrotriorchis radiatus*	While the Site supports habitats broadly analogous with those occupied by the red goshawk (refer Department of Environment and Resource Management 2012) p. 7-10), there are no known records from this immediate locality.	**Unlikely.** The proposed development unlikely to impact this species as it is unlikely to occur within the Site.
Squatter Pigeon (southern)	*Geophaps scripta scripta*	While the Site supports habitat broadly analogous with those occupied by the squatter pigeon, these habitats are abundant within the locality (refer DotEE 2017n), No further assessment required.	**Unlikely.** The proposed development unlikely to impact this species as it is unlikely to occur within the Site.
Painted Honeyeater	*Grantiella picta*	The wooded communities provide habitats which are generally considered to provide periodical foraging habitat; however, only minimal levels of mistletoe was observed during field survey limiting available foraging resources for this species.	**Unlikely.** The proposed development will not have a significant impact on potential foraging habitat for this species. Further, all areas of remnant vegetation will be retained providing a similar level of potential foraging habitat for this species should it move through the Site.
Swift Parrot	*Lathamus discolor*	The Site is broadly within the known range of this species, however contains only minor elements of winter foraging resources, particularly compared to lower alluvial plains in the region or east of the Great Dividing Range.	**Unlikely.** The proposed development will retain as many potential foraging resources as possible (namely remnant vegetation).
Australian Painted Snipe	*Rostratula australis*	The Site supports cleared grassed areas which may periodically hold water during wetter periods of the Year. These lower areas within the Site are not considered to be consistent with suitable habitat for this species, particularly not suited to breeding habitat (refer Department of the Environment 2017s).	**Unlikely.** The proposed development will not remove any suitable habitat for this species.
Fork-tailed Swift	*Apus pacificus*	A widespread (almost exclusively aerial) species which occurs over a wide range of habitats (including urban areas) (DotEE 2017b). This species is considered a likely occurrence at the Site.	**Unlikely.** This species is wide ranging and highly mobile. It readily forages above urban areas and it is considered that development of the Site is unlikely to impact this species.
Oriental Cuckoo	*Cuculus optatus*	The oriental cuckoo is generally associated with rainforest margins, monsoon forest, vine scrub, riverine thickets, wetter densely canopied eucalypt forest, paperbark swamp and mangroves (Morcombe, 2013). No suitable habitat occurs within the Site.	**Unlikely.** The proposed development will not remove any suitable habitat for this species.
White-throated Needletail	*Hirundapus caudacutus*	A widespread (almost exclusively aerial) species which occurs over a wide range of habitats (DotEE 2017n). This species is considered a likely occurrence at the Site.	**Unlikely.** This species is wide ranging and highly mobile. It readily forages above urban areas and it is considered that development of the Site is unlikely to impact this species.
Yellow Wagtail	*Motacilla flava*	This species is generally restricted to coastal areas with populations known from central Australia. The Site does not provide suitable habitat and is likely outside of its core range.	**Unlikely.** The proposed development will not remove any suitable breeding or core habitat for this species.
Satin Flycatcher	*Myiagra cyanoleuca*	The Site provides broadly suitable migratory habitat for this species; however, no core breeding habitat is present.	**Unlikely.** The proposed development will not remove any suitable breeding or core habitat for this species.

Common Name	Scientific Name	Likelihood of Occurrence	Potential for Impacts
Rufous Fantail	*Rhipidura rufifrons*	The Site provides broadly suitable migratory habitat for this species; however, no core breeding habitat is present.	**Unlikely.** It is likely this forages and moves through denser habitat along the riparian habitats. It may also move through denser habitats within remnant vegetation; however, it is unlikely this species will be impacted by the development, particularly as the layout retains remnant vegetation.
Latham's Snipe	*Gallinago hardwickii*	The lower open grassy flood plains in the north-west of the Site form marginal potential foraging habitat for this species (refer DotEE 2017l), and this species is considered a possible occurrence.	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
Osprey	*Pandion haliaetus*	Similar to the white-bellied sea-eagle, this species may overfly the Site; however, is not likely to rely on the Site given its association with riverine and estuarine environments.	**Unlikely.** The proposed development will not remove any suitable habitat for this species.
Great Egret	*Ardea modesta*	The lower open grassy flood plains in the north-west of the Site form potential foraging habitat for this species. With reference to DotEE 2017d, this area provides potentially suitable habitat for the great egret. The remainder of the Site does not provide significant habitat.	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
Cattle Egret	*Ardea ibis*	The lower open grassy flood plains in the south-east of the Site form potential foraging habitat for this species. With reference to DotEE 2017c, this area provides potentially suitable habitat for the great egret. The remainder of the Site does not provide significant habitat.	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Similar to the osprey, this species may overfly the Site; however, is not likely to rely on the Site given its association with riverine and estuarine environments.	**Unlikely.** The proposed development will not remove any suitable habitat for this species.
Rainbow Bee-eater	*Merops ornatus*	A widespread species which occupies a broad range of habitats, including open forest and woodlands, shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It usually occurs in open, lightly-timbered areas that are often (but not always) located in close proximity to permanent water (DotEE 2017q). The Site's habitats are broadly suitable for this species; in particular lower drainage areas.	**Unlikely.** It is considered unlikely that the proposed development will: destroy or isolate any important habitat; result in the establishment of an invasive species in important habitat; or seriously disrupt the lifecycle of an ecologically significant proportion of the species' population.
Common Sandpiper	*Actitis hypoleucos*	This species is associated with muddy edges to wetland and flood plains. Dam areas and clay plains in the north-west of the Site support marginal potential foraging habitat for this species	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
Sharp-tailed Sandpiper	*Calidris acuminata*	This species is associated with muddy edges to wetland and flood plains. Dam areas and clay plains in the north-west of the Site support marginal potential foraging habitat for this species	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
Curlew Sandpiper	*Calidris ferruginea*	Although generally occurring within estuarine environments, records of this species from inland areas around wetlands, bores, permanent lakes and waterholes (DotEE 2017f). Dam areas and clay plains in the	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.

Common Name	Scientific Name	Likelihood of Occurrence	Potential for Impacts
		north-west of the Site support marginal potential foraging habitat for this species.	
Pectoral Sandpiper	*Calidris melanotos*		**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
Painted Snipe	*Rostratula benghalensis*	The lower open grassy clay plains in the north-west of the Site form potential foraging habitat for this species (DotEE 2017s), and this species is considered a possible occurrence.	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality.
Magpie Goose	*Anseranas semipalmata*	Small dam areas within the Site and clay plain areas in the north west of the Site form potential foraging habitat for this species during times of flood. With reference to Morcombe, 2013, this area provides potentially suitable habitat for the magpie goose. The remainder of the Site does not provide significant habitat.	**Unlikely.** Potential flood plain habitats similar to the those in the north-west of the Site are highly abundant in the locality and provide only marginal habitat during periods of flood.
FISH			
Murray Cod	*Maccullochella peelii*	No riverine environments are present within the Site.	**Unlikely.** The proposed development will not remove any suitable habitat for this species.
INSECTS & OTHER			
Brigalow Woodland Snail	*Adclarkia cameroni*	The Site does not support suitable Brigalow or Coolihah-black box woodlands habitats on the Condamine River floodplain. The historical clearing of the majority of the Site, particularly the lower clay plains has significant impacted any potential habitat for this species.	**Unlikely.** Potential flood plain habitats similar to the those in the north-west of the Site are highly abundant in the locality and provide only marginal habitat for this species is generally restricted to higher quality habitats with suitable woody debris for refuge.
Dulacca Woodland Snail	*Adclarkia dulacca*	The Site supports potential habitat for this species; however, is restricted to those areas where suitable woody debris is present for refuge such as those remnant areas, particularly in the south of the Site. The Site also occurs outside of the known range of existing populations (miles-dulacca and south to Meandarra).	**Unlikely.** Although potential habitat occurs in remnant areas of the Site, it is unlikely this species occurs within the Site. Further, the proposed development will not impact suitable habitat for this species.
Pale Imperial Hairstreak	*Jalmenus eubulus*	This species is known to inhabit old growth Brigalow dominated forests which do not occur within the Site. Brigalow habitats within the Site occur as sparse regrowth communities.	**Unlikely.** There is no suitable habitat for this species within the Site. The Brigalow communities occur as sparse low regrowth and are too significantly impacted and isolated to support this species.
MAMMALS			
Large-eared Pied Bat, Large Pied Bat	*Chalinolobus dwyeri*	The Site in on Canozoic and clay geologies and detailed survey of the Site and examination of all vegetated areas surrounding the Site failed to locate cave habitat. Nor is such habitat known from areas surrounding the Site. The occurrence of this species on the Site as a vagrant cannot be discounted, but it apparent that significant habitat does not occur. No further assessment is required.	**Unlikely.** The proposed development footprint will not remove any suitable habitat for this species.
Northern Quoll	*Dasyurus hallucatus*	The Site is located to the south of the known range of this species (refer DotEE 2017g), and considered a highly unlikely occurrence. No further assessment is required.	**Unlikely.** The proposed development will not remove any suitable habitat for this species.
South-eastern	*Nyctophilus corbeni*	This species occurs in a variety of habitats within the western slopes of the Great	**Unlikely.** The proposed development will only result in low levels of clearing of vegetated areas.

Common Name	Scientific Name	Likelihood of Occurrence	Potential for Impacts
Long-eared Bat		Dividing Range, particularly box/ironbark/cypress-pine communities (DotEE, 2017r). The vegetation communities found within the Site are unlikely to be of significance to this species; however, the presence of hollow bearing trees and the complex vegetative strata in the southern remnants is likely to provide habitat for these species. These resources are common within the immediate locality and within the Site.	Those remnant areas which are likely to provided habitat for this species will not be impacted and are not severed from other areas of similar habitat to the south or east. Further, retaining regenerating vegetation around these remnants is likely to improve habitat for this species.
Greater Glider	*Petauroides Volans*	Habitat for this species occurs within the Site; however due to historical clearing events and fragmented isolated parcels of remnant vegetation suitable habitat is restricted to the southern areas of Remnant. Eyre, 2002 suggests greater glider populations in Queensland require at least 2-4 live den trees for every 2ha of suitable forest habitat. This further restricts suitable habitat to the southern remnants.	**Unlikely.** No potential habitat will be impacted.
Koala	*Phascolarctos cinereus*	Suitable habitat occurs at the Site for koala. Koala are likely to be present in the locality; however, it is likely that they occur at low densities. The proposed development will result in the removal of small areas of suitable movement and foraging habitats.	**Unlikely**. The proposed development will result in minor impacts to suitable foraging and movement resources; however, koalas are unlikely to be significantly impacted by the proposed impacts which are considered to be minor. Koala movement will be slightly impeded however, the retention of canopy trees along fence lines will provide koalas with movement opportunities.
Grey-headed Flying-fox	*Pteropus poliocephalus*	Marginal foraging habitat occurs at the Site, and no records of the grey-headed flying have been noted in desktop searches. No camps were observed during survey efforts. This species may potentially forage in the locality during its lifecycle; however, only on rare occasion. No further assessment is required	**Unlikely.** The proposed development will result in the removal of marginal foraging habitat.
REPTILES			
Five-clawed worm-skink	*Anomalopus mackayi*	The Site occurs within the broader potential range of this species; however, the Site does not support any of the vegetation communities considered to be associated with this species as defined within the SRPAT for this species (refer DotEE 2017a)	**Unlikely.** The proposed development will result in a small areas of cleared cracking clay habitat being cleared for the establishment of solar arrays and access tracks; however, the this area has been heavily impacted through historical clearing and grazing and remains highly abundance in the immediate and boarder locality. No records of this species have been noted in the locality despite the significant recent ecological survey efforts for other major infrastructure projects.
Collared Delma	*Delma torquata*	Minimal rocky outcropping or woody debris and deep leaf litter is present within the Site. No areas supporting exposed parent rock were noted within the Site.	**Unlikely**. No suitable habitat is present for this species within the Site.
Yakka Skink	*Egernia rugose*	This species occurs within a wide variety of habitats types. Much of the vegetation communities within the site support minimal suitable denning habitats due to the lack of hollow logs and rocky substrates. The clay plains within the Site occur in cleared paddocks with minimal microhabitat features for denning. Remnant areas in the South of Site support higher quality habitat for this species and a highly likelihood of occurrence.	**Unlikely.** The proposed development will not remove any suitable habitat for this species.

Common Name	Scientific Name	Likelihood of Occurrence	Potential for Impacts
Dunmall's Snake	*Furina dunmalli*	This species is known to be more heavily associated with lower back alluvial cracking clay and clay loams dominated by Brigalow, wattles and native cypress or bull-oak communities. Other habitats it has been associated within include open forests and woodland associations on sandstone derived soils or harder ironstone habitats. The clay plains within the Site have suffered from historical clearing and on-going management measures. They support minimal microhabitats that provide diurnal refuge.	**Unlikely.** The proposed development will only result in minor impact to potential foraging habitat for this species which is highly abundant in this immediate and broader locality. No records of this species occur from the locality.

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