

**GIN GIN BATTERY ENERGY STORAGE  
SYSTEM (BESS) AND TRANSMISSION  
PROJECT**

Ecological Assessment Report

**FINAL**

December 2024



# GIN GIN BATTERY ENERGY STORAGE SYSTEM (BESS) AND TRANSMISSION PROJECT

Ecological Assessment Report

## FINAL

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

Project Director: David Gatfield  
Project Manager: Gina Whittle  
Report No.: 31628/R04  
Date: December 2024



This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

### **Acknowledgement of Country**

*Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.*

### **Disclaimer**

This document has been prepared for the sole use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Umwelt (Australia) Pty Ltd (Umwelt). No other party should rely on this document without the prior written consent of Umwelt.

Umwelt undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. Umwelt assumes no liability to a third party for any inaccuracies in or omissions to that information. Where this document indicates that information has been provided by third parties, Umwelt has made no independent verification of this information except as expressly stated.

### **©Umwelt (Australia) Pty Ltd**

#### **Document Status**

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	Gina Whittle	04/12/2024	David Gatfield	10/12/2024
V2	Gina Whittle	16/12/2024	David Gatfield	16/12/2024

# Abbreviations

Abbreviations	Descriptions
AHD	Australian Height Datum
ALA	Atlas of Living Australia
BESS	Battery Energy Storage System
Biosecurity Act	<i>Biosecurity Act 2014</i>
BPAs	Biodiversity Planning Assessments
BRC	Bundaberg Regional Council
DA	Development application
DBH	Diameter at Breast Height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DESI	Department of Environment, Science and Innovation
Disturbance Footprint	The maximum spatial extent of direct impacts as a result of the Project's proposed infrastructure
DoR	Department of Resources
DTMR	Department of Transport and Main Roads
EAR	Ecological Assessment Report
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
Fisheries Act	<i>The Fisheries Act 1994</i>
GBO	General biosecurity obligation
GES	General ecological significance
ha	hectares
HES	High ecological significance
Iberdrola Australia	Iberdrola Australia Development Pty Ltd
km	kilometres
kV	kilovolt
LGA	Local government area
m	metres
mm	millimetres
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
MW	Megawatt/s
NC Act	<i>Nature Conservation Act 1992</i>
Planning Act	<i>Planning Act 2016</i>
Planning Regulation	Planning Regulation 2017

Abbreviations	Descriptions
<b>Planning Scheme</b>	Bundaberg Regional Council Planning Scheme 2015
<b>PMST</b>	Protected Matters Search Tool
<b>PO</b>	Performance Outcomes
<b>RE/s</b>	Regional Ecosystem/s
<b>SPP</b>	State Planning Policy
<b>SPRAT</b>	Species Profile and Threats Database
<b>Study Area</b>	The proposed area of development for the Project that comprises leasehold land across five land parcels and two road reserves
<b>TEC</b>	Threatened Ecological Communities
<b>the Project</b>	Gin Gin Battery Energy Storage System and Transmission Project
<b>Umwelt</b>	Umwelt (Australia) Pty Ltd
<b>VM Act</b>	<i>Vegetation Management Act 1999</i>
<b>WoNS</b>	Weeds of National Environmental Significance

# Table of Contents

<b>Abbreviations</b>	<b>i</b>
<b>1.0 Introduction</b>	<b>1</b>
1.1 Project Background	1
1.2 Project Description	1
1.3 Ecology Study Area Boundaries	2
1.4 Scope and Objectives	6
<b>2.0 Legislative Context</b>	<b>7</b>
2.1 Local	7
2.2 State	8
<b>3.0 Methodology</b>	<b>10</b>
3.1 Desktop Assessment	10
3.2 Likelihood of Occurrence Assessment	11
3.3 Field Assessment	12
<b>4.0 Results</b>	<b>24</b>
4.1 Environmental Context	24
4.2 Description of Ecological Values	25
<b>5.0 Potential Impacts</b>	<b>46</b>
5.1 Construction	46
5.2 Operation and Maintenance Phase	49
5.3 Decommissioning and Rehabilitation Phase	50
<b>6.0 Avoidance, Mitigation and Management</b>	<b>51</b>
6.1 Avoid and Minimise	51
6.2 Mitigation and Management	51
6.3 Waterway Rehabilitation	55
<b>7.0 Conclusion</b>	<b>56</b>
<b>8.0 References</b>	<b>57</b>

## Figures

Figure 1.1	Study Area Overview	4
Figure 1.2	Site Layout Plan	5
Figure 3.1	Flora and Fauna Survey Locations	16
Figure 4.1	State Regulated Vegetation	27
Figure 4.2	State Regional Ecosystem Mapping (Version 13.0)	31
Figure 4.3	Ground-truthed Regional Ecosystems	32
Figure 4.4	Desktop Records	36
Figure 4.5	Fauna Habitat Types	41
Figure 4.6	Essential Habitat, Protected Plant Trigger Mapping and Connectivity	43
Figure 4.7	Wetlands and Watercourses	45

## Photo

Photo 4.1	<i>Eucalyptus tereticornis</i> and <i>Eucalyptus crebra</i> woodland to open forest	38
Photo 4.2	Mixed eucalypt open woodland to woodland on hills and lowlands	39
Photo 4.3	Modified habitat of exotic pasture grasses (left) and scattered mature trees (right)	39
Photo 4.4	Farm dam (left) and low order waterway (right)	40

## Tables

Table 1.1	Study Area Land Parcels	2
Table 3.1	Likelihood of Occurrence Definitions	12
Table 3.2	Field Survey Timing and Weather Conditions	12
Table 3.3	Fauna Field Survey Techniques	15
Table 3.4	Fauna Field Survey Effort	17
Table 4.1	Geology and Land Zones within the Study Area	25
Table 4.2	Regulated Vegetation within the Study Area	26
Table 4.3	Extent and Condition of REs Identified within the Study Area	28
Table 4.4	Ground-truthed Regional Ecosystems within the Study Area	29
Table 4.5	Flora Likelihood of Occurrence Results	33
Table 4.6	Fauna Likelihood of Occurrence Results	34
Table 4.7	Summary of Terrestrial Habitat Types	37
Table 5.1	Vegetation Clearing Required for the Project	46
Table 5.2	Habitat Clearing Required for the Project	47
Table 6.1	Species-Specific Mitigation Measures	53

# Appendices

Appendix A	Wildlife Online
Appendix B	Likelihood of Occurrence
Appendix C	Flora and Fauna Species List
Appendix D	Biodiversity Area Overlay Code Response



# 1.0 Introduction

## 1.1 Project Background

Umwelt has been engaged by Iberdrola Renewables Australia Pty Ltd (Iberdrola) to submit a change application for the Gin Gin Battery Energy Storage System (BESS) and Transmission Project (the Project).

The change application is made in accordance with Section 51(1) of the *Planning Act 2016* (Planning Act) to modify the combined development application (DA) for Material Change of Use for an Undefined Use (BESS) and Reconfiguring a Lot for Lease (exceeding 20 years) made to the Bundaberg Regional Council (BRC) (BRC Ref. 525.2024.56.1).

To support the changed DA, Umwelt has prepared an Ecological Assessment Report (EAR) for the Project, pertaining to terrestrial ecology including Matters of State Environmental Significance (MSES), potentially impacted by the Project. This EAR is provided to demonstrate compliance with the Biodiversity Areas Overlay Code (**Appendix D**) of the Bundaberg Regional Council Planning Scheme 2015 (Planning Scheme).

## 1.2 Project Description

### 1.2.1 Existing Development Application

The existing DA included the following infrastructure:

- Battery modules (including enclosed lithium-ion type batteries and ancillary systems) with a capacity of up to 500 MW.
- Power conversion systems including associated switchgear, protection and control equipment, transformers and enclosures for housing equipment.
- Underground power and fibre optic cabling interconnecting the equipment.
- Grid connection equipment including main power transformer, switchgear, protection and control equipment, metering, reactive power equipment, filtering equipment, auxiliary/earthing transformers, and enclosures/buildings for housing equipment.
- Earthing and lightning protection systems.
- Site office, storage area/enclosure, internal gravel access tracks, on-site parking, security fencing, CCTV, lighting and temporary construction laydown area.
- Site office, temporary construction laydown area, internal access tracks, security fencing and lighting.
- Site access from Monduran Dam Road.

### 1.2.2 Proposed Change

The proposed change to modify the DA (BRC Ref. 525.2024.56.1) introduces an underground transmission line connecting the BESS to Powerlink's Gin Gin Substation.

The transmission line will comprise approximately 1.7 kilometres (km) of underground 132 kilovolt (kV) dual circuit cable with accompanying optic fibre and earthing cables.

Iberdrola have considered multiple corridor options for the connection into the Gin Gin Substation, including both overhead and underground options. Following discussions with the Department of Transport and Main Roads (DTMR), Powerlink and the design engineers, the proposed transmission line (herein referred to as the Disturbance Footprint) has been selected as the preferred option. Ultimately, the chosen alignment is considered to minimise impacts on existing assets, avoid and minimise environmental impacts and ensure the safe and efficient operation of existing transport networks/roads (local and State) while minimising disruptions during construction.

Regarding the construction methodology, most of the cable will be trenched, with a section under Monduran Dam Road potentially direct drilled at 1.5 metres (m) depth or otherwise trenched. The depth of the trenching will be 1.2 m, with the cables being buried at 0.9 m and warning tape placed at 0.3 m. The width of each trench is 0.75 m and separation of the two cables will be 2 m, with a total width of 3.5 m. Where the connection intersects the adjacent waterway, it will be trenched below the bed level, with the bed and banks restored post-construction to maintain unimpeded water flow and fish passage. To facilitate construction, a disturbance width of between 15 m and 20 m will be required.

During the Project's operation, it will only be accessed in the event of a fault or issue, with no routine maintenance required. Vegetation within the 20 m corridor will be cleared throughout the life of the Project to prevent any damage to the transmission cabling, however grass and small shrubs may be grown in this area.

## 1.3 Ecology Study Area Boundaries

### 1.3.1 Study Area

The proposed area of development includes freehold land across five land parcels and two road reserves, that cover approximately 120.6 hectares (ha) of land. This area will herein be referred to as the 'Study Area' (refer to **Figure 1.1**). Although the Study Area includes both the BESS and the transmission line, this EAR focuses solely on the ecological values and potential impacts related to the transmission line. All land parcels within the Study Area are provided in **Table 1.1**.

**Table 1.1 Study Area Land Parcels**

Lot and Plan	Area (ha)	Tenure
22SP109996	50.2	Freehold
58BON1457	23.4	Freehold
2RP151023	28.4	Freehold
2RP137154	1.9	Freehold
1RP137154	0.4	Freehold
Monduran Dam Road reserve	7.3	-
Bruce Highway road reserve	8.8	-

### 1.3.2 Disturbance Footprint

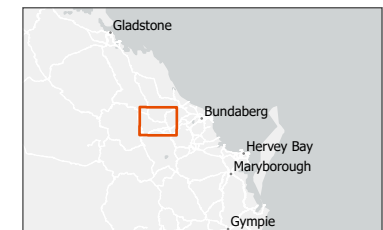
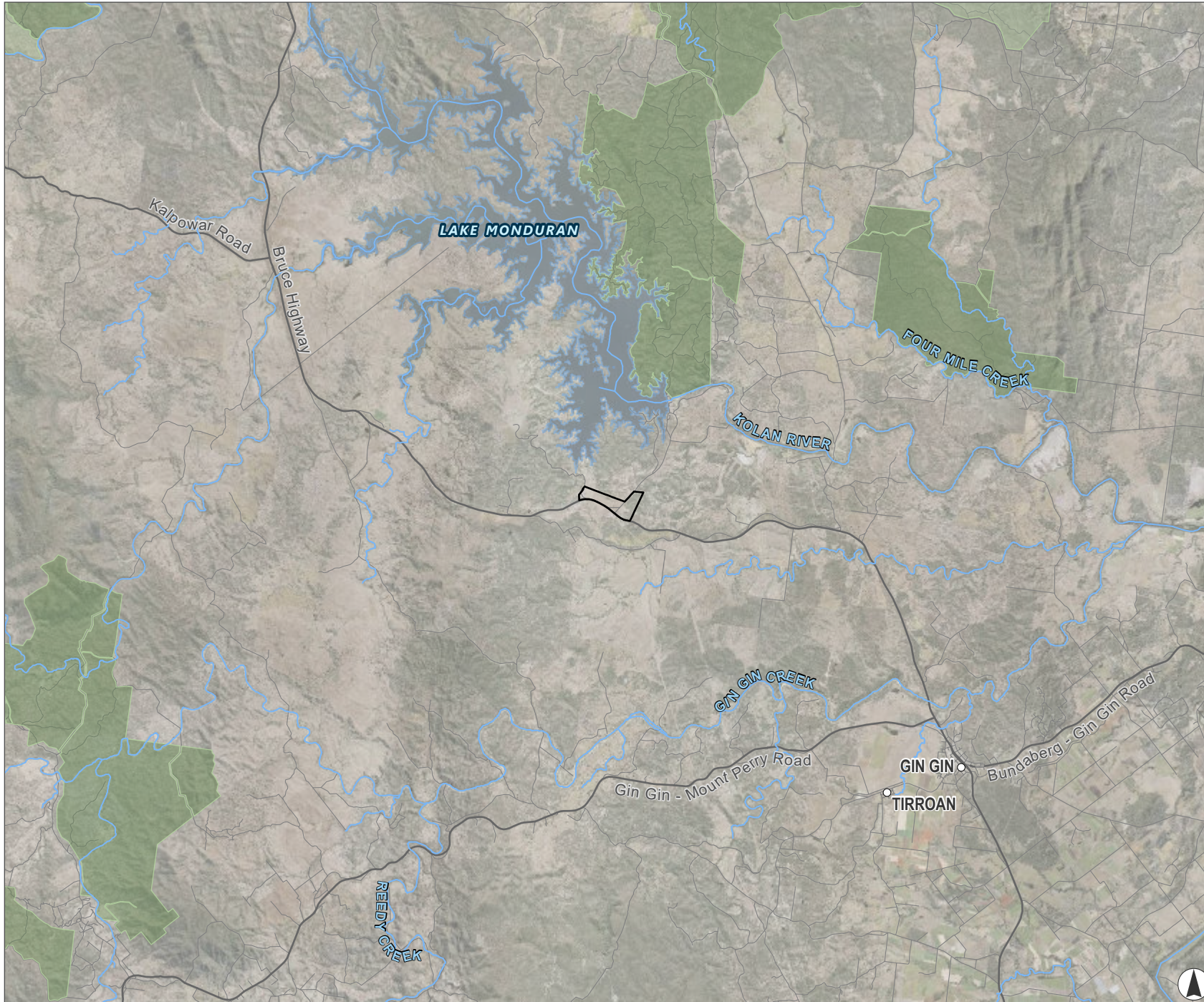
The Disturbance Footprint represents the maximum direct impact due to Project activities and the placement of proposed infrastructure (as shown in **Figure 1.2**). The Project's Disturbance Footprint is 2.7 ha and is the location of the proposed transmission line connecting the BESS to the existing Gin Gin Substation.



**FIGURE 1.1**  
**Study Area Overview**

**Legend**

- Study Area
- National Park
- State Forest
- Reservoir
- State Controlled Road
- Local Road
- Watercourse



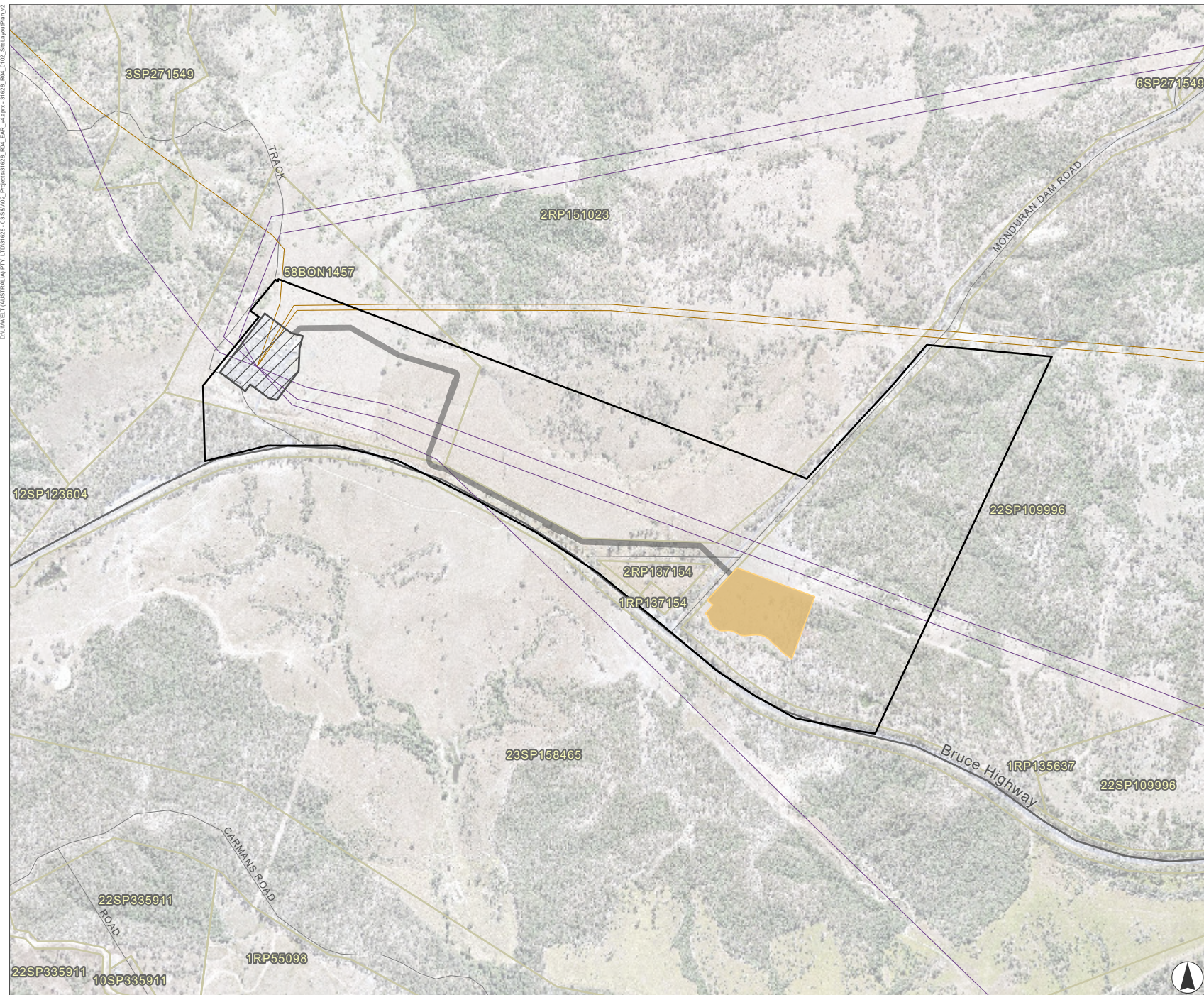
Scale 1:200,000 at A4  
GDA2020 MGA Zone 56

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

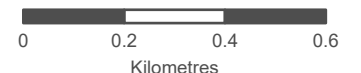
APPROVED FOR AND ON BEHALF OF Umwelt



**FIGURE 1.2**  
**Site Layout Plan**



- Legend**
- State Controlled Road
  - Local Road
  - Existing 132kV Powerline
  - Existing 275kV Powerline
  - ▭ Study Area
  - ▭ Disturbance Footprint – Transmission Connection
  - ▭ Proposed BESS Facility (existing DA)
  - ▨ Powerlink substation (existing infrastructure)
  - ▭ Cadastre



Scale 1:15,000 at A4  
GDA2020 MGA Zone 56

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

APPROVED FOR AND ON BEHALF OF Umwelt



## 1.4 Scope and Objectives

Primary objectives of this EAR are to describe the existing ecological values of the Study Area and provide an assessment against the relevant BRC development codes, as well as undertake a preliminary analysis of the potential impacts of the Project. In order to meet the requirements of the BRC Biodiversity Areas Overlay Code, both State (MSES) and Federal (Matters of National Environmental Significance (MNES)) matters must be addressed.

The following scope of work was completed to support these objectives:

- A comprehensive desktop assessment of relevant background information and available environmental databases to identify ecological values within the Study Area.
- Ground-truthing the occurrence, extent and condition of Regulated Vegetation and Regional Ecosystems (REs) in accordance with Neldner et. al. (2024).
- Assess the likelihood of occurrence for threatened (Critically Endangered, Endangered and Vulnerable) and Near Threatened species listed under the *Nature Conservation Act 1992* (NC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Verify the extent and condition of habitat for threatened and near threatened species identified as known, high or moderate likelihood of occurring.
- Complete observational fauna surveys in accordance with the *Terrestrial Fauna Survey Guidelines (version 4)* (Eyre et al., 2022) targeting threatened or near threatened species.
- Identify potential impacts associated with the Disturbance Footprint to ecological values and an overview of avoidance strategies and mitigation measures associated with the Project.
- Describe and assess potential impacts to ecological values and the underlying ecological processes (e.g. habitat connectivity, ecological threatening processes) in accordance with the Planning Scheme Biodiversity Areas Overlay Code.

## 2.0 Legislative Context

### 2.1 Local

#### 2.1.1 Bundaberg Regional Council Planning Scheme 2015

The Project will be located entirely within boundaries of the BRC local government area (LGA). Applicable developments that are proposed within the LGA are assessable against the local planning instrument, the BRC Planning Scheme.

The Planning Scheme sets out Council's intended settlement pattern, expected planning and development outcomes, and assessment requirements for development within the LGA. BRC have jurisdictional authority to manage development in the region.

An assessment against the Biodiversity Areas Overlay Code is required, to address biodiversity requirements for the Project's DA. A detailed response to this relevant code is provided in **Appendix D**.

##### 2.1.1.1 Biodiversity Areas Overlay Code

The purpose of the Biodiversity Areas Overlay Code is to ensure that areas of environmental significance are protected; ecological connectivity is maintained or improved, habitat extent is maintained or enhanced and degraded areas are rehabilitated; and that wetlands and watercourses are protected, maintained, rehabilitated and enhanced.

The purpose of the code will be achieved through the following overall outcomes:

- Development conserves and enhances the Bundaberg region's biodiversity values and associated ecosystem services.
- Development is not located in an ecologically important area, unless:
  - there is an overriding need for the development in the public interest.
  - there is no feasible alternative.
  - any adverse impacts incurred are minimised and, where appropriate to the circumstances, compensated by ecological improvements elsewhere that result in a net gain and enhancement to the overall habitat values of the Bundaberg Region.
- Development protects and establishes appropriate buffers to native vegetation and significant fauna habitat.
- Development protects known populations and supporting habitat of:
  - endangered, vulnerable and near threatened flora and fauna species, as listed in the (State) *Nature Conservation Act 1992*, Nature Conservation (Wildlife) Regulation 2006.
  - threatened species and ecological communities as listed in the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*.

- development protects environmental values and achieves the prescribed water quality objectives for waterways and wetlands in accordance with the Environmental Protection Policy (Water) 2009.
- development protects and enhances the ecological values and processes, physical extent and buffering of watercourses and wetlands.

The above overall outcomes are measured against 13 Performance Outcomes (POs).

## **2.2 State**

### **2.2.1 Nature Conservation Act 1992**

The NC Act establishes a regulatory regime to manage flora and fauna within Queensland. Specifically, the NC Act regulates the 'take' (i.e. fell, remove, catch etc.) of flora and fauna and provides a permitting framework for such activities.

Under the NC Act, permits are required to:

- Tamper with an animal breeding place (i.e. a bower, burrow, cave, hollow, nest etc).
- Clear protected plants.

Threatened species are listed under the NC Act in the NC Act Animals Regulation and the NC Act Plants Regulation in the following categories:

- Least Concern / Special Least Concern.
- Near threatened.
- Vulnerable.
- Endangered.
- Critically endangered.
- Extinct in the wild / extinct.

### **2.2.2 Vegetation Management Act 1999**

The *Vegetation Management Act 1999* (VM Act) regulates the clearing of native vegetation in Queensland. Approval under the VM Act is required if remnant or certain types of regrowth vegetation is to be cleared, with applications for approval likely to be accompanied by a Property Vegetation Management Plan (PVMP).

### **2.2.3 Biosecurity Act 2014**

The *Biosecurity Act 2014* (Biosecurity Act) establishes a framework to regulate and control invasive plants and animals. Under the Biosecurity Act, landowners are responsible for taking all reasonable and practical steps to minimise the risks associated with invasive plants and animals under their control. This is known as the general biosecurity obligation (GBO).



The Biosecurity Act categorises restricted matters (restricted plants and animals) into the following:

- Category 1: must be reported to an inspector within 24 hours (includes Red Imported Fire Ants, amongst others) (call Biosecurity Queensland on 13 25 23).
- Category 2: must be reported within 24 hours to an inspector or authorised officer (call Biosecurity Queensland on 13 25 23).
- Category 3: must not be distributed either by sale or gift, or released into the environment.
- Category 4: must not be moved.
- Category 5: must not be kept.
- Category 6: must not be fed (animals).
- Category 7: must be euthanised (animals).

#### **2.2.4 Planning Act 2016**

The Planning Act is Queensland's key piece of legislation pertaining to the strategic planning and development of the State. The Planning Act mandates the framework of planning instruments and process for development assessment whilst incorporating the regulatory requirements of other Queensland environmental statutory legislation, such as the VM Act.

Subordinate to the Planning Act, the Planning Regulation 2017 (Planning Regulation) details the mechanics for the operation of the Planning Act. This includes prescription of accepted, prohibited and assessable development, assessment benchmarks for assessable development and identification of the assessment manager (i.e. the chief executive or local government).

## 3.0 Methodology

### 3.1 Desktop Assessment

#### 3.1.1 Database Searches

A comprehensive desktop search was undertaken to identify ecological matters likely to be present within the Study Area. All existing data was reviewed to identify the presence or potential presence of listed species and communities within the Study Area. The results were used to compile preliminary likelihood assessments, which identified the target threatened species and communities and any potential habitat areas within the Study Area. Survey methods were based on this information and were prepared in accordance with the appropriate State survey guidelines, with consideration of Commonwealth survey guidelines.

The following legislation, triggers and databases were used to assess the potential NC Act and EPBC Act listed species within the Study Area:

- Protected Matters Search Tool (PMST) Database (20 km buffer around Study Area boundary) (Department of Climate Change, Energy, the Environment and Water, 2024a).
- Wildlife Online extract with a radius of 20 km from the approximate centre of the Study Area (Lat: -24.9076, Long: 151.8330) (Department of the Environment, Tourism, Science and Innovation, 2024b) (**Appendix A**).
- Vegetation Management Regional Ecosystem map (Version 13) (Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development, 2024a).
- Protected Plants Flora Survey Trigger Map (Department of the Environment, Tourism, Science and Innovation, 2024a).
- Regulated Vegetation Management Map (Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development, 2024b).
- Waterways for Waterway Barrier Works identified under the *Fisheries Act 1994* (Fisheries Act) (Department of Agriculture and Fisheries, 2023).
- Mapped wetlands under the Queensland Wetlands Program and the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (i.e. high ecological significance (HES) and general ecological significance (GES) wetlands) under the Environmental Protection Regulation 2019.
- VM watercourse/drainage feature - 1:100 000 and 1:250 000 (Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development, 2023).
- Atlas of Living Australia (ALA) database records (20 km buffer around the Study Area) (Atlas of Living Australia, 2024).
- Latest Queensland Globe available aerial photography (Queensland Globe, 2024).

- Qld Herbarium Regional Ecosystem Description Database (REDD) (Version 13) (Queensland Herbarium, 2024).
- State Planning Policy (SPP) interactive mapping system.
- BRC Planning Scheme Online Mapping.

### 3.1.2 Species Literature

Various survey methods were undertaken in accordance with a combination of Commonwealth and State survey guidelines. The initial desktop assessment identified NC Act and/or EPBC Act listed fauna and flora species that potentially occur within the Study Area, which were targeted during the field surveys within representative habitat types. Methods used to target threatened species were deployed based on DCCEEW survey guidelines for Australian threatened fauna and other relevant State survey guidelines, including:

- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (version 4) (Eyre *et al.*, 2022).
- *Commonwealth Survey Guidelines for Australia's Threatened Mammals* (Department of Sustainability, Environment, Water, Population and Communities, 2011).
- *Commonwealth Survey Guidelines for Australia's Threatened Birds* (Department of Environment, Water, Heritage and the Arts, 2010).
- *A review of koala (Phascolarctos cinereus) habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021).
- Species Profile and Threats Database (SPRAT) (Department of Climate Change, Energy, the Environment and Water, 2024b).

### 3.1.3 Previous Ecological Studies

A preliminary flora and fauna assessment was completed 9 January 2024 (RPS, 2024) and was limited to the BESS. The following surveys were undertaken:

- Ground-truthing and validation of REs and Regulated Vegetation mapping.
- Identification of significant trees (i.e. diameter at breast height (DBH) of 200 mm).
- Searches for potential fauna breeding places.

## 3.2 Likelihood of Occurrence Assessment

Database searches identified listed threatened species that may occur within the Study Area. The initial likelihood assessments were made prior to undertaking the field survey and were based on a comprehensive desktop assessment (using the database searches listed in **Section 3.1.1**) and the ecologists' understanding of the broader region surrounding the Study Area. These resources allowed for identification of known distributions and preferred habitat areas for species of interest. The criteria used to assess the likelihood of threatened species occurring within the Study Area is presented in **Table 3.1**.

**Table 3.1 Likelihood of Occurrence Definitions**

Potential to Occur	Description
<b>Known</b>	The listed species has been recorded in the Study Area during the past decade (or during the Project survey period). The record is considered valid and is associated with a high spatial confidence.
<b>High</b>	Given the extent, quality and suitability of habitat in the Study Area, the location of the Study Area relative to existing contemporary records (past 20 years) of the species (with consideration of sampling effort in the region and the species' detectability (e.g. cryptic species) it is highly likely that the species occurs in the Study Area. Also includes species likely to regularly occur within the Study Area during migratory, short-distance season or nomadic movements (including cases for which likelihood of occurrence is high regardless of the nature of habitat present in the Study Area).
<b>Moderate</b>	Potential or suitable habitat is present in the Study Area, however, given the distribution of records in the surrounding region and/or the species' detectability a moderate rating for likelihood of occurrence is deemed more appropriate than a low or high rating. Includes species that may be present or may occasionally utilise the Study Area but for which there may be little information or those that are either cryptic or occur at low densities. Also includes species that may occasionally occur in the Study Area during migratory, short-distance season or nomadic movements.
<b>Low</b>	The Study Area either contains limited suitable habitat or only potential/marginal habitat. The species is either very scarce or absent in the surrounding region. The species is deemed unlikely to occur within the Study Area based on the aforementioned factors. The species may disperse through or near the Study Area infrequently.
<b>No</b>	The Study Area is fundamentally unsuitable for the species, or the species is presumed extinct or locally extinct. For example, this is usually applied to marine species or seabird for terrestrial sites.

### 3.3 Field Assessment

#### 3.3.1 Field Survey Timing and Weather Conditions

The field survey details are provided in **Table 3.2** along with weather conditions. Weather data was extracted from the nearest weather station. The rainfall data was obtained from the Gin Gin Post Office (Weather Station 039040) and the temperature was obtained from Bundaberg (Weather Station 039128) (Bureau of Meteorology, 2024). The methods employed during the field surveys are detailed in **Section 3.3.2** and **Section 3.3.3**.

**Table 3.2 Field Survey Timing and Weather Conditions**

Field Survey	Survey Dates	Survey Length	Rainfall (mm) <sup>1</sup>	Total Rainfall (mm) <sup>2</sup>	Temperature (°C) (max) <sup>3</sup>	Season
<b>Baseline flora and fauna</b>	8 September – 10 September 2024	3 days	0.00	152.3	27.4	Spring

<sup>1</sup> Rainfall experienced during the duration of the survey period

<sup>2</sup> Rainfall experienced during the three months preceding the survey

<sup>3</sup> Maximum temperature experienced during the survey

### 3.3.2 Flora

The flora and vegetation surveys were undertaken to identify and record vascular flora species as well as classify and map vegetation communities. These surveys were undertaken to comply with relevant Commonwealth and State Government survey guidelines.

#### 3.3.2.1 Vegetation Communities

Ground-truthing and validation of State vegetation community mapping within the Study Area was undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 7.0* (Neldner et al., 2024). Vegetation sampling consisted of two tertiary and six quaternary surveys within representative examples of each RE observed within the Study Area, as shown in **Figure 3.1**.

Quaternary plots constitute rapid vegetation surveys which include marking the GPS location and recording the dominant species in the characteristic layers, along with soil/landform and structural data. Tertiary assessments include the collection of height and cover data for each strata measured using a transect, as well as species presence and dominance in each stratum. To support data collected by tertiary and quaternary sites, rapid flora and vegetation observation points were also made. These sites supplement quaternary and tertiary flora assessment sites to achieve a detailed vegetation record/coverage of the Study Area. These points identified vegetation boundary change or dominant canopy species but include height or cover observations at a location.

Vegetation within the Study Area was classified with reference to the RE Technical Descriptions within the *Regional Ecosystem Description Database version 13*, for South East Queensland (Queensland Herbarium, 2024), and Specht's (Specht, 1970) structural classification of structural land formations.

Vegetation within the Study Area was classified as 'remnant', 'regrowth' and 'non-remnant' according to the criteria below:

- Remnant – vegetation communities that conform within the definition under the VM Act and referenced by Neldner et al., (2024). Specifically, this comprises vegetation, part of which forms the predominant canopy of vegetation:
  - Covering more than 50% of the undisturbed predominant canopy.
  - Averaging more than 70% of the vegetation's undisturbed height.
  - Composed of species characteristics of the vegetation undisturbed predominant canopy.
- Regrowth – is non-remnant vegetation (> 3 m height) that has a significant woody component but fails to meet the structural/floristic characteristics of remnant vegetation.
- Non-remnant – includes changes to vegetation caused by clearing or other extensive human disturbances and fails to meet the structural and/or floristic characteristics of remnant vegetation. It also includes cropping land.

### 3.3.2.2 Opportunistic Flora Observations

Incidental flora species observed during the survey were also recorded to provide a more comprehensive species list. Specimens of any plant taxa that could not be identified in the field were collected, pressed and dried in accordance with the requirements of the Queensland Herbarium (Queensland Herbarium and Bean, 2016). Dried specimens were then identified through reference books and keys and through comparison with named species. Nomenclature used in this report follows that of the Census of the Flora of Australia (Brown and Bostock, 2023). Introduced species are denoted by an asterisk in the text (\*).

### 3.3.2.3 Targeted Threatened Flora Species Search

Surveys to assess the presence/absence of potentially occurring threatened flora identified through the desktop assessment were targeted as part of the flora survey effort. During this survey, all areas of potentially suitable habitat were surveyed for threatened flora using active searches and random meanders (not time bound), adapted from the random meander technique (Cropper, 1993). This method is particularly suitable for locating species that typically occur at low densities or that may be distributed in isolated clumps. All threatened flora species identified in the preliminary likelihood of occurrence as high or moderate occurrence were targeted including *Cycas megacarpa* and *Cupaniopsis shirleyana* (wedge-leaf tuckeroo).

### 3.3.2.4 Introduced Flora

Exotic flora species were recorded opportunistically within the Study Area, in conjunction with quaternary and tertiary flora surveys. The presence of the following species was recorded during the field surveys:

- Restricted matter flora species listed under the Biosecurity Act, Schedules 1 and 2.
- Weeds of National Environmental Significance (WoNS).

It is important to note that the data collected for weed species serves as an indicator and does not encompass all exotic flora within the Study Area. The primary aim of collecting the data was to gain insight into the dominant exotic flora and their threatening processes within the Study Area.

## 3.3.3 Fauna

A combination of field verification methodologies was employed to assess the occurrence of threatened fauna species identified as having a high or moderate likelihood of occurrence. Survey methods employed during surveys were based on survey guidelines for threatened species published by the Commonwealth and State Government as detailed in **Section 3.1.2**.

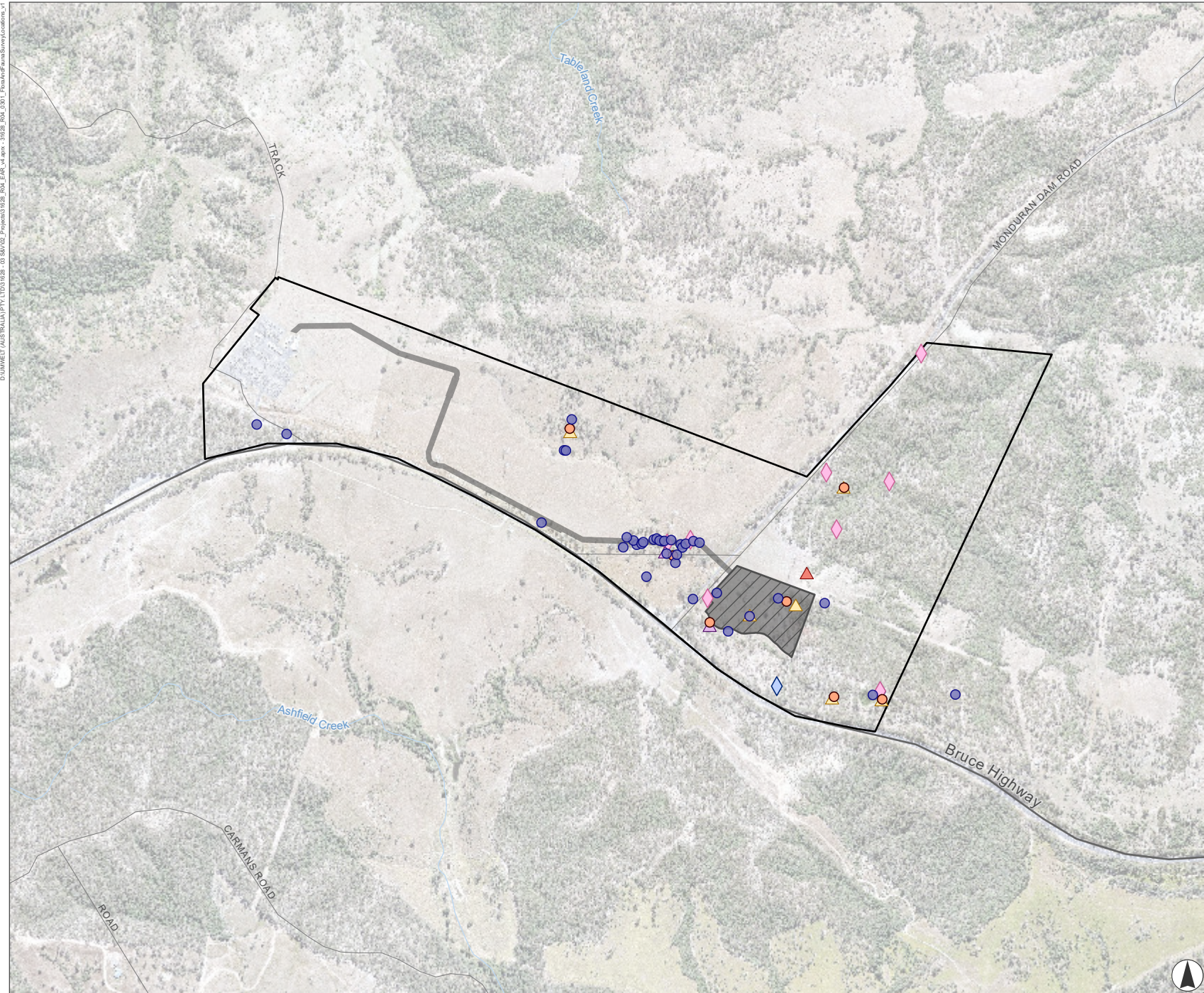
As well as some targeted methods, the survey included undertaking habitat assessments, while simultaneously actively searching for species of interest. Fauna field survey techniques are detailed in **Table 3.3** and field survey effort implemented to assess the presence of fauna species are specified in **Table 3.4** and displayed in **Figure 3.1**.

**Table 3.3 Fauna Field Survey Techniques**

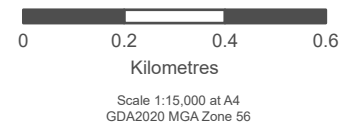
Technique	Description	Effort
<b>Habitat Assessments</b>	<p>Fauna habitat values were characterised using a comprehensive habitat assessment methodology within all accessible broad habitat types capturing variation in condition, vegetation types and disturbances. The presence and abundance of specific habitat resources was also assessed, including but not limited to:</p> <ul style="list-style-type: none"> <li>• Koala food and potential shelter trees.</li> <li>• Hollow bearing trees and stags.</li> <li>• Fallen logs, woody debris and leaf litter.</li> <li>• Rocky features such as surface rocks, boulders, crevices, overhangs and caves.</li> <li>• Presence, abundance and type of mistletoe.</li> <li>• Presence / absence of wetland features, including gilgai formations.</li> <li>• Proximity to water and whether it is permanent or ephemeral.</li> </ul> <p>Habitat assessments were conducted and used to inform habitat mapping for each of the potentially occurring or known conservation significant species.</p>	7 habitat assessments
<b>Active Diurnal Searches</b>	<p>Active diurnal searches were conducted within all habitat types to identify the presence of fauna or signs of fauna activity including scats and scratches. Searches included scanning the trees and ground, searching beneath microhabitat such as rocks, fallen timber and peeling bark, digging through leaf litter and soil at tree bases and flushing birds from areas with a dense or grassy ground cover. Grass tussocks were gently disturbed to potentially flush ground-dwelling birds such as the threatened squatter pigeon (southern) (<i>Geophaps scripta scripta</i>). Disturbance to microhabitat features and reptiles was kept to a minimum. Active searches were completed opportunistically at Habitat Assessment sites.</p>	Opportunistic at habitat assessments and whilst traversing Project (20 hrs)
<b>Spotlighting</b>	<p>Spotlighting on foot was undertaken within all habitat types, though primarily targeting Eucalyptus woodlands to target species such as the koala, greater glider (southern and central) (<i>Petauroides volans</i>) and the yellow-bellied glider (south-eastern) (<i>Petaurus australis australis</i>). To bolster survey effort, spotlighting was also undertaken from the passenger window of a slow-moving vehicle on Monduran Dam Road, which is a proven method for detecting arboreal mammals. Nocturnal spotlighting surveys were undertaken half-an-hour after sunset for a duration of approximately two hour per night.</p>	4 hours total per ecologist
<b>Call playback</b>	<p>Call playback targeted owls, consisting of the species known to the region. Call playback was conducted at the start of each new spotlight search location to elicit a call response from any individuals in the area.</p>	10 mins per night (2 nights).
<b>Bird Surveys</b>	<p>Roaming/meandering bird surveys using both visual and auditory identification were conducted within all habitat types. Active birding was also completed at farm dams and watercourses where suitable.</p>	All birds recorded over two days.
<b>Opportunistic Sightings</b>	<p>All fauna species observed incidentally throughout the Study Area were recorded.</p>	All fauna recorded over two days.



**FIGURE 3.1**  
**Flora and Fauna Survey Locations**



- Legend**
- ▭ Study Area
  - Disturbance Footprint
  - ▨ Proposed BESS Facility (existing DA)
  - State Controlled Road
  - Local Road
  - Watercourse
  - Fauna Habitat Assessment
  - Flora Observations
- Timed Fauna Method**
- ◇ Call playback
  - ◇ Spotlight
- Flora Forms**
- ▲ Incidental
  - ▲ Quaternary
  - ▲ Tertiary



This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

APPROVED FOR AND ON BEHALF OF Umwelt



**Table 3.4 Fauna Field Survey Effort**

Species	Relevant Guidelines	Recommended Methodology	Survey Effort Undertaken	Survey Adequacy
<p><b>Latham's snipe</b> <i>Gallinago hardwickii</i></p>	<p>Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species</p>	<ul style="list-style-type: none"> <li>• Identify important (areas that have previously been identified as internationally important sites for the species, or areas that support at least 18 individuals of the species). Identifying important areas without existing credible information requires:               <ul style="list-style-type: none"> <li>○ Survey coverage of all habitat thought to be used including the entire area of contiguous habitat where the species may occur.</li> <li>○ Four surveys during the period when the species is present in the area (i.e. the Austral summer).</li> <li>○ One survey during the northern hemisphere breeding season.</li> <li>○ Surveys to be conducted when habitat conditions are suitable for the species (i.e. when water is present).</li> <li>○ Surveys should not be undertaken during periods of high rainfall or strong winds.</li> <li>○ Surveys should not be undertaken when activities are taking place which cause disturbance to the birds.</li> <li>○ Thorough habitat assessment to identify potential habitat.</li> <li>○ Surveys of non-tidal wetlands may provide a greater challenge than coastal tidal wetlands, as the roosting and foraging behaviour is less predictable and there are no concentrated high tide roost areas.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• 7 habitat assessments - including at farm dams that provide potential habitat.</li> <li>• Diurnal bird surveys undertaken throughout the fauna surveys.</li> <li>• Bird species were recorded incidentally throughout the survey program both visually and aurally.</li> <li>• Surveys were not undertaken during periods of high rainfall, strong winds or when activities were taking place which may cause disturbance to the birds.</li> </ul>	<p><b>Survey Effort Adequate</b></p> <p>The combination of habitat assessments, diurnal bird surveys, and incidental sightings provide suitable survey effort to detect Latham's snipe and/or its habitat.</p>

Species	Relevant Guidelines	Recommended Methodology	Survey Effort Undertaken	Survey Adequacy
<p><b>White-throated needletail</b> <i>Hirundapus caudacutus</i></p>	<p>In lieu of species-specific guidelines, surveys were undertaken in consideration of the <i>Survey guidelines for Australia's threatened birds and the Terrestrial Vertebrate Fauna Survey Guidelines for Qld</i> and <i>Draft referral guideline for 14 birds listed as migratory species under the EPBC Act</i>.</p>	<ul style="list-style-type: none"> <li>Although there are no standard survey techniques for this species, it is recommended they be counted by an experienced person from elevated viewpoints during summer.</li> <li>Observations should be made as late as possible in the evening of birds coming into roost in tall trees along ridge tops.</li> </ul>	<ul style="list-style-type: none"> <li>7 habitat assessments -in all areas of representative habitat.</li> <li>Diurnal bird surveys undertaken throughout the fauna surveys.</li> <li>Bird species were recorded incidentally throughout the survey program both visually and aurally.</li> </ul>	<p><b>Survey Effort Adequate</b></p> <ul style="list-style-type: none"> <li>Surveys were conducted early in the migration season and its likely detection was low. Given the Projects largely modified state and available desktop information, the survey effort to detect species or habitat is adequate.</li> </ul>
<p><b>Powerful owl</b> <i>Ninox strenua</i></p>	<p>In lieu of species-specific guidelines, surveys were undertaken in consideration of the <i>Survey guidelines for Australia's threatened birds and the Terrestrial Vertebrate Fauna Survey Guidelines for Qld</i>.</p>	<ul style="list-style-type: none"> <li>No specific methodology or effort standards are prescribed for powerful owl surveys. However, the species is nocturnal and has a strong eyeshine.</li> </ul>	<ul style="list-style-type: none"> <li>7 habitat assessments -in all areas of representative habitat.</li> <li>Spotlighting searches were also conducted across two nights in September 2024. Spotlighting targeted all suitable habitat patches.</li> </ul>	<p><b>Survey Effort Adequate</b></p> <ul style="list-style-type: none"> <li>Survey effort is considered adequate for the purposes of this assessment, noting the limited availability of habitat present within the main extent of the Study Area (where the Project will occur). Field survey findings support the conclusion that suitable habitat is restricted to connected remnant vegetation in the northeast of the Study Area.</li> </ul>

Species	Relevant Guidelines	Recommended Methodology	Survey Effort Undertaken	Survey Adequacy
<p><b>Northern quoll</b> <i>Dasyurus hallucatus</i></p>	<p><i>The EPBC Act Referral Guideline for the Endangered Northern Quoll and Survey Guidelines for Australia's Threatened Mammals</i></p>	<ul style="list-style-type: none"> <li>• If the Project will occur within the modelled distribution of the species and suitable habitat is likely to occur, initially undertake a reconnaissance survey using remote cameras and latrine searches.</li> <li>• If habitat critical to the survival of the species is present and may be impacted, undertake targeted surveys applying a refined and more targeted use of remote cameras and other supplementary techniques.</li> <li>• Transects of baited cameras, spaced 100 m apart for four nights is recommended. Remote cameras can be used at any time of the year but preferably when northern quolls are likely to be active and more detectable, i.e. before male die-off.</li> <li>• In Queensland, camera trapping is recommended over cage trapping.</li> </ul>	<ul style="list-style-type: none"> <li>• 7 habitat assessments -in all areas of representative habitat.</li> <li>• Spotlighting searches were also conducted across two nights in September 2024. Spotlighting targeted all suitable habitat patches.</li> </ul>	<p><b>Survey Effort Adequate</b></p> <ul style="list-style-type: none"> <li>• Habitat assessments were conducted throughout the field survey program to identify potential areas of habitat critical to the survival of the species.</li> <li>• Survey effort is considered adequate for the purposes of this assessment, noting the limited availability of habitat present within the main extent of the Study Area (where the Project will occur).</li> </ul>

Species	Relevant Guidelines	Recommended Methodology	Survey Effort Undertaken	Survey Adequacy
<p><b>Yellow-bellied glider (south-eastern)</b> <i>Petaurus australis australis</i></p> <p><b>Greater glider (southern and central)</b> <i>Petauroides volans</i></p>	<p>In lieu of species-specific guidelines, surveys for these species were undertaken in consideration of the <i>Survey guidelines for Australia's threatened mammals and the Terrestrial Vertebrate Fauna Survey Guidelines for Qld.</i></p>	<ul style="list-style-type: none"> <li>• Arboreal mammal survey methods outlined in the <i>Survey guidelines for Australia's threatened mammals</i> include:               <ul style="list-style-type: none"> <li>○ Diurnal searches for the presence of potentially suitable habitat resources for nest or den sites as well as signs of the species' presence, such as scratches on tree trunks and scats beneath trees.</li> <li>○ Stag watching.</li> <li>○ Spotlight surveys in suitable vegetation types.</li> <li>○ Call detection and/or call playback surveys for vocal species, in addition to playback of the calls of owl predators that are known to induce a call response.</li> <li>○ Cage trapping.</li> </ul> </li> <li>• As per <i>Terrestrial Vertebrate Fauna Survey Guidelines for Qld</i>:               <ul style="list-style-type: none"> <li>○ Spotighting transects are the most effective method.</li> <li>○ Survey effort should target habitat known to be suitable for listed species.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• A total of 7 habitat assessments, which included searches for arboreal mammals and/or signs of their presence.</li> <li>• Spotighting searches were also conducted across two nights in September 2024. Spotighting targeted all suitable habitat patches including areas of disconnected habitat.</li> </ul>	<p><b>Survey Effort Adequate</b></p> <ul style="list-style-type: none"> <li>• Survey effort is considered adequate for the purposes of this assessment, noting the limited availability of habitat present within the main extent of the Study Area (where the Project will occur). Field survey findings support the conclusion that suitable habitat is restricted to connected remnant vegetation in the north east of the Study Area.</li> </ul>
<p><b>Koala</b> <i>Phascolarctos cinereus</i></p>	<p><i>A review of koala habitat assessment criteria and methods</i> (Youngentob et al., 2021).</p>	<ul style="list-style-type: none"> <li>• No specific methodology or effort standards are prescribed for koala surveys. However, where there is a need to critically evaluate the potential impacts of major projects, multiple techniques should be used. Repeat surveys may be necessary to take temporal variation into account.</li> <li>• Direct observation methods include transect and point surveys, spotighting, mark-resight or mark-recapture, thermal detection drones, radio-tracking, camera traps and detection dogs.</li> </ul>	<ul style="list-style-type: none"> <li>• A total of 7 habitat assessments, which included searches for koalas and/or signs of their presence, have been undertaken across the Study Area.</li> <li>• Spotighting searches were also conducted across two nights (4 hours total per ecologist)</li> </ul>	<p><b>Requirements met</b></p> <ul style="list-style-type: none"> <li>• As recommended, the field survey program employed both direct and indirect methods, including within the months when activity is generally high. Targeted survey methods employed include spotighting.</li> </ul>

Species	Relevant Guidelines	Recommended Methodology	Survey Effort Undertaken	Survey Adequacy
		<ul style="list-style-type: none"> <li>Indirect methods include scratchings, Spot Assessment Technique (SAT) and other scat search methods, call playback, passive acoustics and landscape nutritional quality surveys. To optimise detection, call playback surveys should be conducted at night during the breeding season, and in the absence of strong winds or rain. Indirect methods are reported to be often the most effective for gathering presence/absence data due to the difficulty in observing koalas and the variable density of koalas across the landscape.</li> </ul>		<ul style="list-style-type: none"> <li>Although not all recommended methods have been employed, survey effort is considered sufficient for the purposes of this assessment.</li> </ul>
<p><b>Grey-headed flying-fox</b> <i>Pteropus poliocephalus</i></p>	<p>In lieu of species-specific guidance, surveys were conducted in consideration of the <i>Survey guidelines for Australia's threatened bats and Terrestrial Vertebrate Fauna Survey Guidelines for Queensland</i></p>	<ul style="list-style-type: none"> <li>Prior to survey conduct a database search of active and historical flying fox roosting sites.</li> <li>Diurnal surveys for active flying fox camps should be undertaken to determine the potential presence of unrecorded roosting sites. Signs of flying fox presence such as audible calls, odour and droppings should be examined. Dusk surveys can also be conducted to detect roost sites.</li> <li>Surveys of vegetation communities and food plants by a qualified botanist.</li> <li>Night-time, walking transect surveys in search of feeding and flying bats.</li> </ul>	<ul style="list-style-type: none"> <li>A database search of active and historical flying fox roosting sites was undertaken prior to survey.</li> <li>7 habitat assessments noting signs of bat activity, food plants and habitat suitability.</li> <li>2 tertiary plots and 5 quaternary plots were completed to determine presence of suitable winter flowering eucalypts.</li> <li>4 hours of spotlighting (per ecologist) on foot and from vehicles within locations of identified potential habitat.</li> </ul>	<p><b>Survey Effort Adequate</b></p> <ul style="list-style-type: none"> <li>Based on the use of both indirect and direct methods in areas of representative habitat, overall effort is considered sufficient.</li> </ul>

Species	Relevant Guidelines	Recommended Methodology	Survey Effort Undertaken	Survey Adequacy
<p><b>Dunmall's snake</b> <i>Furina dunmali</i></p>	<p>Surveys were undertaken in consideration of the <i>Survey guidelines for Australia's threatened reptiles</i></p>	<ul style="list-style-type: none"> <li>• Active searches of sheltering sites, particularly under rocks, logs or debris.</li> <li>• Pitfall trapping.</li> <li>• Road driving at night.</li> </ul>	<ul style="list-style-type: none"> <li>• 7 habitat assessments noting features to confirm species habitat suitability.</li> <li>• Opportunistic active searches at habitat assessment sites</li> <li>• 4 hours of spotlighting (per ecologist) on foot and from vehicles within locations of identified potential habitat.</li> </ul>	<p><b>Survey Method &amp; Effort Applied Considered Adequate</b></p> <ul style="list-style-type: none"> <li>• The combination of active diurnal searches, spotlighting and road driving at night provide suitable survey effort. No pitfall trapping was completed; however, given the size of this species (ability to extricate itself from a pitfall trap) and lack of evidence of this technique yielding results it was deemed unsuitable.</li> </ul>

### 3.3.4 Survey Limitations

This assessment has been completed using a combination of field-validated data, desktop information and reasonably extrapolated field survey results. As such, the results are subject to the level of accuracy and detail associated with this information.

Patterns of faunal activity and estimates of relative abundance or presence-absence of species, varies temporally in response to the time of day (e.g. day versus night), seasonal changes (e.g. spring versus winter) as well as between years (e.g. rainy year versus drought year) (Eyre *et al.*, 2022).

Many fauna species have a cryptic or nocturnal nature often limiting fauna species detection during field surveys and habitat assessment. Species directly observed during field surveys are opportunistic sightings and are not deemed a complete complement of fauna species utilising the Study Area.

Despite the above, survey effort and coverage overall is considered appropriate as representative vegetation communities and habitat types were sampled, and an extensive suite of flora and fauna survey methodologies were employed. The limitations have been taken into consideration throughout this report.

## 4.0 Results

### 4.1 Environmental Context

#### 4.1.1 Southeast Queensland Bioregion

The Study Area is located within the South East Queensland bioregion which encompasses approximately 6,600,000 ha, extending from Curtis Island in Gladstone in the north to Coffs harbour in New South Wales (New South Wales Government, 2021). The ranges, coastal strip and adjacent hills of this bioregion are among the richest parts of Australia for flora and fauna. The area contains a wide variety of habitat types and localised centres of endemism (Sattler and Williams, 1999). Moderate to high rainfall with a significant cooler winter component and warm to hot summers characterise this bioregion. The major physiographical features include a coastal plain of varying width, hills and ranges, the major drainage basins of the Brisbane and Mary Rivers, Barabah Creek, the lower Burnett River, the coastal mainland and island sand masses (Sattler and Williams, 1999).

The bioregion is encompassed to the north and west by the Brigalow Belt region. The boundary is generally diffuse between the two bioregions, except for Main Range and Kroombit Tops, where sharp-east rainfall gradients are associated with mountainous topography (Sattler and Williams, 1999). Subsequently, the western part of this bioregion and the eastern Brigalow Belt region closely correlate in terms of biodiversity (Sattler and Williams, 1999).

The Southeast Queensland bioregion comprises ten provinces, with the Study Area located within the Gympie Block province. This province is based on old sedimentary rocks, metamorphic and intermediate and basic volcanics with scattered acid volcanic intrusions forming low, hilly landscapes (Sattler and Williams, 1999). Dominant vegetation communities include araucarian notophyll and microphyll rainforest as well as mixed eucalypt forests. Where rainfall is less than approximately 1,000 mm per year, ironbark woodlands replace the mixed eucalypt forests (Sattler and Williams, 1999).

#### 4.1.2 Climate

The Bundaberg region has a warm humid subtropical climate. The annual rainfall for the Gin Gin area is approximately 1,034 mm and is predominantly seasonal, characterised by wet summers (December to February) and dry winters<sup>4</sup>. The average monthly temperatures range between a maximum of 30.3° Celsius (C) and a minimum of 9.9°C recorded during January and July, respectively<sup>5</sup>.

#### 4.1.3 Geology and Land Zones

The detailed surface geology mapping (Queensland Globe, 2024) identified three surface rock types mapped within the Study Area (**Table 4.1**). Based on these mapped geological units, one potential land zone as described by (Wilson and Taylor, 2012), may be present; Land Zone 11: Metamorphosed rocks (ranges, hills and lowlands).

---

<sup>4</sup> Meteorological rainfall data was collected at the Study Area's nearest Bureau of Meteorology (BOM) station: 039040.

<sup>5</sup> Meteorological climate data was collected at the Study Area's nearest Bureau of Meteorology (BOM) station: 039128.



**Table 4.1 Geology and Land Zones within the Study Area**

Geological Unit	Source	Description	Land Zone
Tbsr	DoR Detailed Surface Geology (2024)	Stony Range Basalt	11
Co		Goodnight Beds	11
Pgca		Carmans Syenogranite	11

#### 4.1.4 Topography

The Study Area is located on a predominantly gently undulating to flat landscape, ranging from 120 m to 160 m Australian Height Datum (AHD). The surrounding landscape is relatively flat to undulating with no mountain land marks present.

#### 4.1.5 Hydrology

The Study Area is located within the Kolan River drainage sub-basin within the Burnett Mary region. The Kolan drainage basin is approximately 2,905 km<sup>2</sup> in area and encompasses the townships of Avondale, Gin Gin, Maroondan, Monduran, Moore Park, Tirroan and Yandaran (Department of Environment, Science and Innovation, 2013). Several unnamed, DoR mapped minor ephemeral tributaries of Lake Monduran and the Kolan River extend from the Study Area (Queensland Globe, 2024). One farm dam is located in the south-eastern corner of the Study Area. The waterways run north and/or north-east, ultimately flowing into Lake Monduran located north of the Study Area or Koan River located north-east of the Study Area.

## 4.2 Description of Ecological Values

### 4.2.1 Land Use and Study Area Characteristics

The Study Area is primarily utilised for agricultural purposes (grazing and cropping) and for utility services. An existing Powerlink Substation is located along the western boundary within the Study Area. All allotments encompassing the Study Area are utilised for cattle grazing, however, lot and plan 22SP109996 contained a large patch of remnant vegetation north-east of the Study Area. The western and southern sections of the Study Area mostly contained non-remnant grazing pasture with smaller areas of remnant vegetation scattered throughout. There are no permanent residences/dwellings within the Study Area. The Study Area also covers Monduran Dam Road and Bruce Highway road reserves which are largely clear of vegetation, with only small, scattered patches of woody vegetation present.

### 4.2.2 Results of Previous Studies

The previous ecological assessment (RPS, 2024) reported that the Study Area (BESS footprint only) had been previously cleared and contained no threatened species. The study did not quantify and assess threatened species habitat, conduct impact assessments or provide ground-truthed REs. The report has not been considered further, with the results presented in this report superseding the RPS (2024) findings.

### 4.2.3 Regulated Vegetation

The Study Area is mapped on the Regulated Vegetation Management Map (Version 7.07) as primarily containing Category X (non-remnant) vegetation. Patches of Category B (remnant) and Category R (reef-regrowth) vegetation occur in the north-east and south-west corners (**Table 4.2** and **Figure 4.1**).

**Table 4.2 Regulated Vegetation within the Study Area**

Regulated Vegetation	Description	Extent (ha) within Study Area	Extent (ha) within Disturbance Footprint
<b>Category B</b>	An area which is remnant vegetation.	26.7	0.0
<b>Category R</b>	An area which is a regrowth watercourse and drainage feature area located within 50 metres of a watercourse located in the Burdekin, Burnett–Mary, Eastern Cape York, Fitzroy, Mackay–Whitsunday or Wet Tropics catchments. The vegetation management framework regulates clearing of native vegetation within this buffer area.	11.5	0.5
<b>Category C</b>	An area which is high-value regrowth vegetation on freehold land, Indigenous land or land the subject of a lease issued under the <i>Land Act 1994</i> for agriculture or grazing purposes or an occupation licence under that Act, in an area that has not been cleared in the last 15 years which is also an endangered, of concern, or least concern regional ecosystem.	0.03	0.0
<b>Category X</b>	Non-remnant vegetation.	82.4	2.2

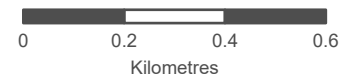
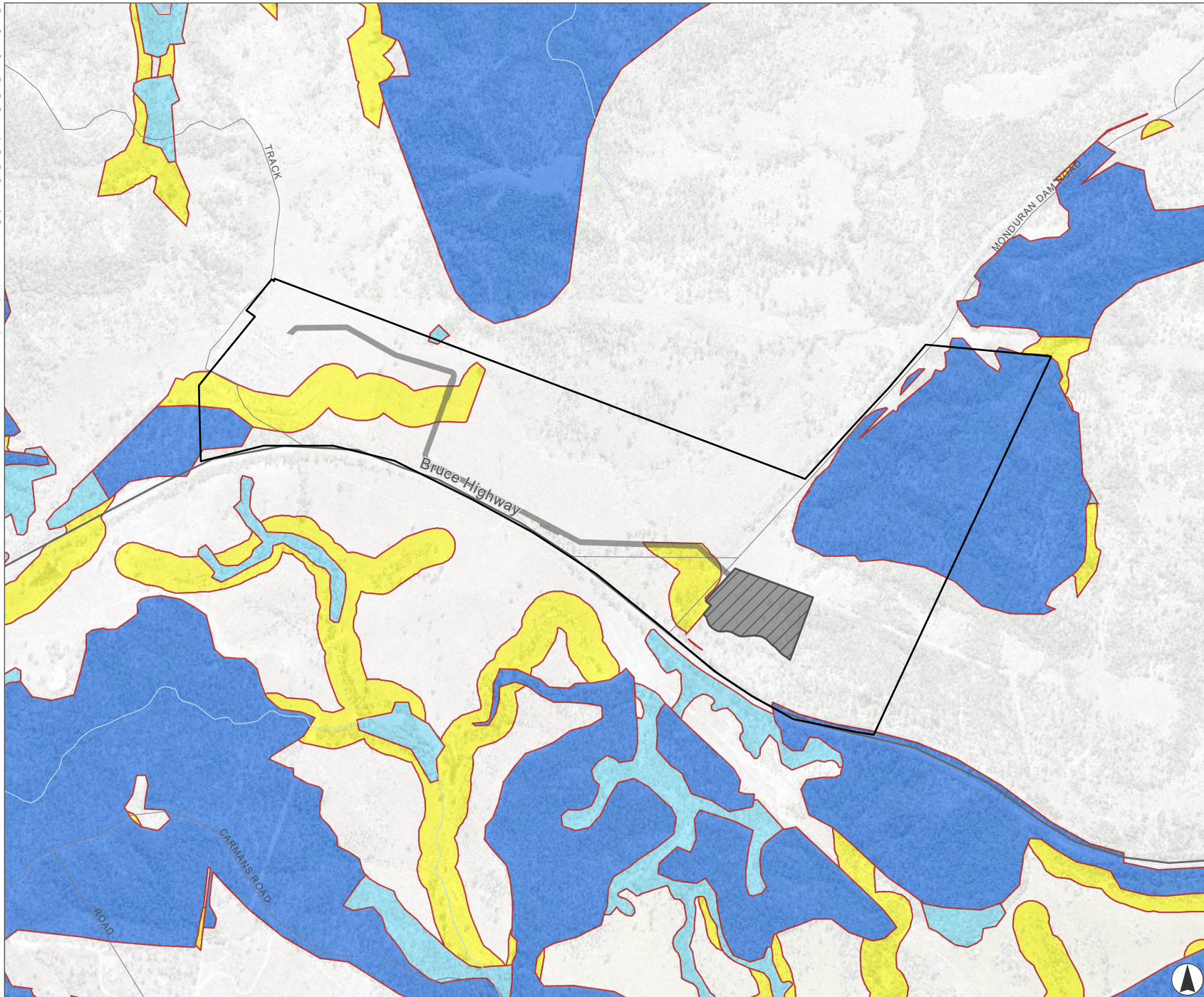


**FIGURE 4.1**

**State Regulated Vegetation**

**Legend**

- Study Area
- Disturbance Footprint
- Proposed BESS Facility (existing DA)
- State Controlled Road
- Local Road
- Watercourse
- State Regulated Vegetation**
- Category B
- Category C
- Category R
- Category X
- Water



Scale 1:15,000 at A4  
GDA2020 MGA Zone 56

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

APPROVED FOR AND ON BEHALF OF Umwelt

## 4.2.4 Regional Ecosystems

A review of the Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development RE mapping (Version 13) shows the Study Area is largely mapped as non-remnant, with the Category B and R vegetation patches both mapped as RE 12.11.6/12.11.14 (**Figure 4.2**).

The field survey ground-truthed three remnant REs within the Study Area (**Table 4.3, Figure 4.3**). In total, 43 ha (35.7%) of remnant vegetation was ground-truthed, comprising of one ‘Endangered’, one ‘Of Concern’ and one ‘Least Concern’ RE under the VM Act. This is largely attributed to a single large patch of intact vegetation in the north-east of the Study Area. The majority of the Study Area (64.3%) comprises non-remnant vegetation (77.6 ha). These areas have been subject to historical clearing, livestock impacts, pasture improvement and weed encroachment.



A detailed description of REs including representative photos of each RE is provided in **Table 4.4**.



**Table 4.3 Extent and Condition of REs Identified within the Study Area**

RE	REDD Short Description	VM Act Status	Vegetation Condition	Extent within the Study Area (ha)	Extent (ha) within Disturbance Footprint
12.3.3	<i>Eucalyptus tereticornis</i> woodland on Quaternary alluvium.	Endangered	Remnant	2.7	0.3
12.11.6	<i>Corymbia citriodora</i> subsp. <i>variegata</i> , <i>Eucalyptus crebra</i> woodland on metamorphics +/- interbedded volcanics.	Least concern	Remnant	36.2	0.0
12.11.14	<i>Eucalyptus crebra</i> , <i>E. tereticornis</i> , <i>Corymbia intermedia</i> woodland on metamorphics +/- interbedded volcanics.	Of Concern	Remnant	4.2	0.2
<b>Non-remnant</b>	-	-	-	71.7	2.1
<b>Existing infrastructure</b>	-	-	-	5.9	0.0
<b>Total</b>				<b>120.6</b>	<b>2.7</b>



**Table 4.4 Ground-truthed Regional Ecosystems within the Study Area**

RE	Field Description	Representative Photo
12.3.3	<p><i>Eucalyptus tereticornis</i> was dominant to co-dominant with <i>Eucalyptus crebra</i> averaging up to 24 m tall. A sub-canopy of <i>Corymbia tessellaris</i> was noted in places, however not consistent across all patches. The shrub cover ranged from 12–24%, dominated by the exotic species, <i>Lantana camara</i>*, although native shrubs such as <i>Acacia disparrima</i> and <i>Ficus opposita</i> were recorded. The ground cover density was high, exceeding 85% cover and dominated by the exotic grasses, <i>Hyparrhenia rufa</i>* and <i>Megathyrsus maximus</i>*. Past clearing, grazing and weeds are the dominant forms of disturbance to this vegetation community.</p>	
12.11.6	<p><i>Corymbia citriodora</i> and <i>Eucalyptus crebra</i> woodland, open woodland or open forest averaging up to 18 m tall. Other canopy and/or sub-canopy trees included <i>Eucalyptus exserta</i>, <i>Lophostemon confertus</i> and <i>Corymbia tessellaris</i>. A shrub layer was mostly sparse, although pockets of high shrub cover were noted where <i>Lantana camara</i>* was present. The ground cover did not exceed 50%. Isolated patches of this community showed increased signs of disturbance from edge effects and cattle access. Larger patches including those in the north-east of the Study Area, were had a more complex structure and supported relatively higher habitat features for fauna.</p>	

RE	Field Description	Representative Photo
<p><b>12.11.14</b></p>	<p>Open woodland of <i>Eucalyptus crebra</i>, <i>Eucalyptus tereticornis</i> and <i>Angophora leiocarpa</i> averaging up to 16 m tall. Shrub layer was sparse (&lt;5%) and comprised <i>Acacia</i> spp. This vegetation occurred within road verges and showed signs of disturbance such as weeds, primarily exotic grasses. Access to these areas was limited (adjacent to major highway) and more comprehensive flora survey was not possible, however confirmation of canopy, heights and cover estimates was achieved.</p>	
<p><b>Non-remnant</b></p>	<p>This vegetation is characterised by the dominance of exotic pasture grasses with occasional scattered emergent trees, typically <i>Eucalyptus crebra</i> and <i>Angophora leiocarpa</i>. Extensive grazing activities are evident in addition to past land clearing. This vegetation community is associated with a diversity of landforms and soils.</p>	



**FIGURE 4.2**

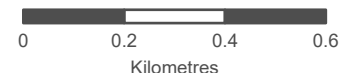
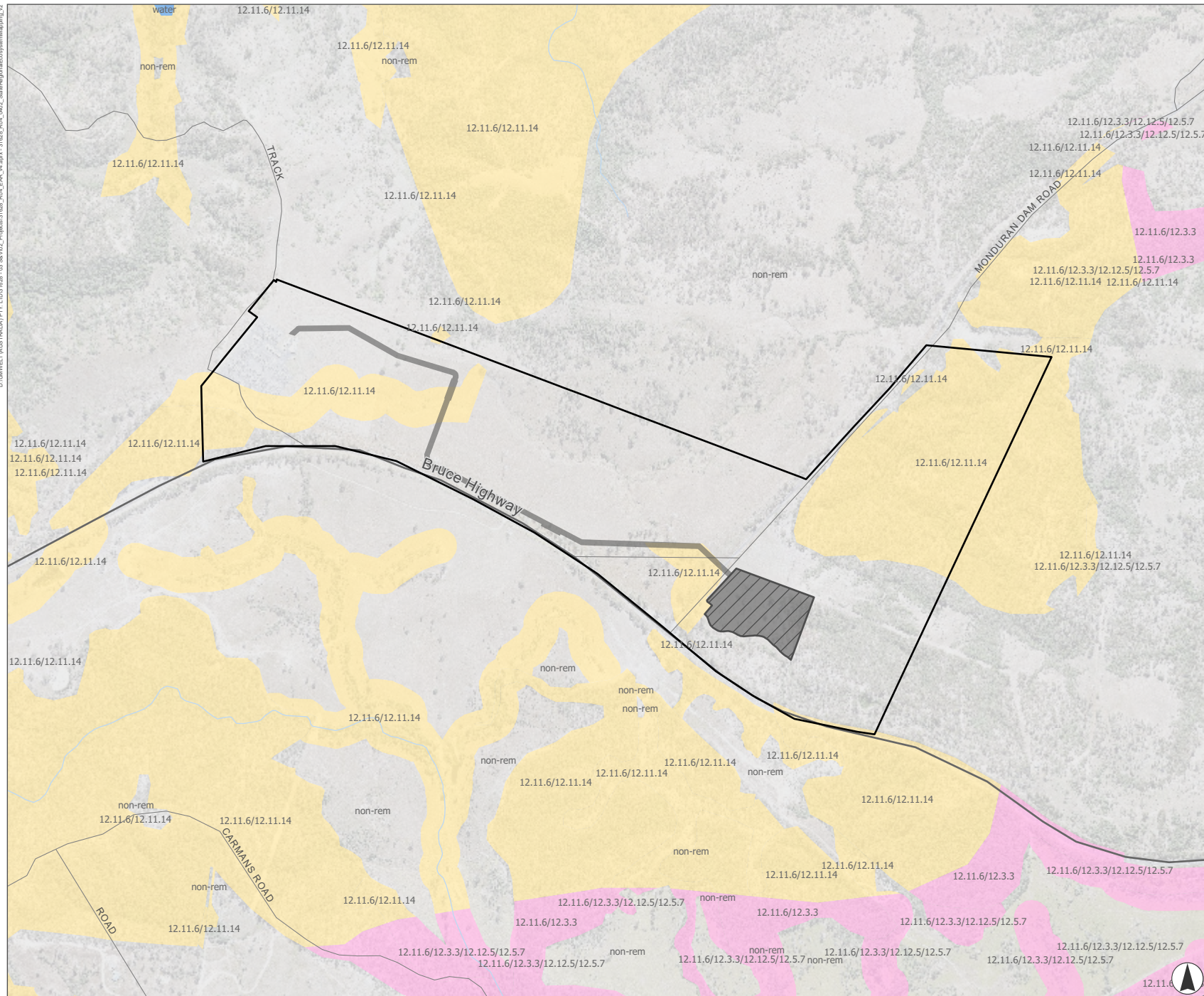
**State Regional Ecosystem Mapping**

**Legend**

- Study Area
- Disturbance Footprint
- Proposed BESS Facility (existing DA)
- State Controlled Road
- Local Road
- Watercourse

**Regional Ecosystem**

- Endangered (Sub-dom)
- Of Concern (Sub-dom)
- Non-rem
- water



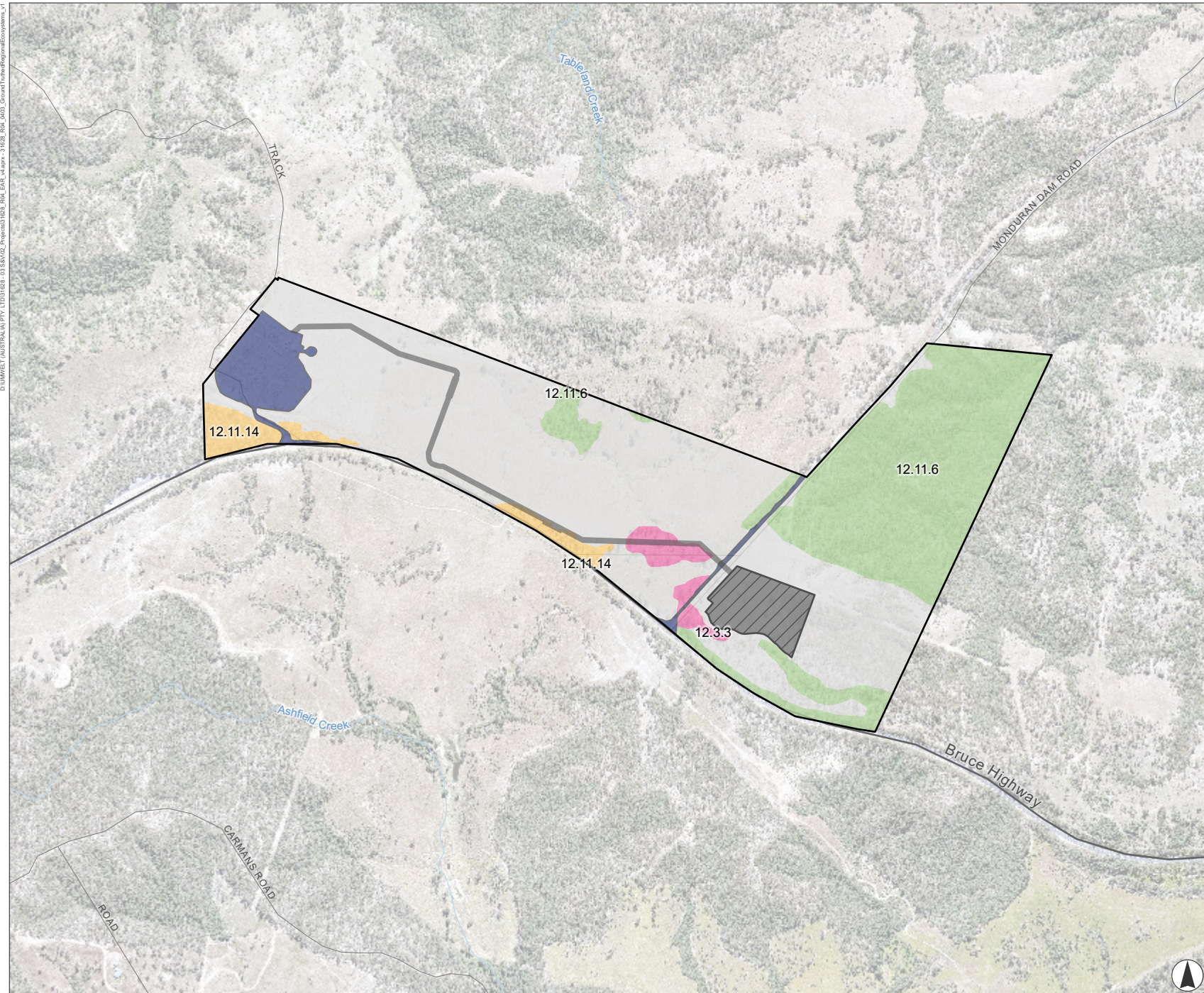
Scale 1:15,000 at A4  
GDA2020 MGA Zone 56

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

APPROVED FOR AND ON BEHALF OF Umwelt



**FIGURE 4.3**  
Ground-truthed Regional Ecosystems

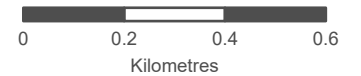


**Legend**

- Study Area
- Disturbance Footprint
- Proposed BESS Facility (existing DA)
- State Controlled Road
- Local Road
- Watercourse

**GTRE**

- Endangered
- Of concern
- Least concern
- non-remnant
- Existing Infrastructure



Scale 1:15,000 at A4  
GDA2020 MGA Zone 56

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.  
APPROVED FOR AND ON BEHALF OF Umwelt



## 4.2.5 Threatened Ecological Communities

A total of five threatened ecological communities (TECs) listed under the EPBC Act were identified on the desktop assessment as potentially occurring within 20 km of the Study Area. Of those TECs, only one had potentially analogous vegetation present within the Study Area and was subject to further field assessment; *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions* (Subtropical eucalypt floodplain forest). No analogous vegetation for the remaining four TECs was recorded within the Study Area and therefore, they are considered to have a low likelihood of occurrence (**Appendix B**).

Based on the key diagnostics and condition thresholds, potential TEC patches were delineated and an assessment of condition classes and thresholds was completed. The assessment found that no patches of 12.3.3 qualify as a Subtropical eucalypt floodplain forest TEC under the EPBC Act.

## 4.2.6 Flora Diversity

A total of 34 flora species were recorded within the Study Area during the field survey undertaken by Umwelt, comprising 26 native and eight introduced species. The dominant plant families recorded included: Myrtaceae and Poaceae. A full flora species list is provided in **Appendix C**.

### 4.2.6.1 Introduced Flora Species

One introduced flora species recorded during field surveys listed as WONS and listed as State Restricted under the Biosecurity Act; *Lantana camara\** (Lantana).

### 4.2.6.2 Threatened and Near Threatened Flora Species

No flora species listed under the NC Act or EPBC Act were recorded within the Study Area during the field survey undertaken by Umwelt.

A total of 18 flora species listed under the NC Act and/or EPBC Act were identified during the desktop assessment based on a 20 km buffer of the Study Area. Locations of the available desktop records for threatened flora species previously recorded within the Study Area or 20 km buffer are displayed on **Figure 4.4**.

The likelihood of occurrences assessment identified two threatened flora species with a moderate likelihood of occurring within the Study Area based on suitable habitat encountered during the field surveys. For both species, the likelihood of their occurrence is associated with the single large patch of vegetation (12.11.6) north of the existing transmission line. These species are summarised in **Table 4.5**.

All remaining threatened species are considered to have a low likelihood of occurring or are unlikely to occur within the Study Area, and therefore are not discussed further. Refer to **Appendix B** for the full likelihood of occurrence assessment.

**Table 4.5 Flora Likelihood of Occurrence Results**

Scientific Name	Common Name	NC Act Status	EPBC Act Status
<b>Moderate likelihood of occurrence</b>			
<i>Cycas megacarpa</i>	-	Endangered	Endangered

Scientific Name	Common Name	NC Act Status	EPBC Act Status
<i>Samadera bidwillii</i>	Quassia	Vulnerable	Vulnerable

## 4.2.7 Fauna Diversity

A total of 32 fauna species were identified within the Study Area throughout the field surveys comprising of 24 birds, six mammals and two amphibians. The full list of fauna species recorded within the Study Area is provided in **Appendix C**.

### 4.2.7.1 Introduced Fauna Species

One introduced fauna species have been recorded; cane toad (*Rhinella marina*\*)

Due to the high degree of existing disturbance within the Study Area, as well easy access to water resources (dams) and food sources, numerous introduced fauna species are likely to occur, including red fox (*Vulpes vulpes*\*) and feral cat (*Felis catus*\*).

### 4.2.7.2 Threatened and Near Threatened Fauna Species

No fauna species listed under the NC Act or EPBC Act were recorded within the Study Area during the field survey undertaken by Umwelt.

A total of 37 fauna species listed as threatened or near threatened under the NC Act and/or EPBC Act were identified during the desktop assessment based on a 20 km buffer of the Study Area: this included 20 birds, 9 mammals, 1 fish, 1 frog and 6 reptiles. Locations of the available desktop records for these fauna species previously recorded within the Study Area or 20 km buffer are displayed on **Figure 4.4**.

The likelihood of occurrences assessment determined nine fauna species with the potential to occur within the Study Area based on the habitat encountered during the field surveys: two have a high likelihood of occurring and seven have a moderate likelihood of occurring. A summary of these species is provided in **Table 4.6**.

All remaining species are regarded as having a low likelihood of occurring or are unlikely to occur within the Study Area and therefore is not discussed further. Refer to **Appendix B** for the full likelihood of occurrence assessment.

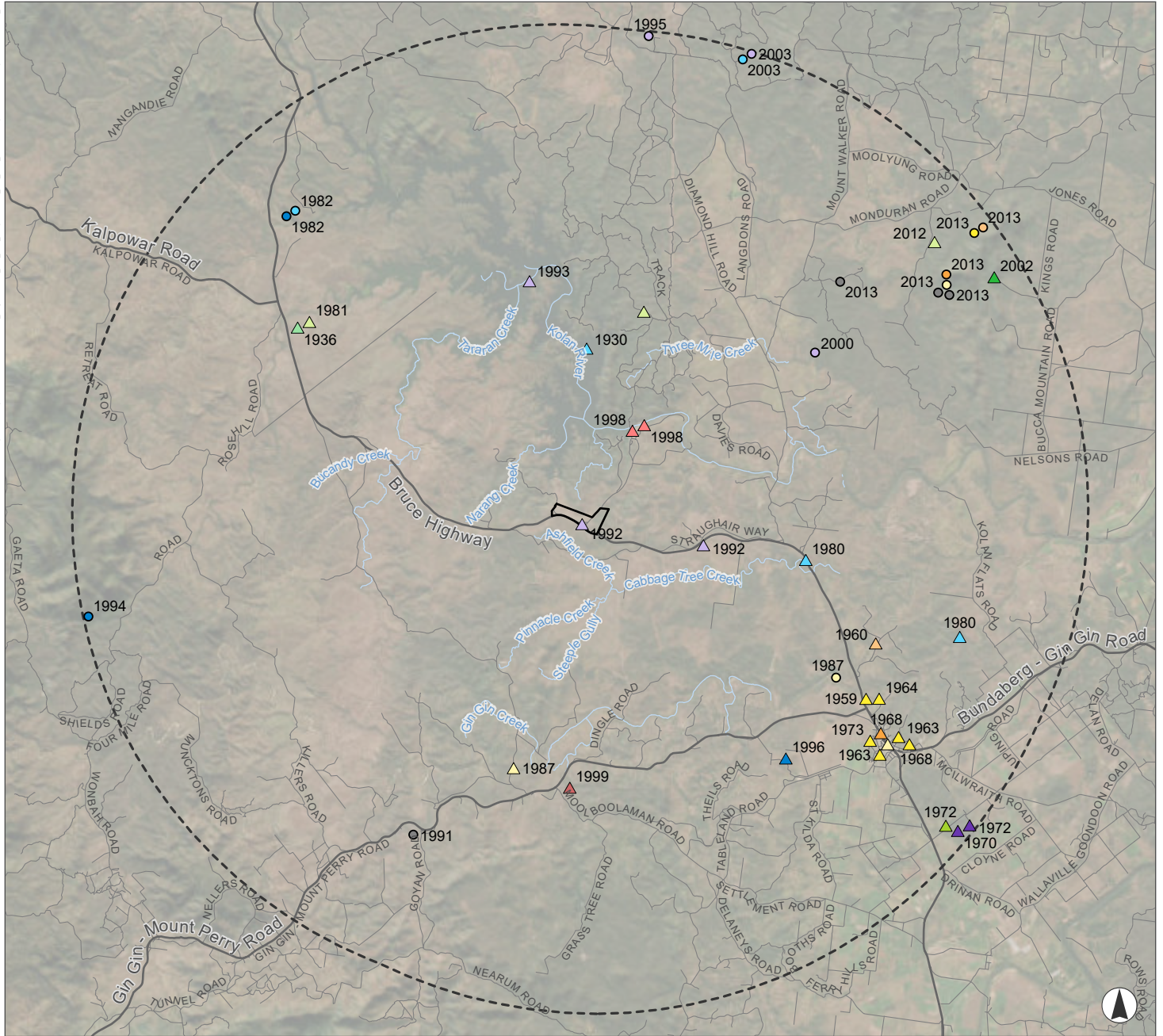
**Table 4.6 Fauna Likelihood of Occurrence Results**

Scientific Name	Common Name	NC Act Status	EPBC Act Status
<b>High likelihood of occurrence</b>			
<i>Hirundapus caudacutus</i>	White-throated needletail	Vulnerable	Vulnerable, Migratory
<i>Phascolarctos cinereus</i>	Koala	Endangered	Endangered
<b>Moderate likelihood of occurrence</b>			
<i>Dasyurus hallucatus</i>	Northern quoll	-	Endangered
<i>Furina dunmalli</i>	Dunmall's snake	Vulnerable	Vulnerable
<i>Gallinago hardwickii</i>	Latham's snipe	Vulnerable	Vulnerable, Migratory
<i>Ninox strenua</i>	Powerful owl	Vulnerable	-

Scientific Name	Common Name	NC Act Status	EPBC Act Status
<i>Petaurus australis australis</i>	Yellow-bellied glider (south-eastern)	Vulnerable	Vulnerable
<i>Petauroides volans</i>	Greater glider (southern and central)	Endangered	Endangered
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	-	Vulnerable

**FIGURE 4.4**

**Threatened Species within Desktop Assessment Area**



**Legend**

- Study Area
- 20km study area buffer
- Watercourse
- State Controlled Road
- Local Road

**Threatened Fauna Species**

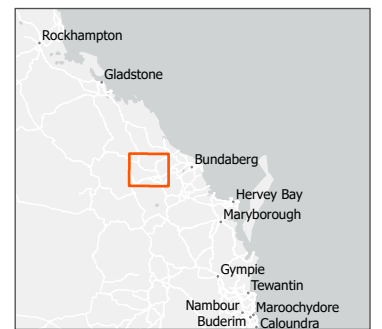
- ▲ black-breasted button-quail (*Turnix melanogaster*)
- ▲ glossy black-cockatoo (*Calyptorhynchus lathami*)
- ▲ koala (*Phascolarctos cinereus*)
- ▲ oriental cuckoo (*Cuculus optatus*)
- ▲ plumed frogmouth (*Podargus ocellatus plumiferus*)
- ▲ powerful owl (*Ninox strenua*)
- ▲ red goshawk (*Erythrotriorchis radiatus*)
- ▲ rufous fantail (*Rhipidura rufifrons*)

- ▲ southern greater glider (*Petauroides volans volans*)
- ▲ spectacled monarch (*Symphisochrus trivirgatus*)
- ▲ tusked frog (*Adelotus brevis*)
- ▲ white shark (*Carcharodon carcharias*)
- ▲ white-throated snapping turtle (*Elseya albagula*)
- ▲ yellow-bellied glider (southern subspecies) (*Petaurus australis australis*)

**Threatened Flora Species**

- *Adiantum atroviride*
- *Adiantum hispidulum* var. *hispidulum*
- *Adiantum hispidulum* var. *minus*
- *Doryopteris concolor*
- *Drynaria rigidula*
- *Lastreopsis tenera*
- *Lobelia membranacea*

- *Lobelia purpurascens* (white root)
- *Lobelia quadrangularis*
- *Microsorium punctatum*
- *Pellaea nana*
- *Platynerium superbum* (staghorn fern)
- *Potamogeton tepperi*
- *Pyrrosia rupestris* (rock felt fern)



Scale 1:250,000 at A4  
GDA2020 MGA Zone 56

This document and the information are subject to Terms and Conditions and Umwelt (Australia) Pty Ltd ("Umwelt") Copyright in the drawings, information and data recorded ("the information") is the property of Umwelt. This document and the information are solely for the use of the authorized recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by Umwelt. Umwelt makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

APPROVED FOR AND ON BEHALF OF Umwelt



## 4.2.8 Fauna Habitat

The Study Area can be characterised into three terrestrial habitat types based on the findings of the field survey program. The presence and extent of these habitat types is summarised in **Table 4.7** and displayed on **Figure 4.5**.

The ‘modified areas’ habitat type dominates the Study Area occupying 64.28%. A description of each habitat type, relevant microhabitat features and associated MNES is provided in the following subsections.

**Table 4.7 Summary of Terrestrial Habitat Types**

Habitat Type	Extent (ha) within Study Area	Extent (ha) within Disturbance Footprint
<i>Eucalyptus tereticornis</i> and <i>Eucalyptus crebra</i> woodland to open forest, fringing waterways	2.7	0.3
Mixed Eucalypt open woodland to woodland on hills and lowlands	40.2	0.2
Modified areas comprising exotic pasture, scattered mature Eucalypts, farm dams and low order waterways	77.8	2.1

### 4.2.8.1 *Eucalyptus tereticornis* and *Eucalyptus crebra* woodland to open forest, fringing waterways

All occurrences of this habitat type were sampled, restricted to two discrete patches near the southern boundary of the Study Area and centred around a lower order waterway (stream order 1). The habitat type occurs on Quaternary alluvial deposits, influenced by the ephemeral to semi-permanent waterway which dissects the habitat. Dominant canopy vegetation within the is habitat type includes *Eucalyptus tereticornis* (Queensland blue gum), *Eucalyptus crebra* (narrow-leaved red ironbark), *Corymbia tessellaris* (Moreton Bay ash). A sub-canopy and/or shrub layer was also present, with typical species including *Eucalyptus* spp, *Euroschinus falcata*, *Acacia dissosperma*, *Ficus* sp., and *Alphitonia excelsa* (soap tree). The exotic shrub, *Lantana camara*\*, was present in dense thickets. The ground layer was dense and dominated by exotic grasses, *Megathyrsus maximus*\* (guinea grass) and *Hyparrhenia rufa*\* (thatch grass). Native grasses were rare.

Key habitat features large mature trees including several with a DBH greater than 60 cm, rare hollows (typically small sized), occasional fallen logs (10–30 cm width) and decorticating bark. Within the channel of the drainage feature, a stony bed with relatively steep, low banks was noted. In patches west of Lake Monduran Dam Road, water pools were present and aquatic macrophytes (*Juncus* sp.) were prevalent.

The dominance of a eucalypt canopy provides a food resource for koala. The small size of the hollows and disconnected nature of the habitat patches renders this habitat unsuitable for threatened hollow dependent subspecies such as greater glider (central and southern), yellow-bellied glider (south-eastern) and powerful owl. The dominance and density of exotic grasses render the habitat unsuitable for squatter pigeon (southern).





**Photo 4.1** *Eucalyptus tereticornis* and *Eucalyptus crebra* woodland to open forest

#### **4.2.8.2 Mixed eucalypt open woodland to woodland on hills and lowlands**

This habitat type was sampled across the Study Area and often occurred as isolated stands or within road easements. Dominant canopy vegetation within the is habitat type includes *Corymbia citriodora* and *Eucalyptus crebra*. The exotic shrub, *Lantana camara*\*, was often present in dense thickets, although not distributed widely throughout. The ground layer was moderately sparse (30–50% cover) and comprised a mix of native and non-native species.

Key habitat features included high leaf litter, although not forming deep matts, occasional rocky features including surface stones to 20 cm. Fallen timber was generally small in size, with rare occurrences of larger habitat logs. Shedding bark, particularly on *Angophora leiocarpa*, provided opportunities for reptiles and ground mammals. The dominance of a eucalypt canopy provides a food resource for koala. The larger remnant patch in the northeast of the Study Area was connected more broadly to areas beyond the Study Area and included small gullies where higher vegetation complexity (mostly shrub layer) was noted.

Isolated patches typically showed signs of disturbance and were disconnected quite considerably by local road access, major highways and cleared land for grazing. Where gullies intersected this habitat type, considerable erosion was recorded. Larger habitat patches, such as those in the northeast of the Study Area maintain connection to areas beyond the Study Area and thus hold higher potential to support threatened species such as yellow-bellied glider (south-eastern), Dunmall’s snake or northern quoll.